

Consumer Council of Canada (CCC) INTERROGATORY #1 List 1

Interrogatory

Ex. B/T1/S1/p. 2

Please recast Figure 1 - "Annual Peak and Energy Savings from OPA-Contracted and Board-Approved CDM Programs" and separate out the projected savings related to Board-Approved Programs and OPA contracted programs.

Response

In Exhibit B, Tab 1, Schedule 2, Table 5, Page 13 of 24, HONI itemized projected savings related to the proposed Board-Approved Programs. The anticipated OPA-Contracted annual peak and energy savings is reported below for convenience.

Annual Peak and Energy Savings from OPA-Contracted and OEB Programs					
Savings	2011	2012	2013	2014	Total 2011 2014
OPA Programs - Peak (kW) cumulative savings	30,000	69,000	113,000	161,000	161,000
OEB Programs – Peak (kW) cumulative savings	12,000	25,000	37,000	49,000	49,000
Total - Peak (kW) cumulative savings	42,000	94,000	150,000	210,000	210,000
OPA Programs - Annual Energy Savings (MWh)	77,000	173,000	270,000	373,000	894,000
OEB Programs - Annual Energy Savings (MWh)	19,000	43,000	54,000	64,000	179,000
Total - Programs - Annual Energy Savings (MWh)	96,000	216,000	324,000	437,000	1,073,000

* These are Hydro One estimates.

Consumer Council of Canada (CCC) INTERROGATORY #2 List 1

Interrogatory

Ex. B/T1/S1/p. 3

The forecasted budget for OPA-contracted programs is \$181 million. The budget for Board-approved programs is \$32 million. Please explain the process that HON undertook with the OPA to arrive at an overall \$181 million budget for OPA-Contracted programs? Please explain how HON determined that \$32 million was an appropriate budget for it Board-approved programs? Why not \$16 million? Why not \$100 million?

Response

For the process that HONI undertook to arrive at an overall \$181 million budget for OPA-Contracted Programs, please refer to Exhibit I, Tab 5, Schedule 2, part f.

The budget of \$32 million for Board-approved programs was the summation of estimates computed at the individual initiative level. Individual initiative budgets were estimated considering: 1) Hydro One past experience in delivering similar programs (e.g. Community Events, Double Return Plus); 2) confidential budget information from Third-Party vendors delivering similar initiatives in other jurisdictions (e.g. Neighbourhood Benchmarking); and 3) the consultant's study .

Hydro One's estimate of the Board-approved initiative budget is determined by the expected participation rate for each initiative and the corresponding incentive and deployment costs to achieve the results. Thus the estimated budget is what Hydro One requires to cost-effectively meet its OEB-allocated targets.

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2 **Consumer Council of Canada (CCC) INTERROGATORY #3 List 1**

3
4 **Interrogatory**

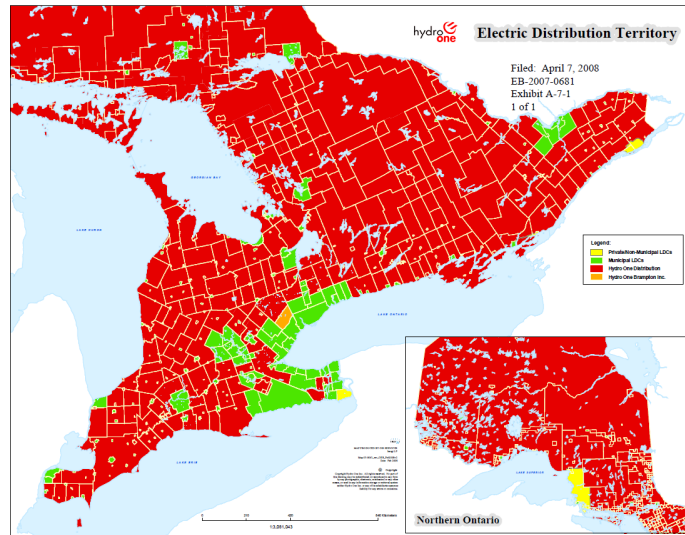
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6 Ex. B/T1/S2/p. 2

7
8 Please file the consultant's report on HON's CDM potential. What was the cost of the
9 study and how are those costs to be recovered?

10
11
12 **Response**

13
14 Please refer to Attachment 1 for a copy of the CDM potential study. The cost of the
15 CDM study was approximately \$150,000. This cost was recovered through the funding
16 approved as part of the Distribution Rate filing EB-2009-0096.

Hydro One CDM Achievable Potential - Part A



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ACRONYMS AND ABBREVIATIONS

CDM	- Conservation and Demand Management
CO ₂ e	- Carbon Dioxide equivalent
CUSUM	- Cumulative Sum Control Chart
ECM's	- Electronically Commutating Motors
EM&V	- Evaluation, Measurement and Verification
ERIP	- Electricity Retrofit Incentive Program
GHG	- Greenhouse Gas
GS<50kW	- General Service Account with monthly peak demand of less than 50 kW
GS>50kW	- General Service Account with monthly peak demand greater than 50 kW
HONI	- Hydro One Networks Inc.
HPNC	- High Performance New Construction
kW	- kilowatt
kWh	- kilowatt-hour
LDC	- Local Distribution Companies
NRCan	- Natural Resources Canada
OPA	- Ontario Power Authority
OPG	- Ontario Power Generation
PAC	- Program Administrator Cost
PSB	- Power Saving Blitz
PIA	- Prescriptive Input Assumptions
SCG	- Southern California Gas
TOU	- Time of Use
TRC	- Total Resource Cost

1. EXECUTIVE SUMMARY

Hydro One has been very active in pursuing Conservation and Demand Management (CDM) since 2005. Between 2005 and April 2008, HONI brought over 25 CDM programs/initiatives to customers across all sectors. These programs achieved annualized savings of 284 GWh and resulted in over 67 MW in peak demand savings.

HONI's service territory differs from that of most other Ontario LDC's. Although the Ontario Power Authority offers a number of CDM programs across the province, their programs tend to be designed for "urban" LDCs and don't fully reflect or address HONI's customers' needs. The characteristics of HONI's service territory and customer base, including its geographic size, much lower customer densities, greater prevalence of electric space and water heating, and the number and diversity of channel partners and media, combine to present a number of unique challenges.

The Ontario government has signaled its strong focus on CDM as a central component of the province's electricity future by passing the Green Energy and Green Economy Act (GEGEA) in 2009. An important provision in the Act allows the Minister to issue a directive for the OEB to set CDM target for distributors including HONI.

Recognizing the growing importance of CDM to its overall system planning and to ensure it can maximize its CDM achievements under whatever new framework is established, HONI has acted proactively to identify opportunities for energy efficiency and demand reductions. As part of this effort, Navigant Consulting Ltd. (Navigant) was retained to undertake a two-part study:

- Part A of the study was to estimate HONI's achievable electricity peak reduction and energy savings from CDM programs for HONI's distribution customers through 2014.
- Part B is to address an OEB requirement that HONI bring forward a proposal on how to incorporate CDM into its load forecast.

This report addresses Part A of the overall study. Part B will be addressed in a separate report.

For this project, Navigant completed a comprehensive review of electricity end-uses and available CDM measures in order to develop an estimate of "achievable potential" based on an analysis of the existing mix of electricity end uses in HONI's service territory and the mix of programs currently being offered in Ontario by the OPA and HONI. These measures were combined into additional programs and initiatives for development by

HONI, which were then selected and developed based on “best practices” from other jurisdictions to address significant areas of end-use potential.

The first step in our analysis was to develop a “sales profile” for each sector of HONI’s customer base and gather information regarding the characteristics of HONI’s service territory and loads. This profile, reconciled against HONI’s total sales, provided a picture of customer electricity use by sector at the end-use level, providing the basis for developing an estimate of achievable potential consistent with HONI’s actual sales and load forecast.

Building on the analysis of HONI’s sales, candidate measures were considered across the end uses for each sector. For each measure considered, the initial and potential market penetrations of the technologies were estimated over the study period; with and without the candidate programs. Estimates of the “achievable” electricity peak reduction and energy savings by year, sector and end-use were then developed by applying the measures covered by current programs to the adjusted sales profile.

Using the end-use/measure level TRC estimates and taking into account best practices and feedback from stakeholders, candidate programs were developed, reviewed and ranked in terms of their appropriateness to the characteristics of HONI’s territory and their ability to address significant areas of potential. Consideration was also given to the need to develop a diversified and comprehensive portfolio covering all key market segments.

A recommended portfolio of additional HONI programs was then developed to deliver: a) proven results based on prior program experience (from HONI or elsewhere); b) cost-effectiveness based on TRC and PAC tests; and c) programs which HONI can market and deliver across its extensive service territory which do not duplicate existing initiatives offered by the OPA.

The resulting analysis provided an estimate of the achievable potential for the 2011 – 2014 period under three scenarios. The three scenarios are cumulative in that the impacts of each scenario assume the levels of conservation and demand management of the prior scenario.

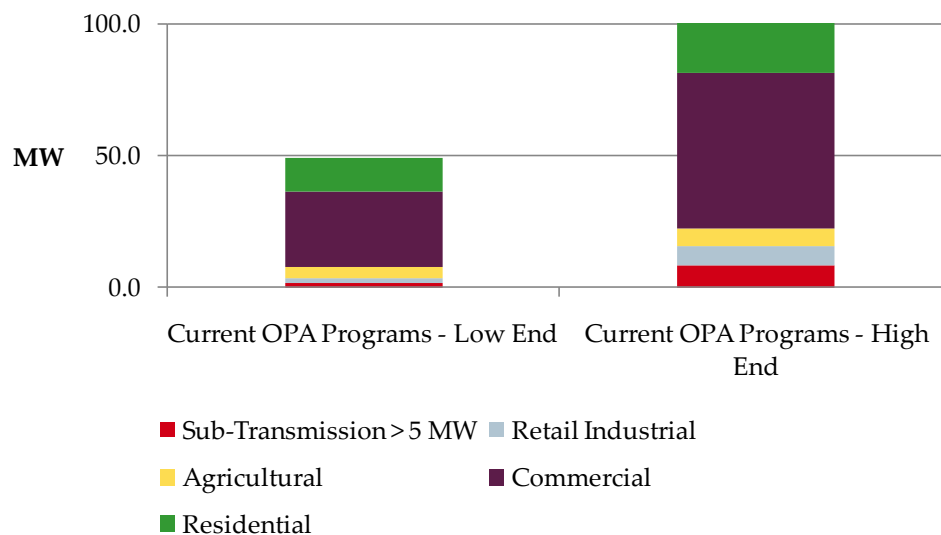
Figure 1: Description of Scenarios

No OPA Programs	• Without any electricity ratepayer-funded programs (<i>ie. federal/provincial/gas initiatives only</i>).
Current OPA Programs	• Current electricity ratepayer-funded programs
Additional HONI Programs	• Proposed additional HONI programs and initiatives.

Estimates of conservation and demand management, including fuel switching, were developed for each scenario. The effect of implementing time-of-use (TOU) rates was also calculated, though not included in the estimates of achievable CDM potential.

Under the “Current OPA Programs” scenario, Navigant Consulting developed a range of estimates of the potential net savings from energy efficiency and fuel switching measures resulting from OPA programs operating in HONI territory (shown in the figure below).

Figure 2: Likely Range of Net EE and FS Demand Savings for Current OPA Programs (2011 – 2014)



	Current OPA Programs - Low End	Current OPA Programs - High End
Residential	12.8	21.7
Commercial	28.5	59.1
Retail Industrial	1.6	7.5
Sub-Transmission > 5 MW	1.7	8.1
Agricultural	4.2	6.6
Total	49.0	103.1

In addition to these energy efficiency and fuel switching savings, Navigant Consulting estimates the achievable demand response (DR) potential in HONI's service territory of just under 50 MW through 2014.

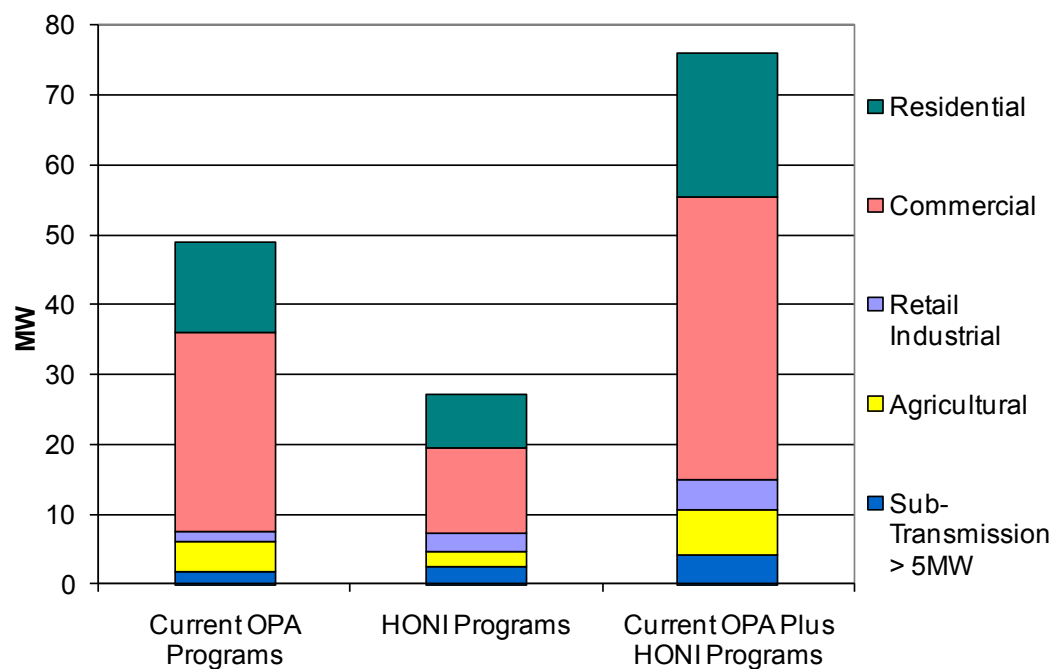
Additional HONI programs were then developed and modelled based on an analysis of the characteristics of HONI's service territory and customer loads and consideration of CDM best practices. The energy and demand potential for the ten additional HONI programs proposed are shown in the table below. The table shows the expected range of demand and energy potential associated with the proposed programs.

Figure 3: Summary of Proposed HONI Programs

Cumulative Achievable Potential 2011- 2014	Demand				Energy	
	Winter MW		Summer MW		GWh	
	Low	High	Low	High	Low	High
Residential						
Heat Pump Water Heater Incentive	7	12	4	6	37	67
Electric Thermal Storage (ETS) Heater Promotion	69	122	0	0	0	0
ETS Heater Retrofit (Low Income)	6	11	0	0	0	0
In-Home Display	5	8	4	8	27	49
Subtotal	87	154	8	14	65	116
Commercial						
Re-Commissioning	2	3	2	4	9	17
Commercial Energy Audit Program	5	8	9	16	31	56
Support for MUSH Sector	1	1	1	1	3	6
Subtotal	7	12	12	21	44	79
Industrial						
Compressed Air Program	0	1	0	1	2	7
Industrial Energy Audit Program	1	3	1	3	8	30
Monitoring & Targeting	1	4	1	4	10	37
Subtotal	3	8	3	7	20	74
Sub-Transmission > 5MW						
Compressed Air Program	0	1	0	1	3	11
Industrial Energy Audit Program	1	3	1	3	8	28
Monitoring & Targeting	1	4	1	4	12	43
Subtotal	3	8	3	7	23	83
Agricultural						
Energy Audit Program	3	4	2	3	17	19
Subtotal	3	4	2	3	17	19
Total Portfolio	103	185	27	52	169	370

The resulting range of energy efficiency and fuel switching demand savings that HONI could achieve by 2014 are shown below, in both demand and energy terms. The figures below and on the following pages present the low end estimate of demand (Summer MW) and energy (GWh) potential, followed by the high end estimate of achievable potential for demand and energy.

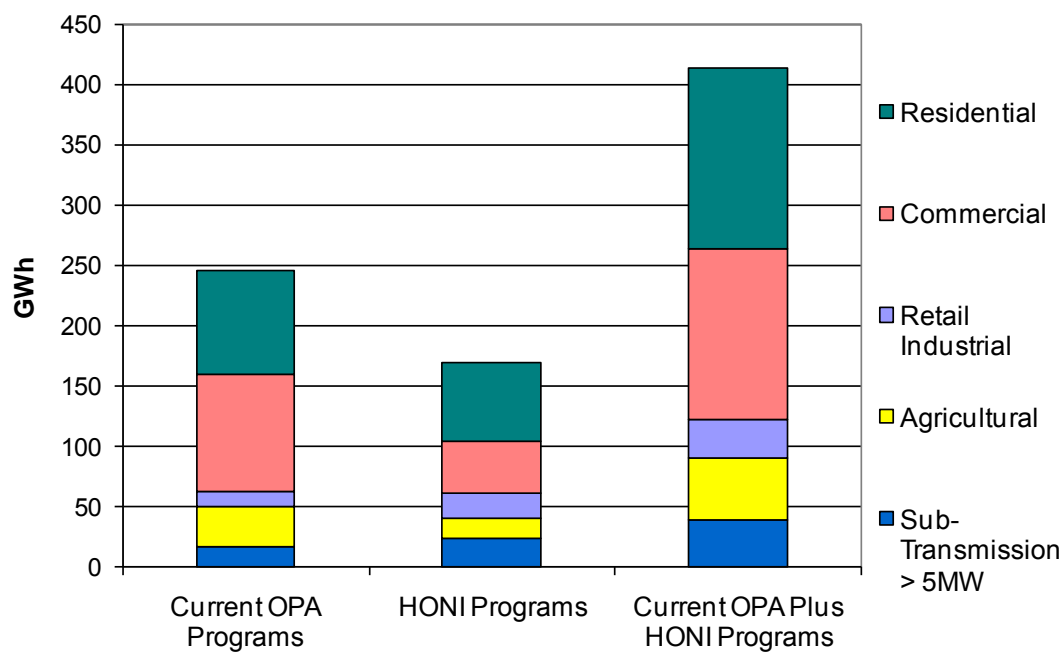
Figure 4: 2011 - 2014 Achievable EE and FS Summer MW Demand Savings (Low End of Range)



Demand Reductions (MW)	2011- 2014 Cumulative Achievable Potential		
	Current OPA Programs	HONI Programs	Current OPA Plus HONI Programs
Sub-Transmission > 5MW	2	3	4
Agricultural	4	2	6
Retail Industrial	2	3	4
Commercial	28	12	41
Residential	13	8	21
Total	49	27	76

No spill-over included

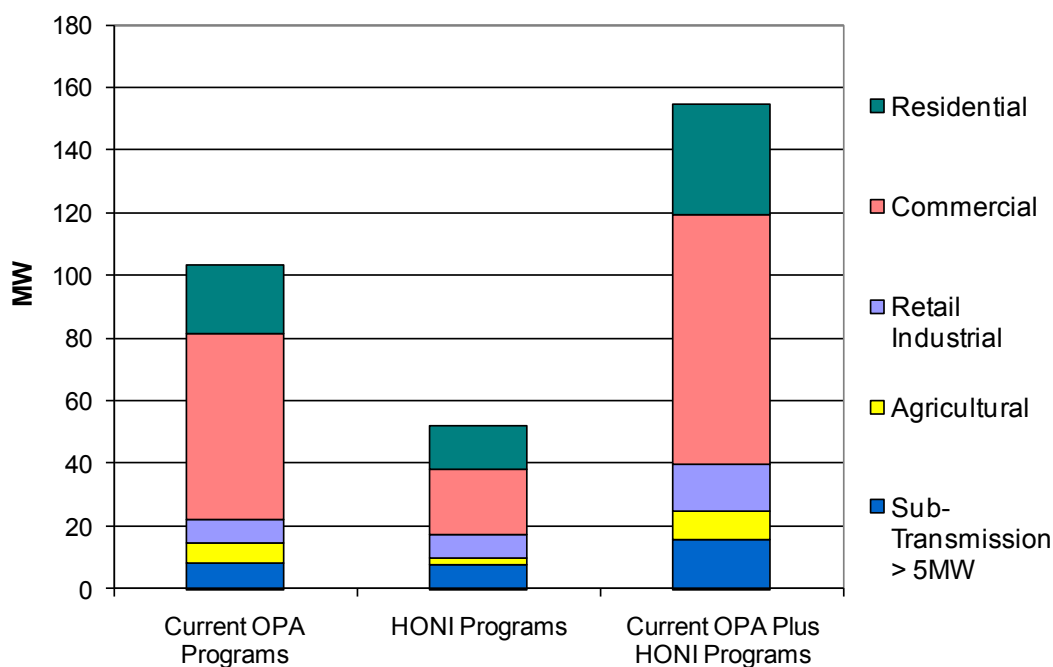
Figure 5: 2011 – 2104 Achievable EE and FS GWh Savings (Low End of Range)



Energy Savings (GWh)	2011-2104 Cumulative Achievable Potential		
	Current OPA Programs	HONI Programs	Current OPA Plus HONI Programs
Sub-Transmission > 5MW	16	23	39
Agricultural	33	17	50
Retail Industrial	12	20	33
Commercial	97	44	141
Residential	86	65	151
Total	245	169	413

No spill-over included

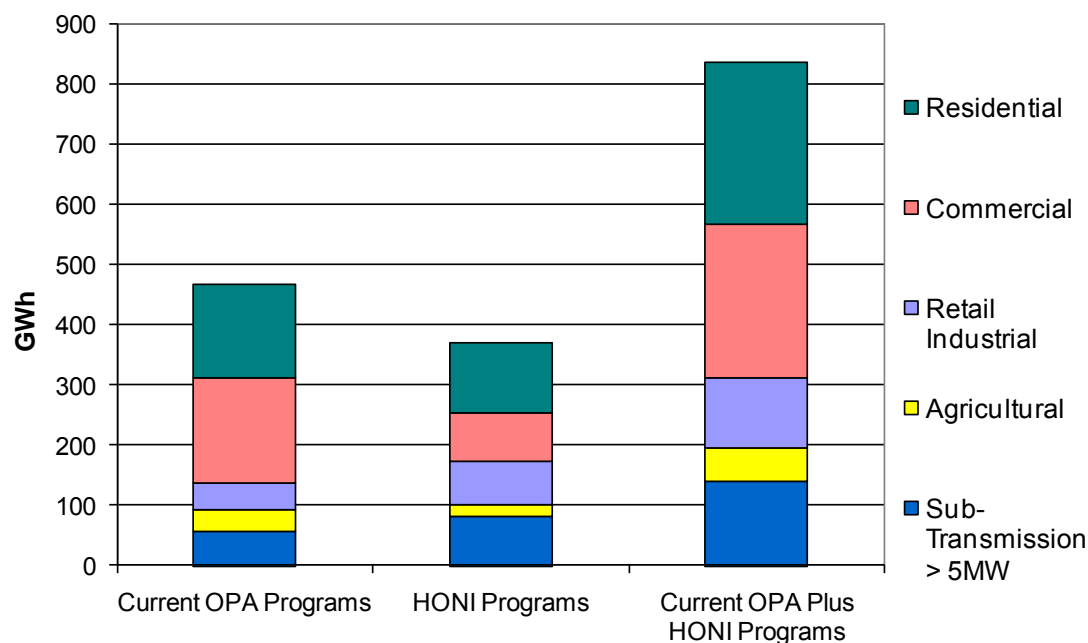
Figure 6: 2011 – 2104 Achievable EE and FS Summer MW Demand Savings (High End of Range)



Demand Reductions (MW)	2011- 2014 Cumulative Achievable Potential		
	Current OPA Programs	HONI Programs	Current OPA Plus HONI Programs
Sub-Transmission > 5MW	8	7	15
Agricultural	7	3	9
Retail Industrial	8	7	15
Commercial	59	21	80
Residential	22	14	36
Total	103	52	155

No spill-over included

Figure 7: 2011 – 2104 Achievable EE and FS GWh Savings (High End of Range)



Energy Savings (GWh)	2011- 2014 Cumulative Achievable Potential		
	Current OPA Programs	HONI Programs	Current OPA Plus HONI Programs
Sub-Transmission > 5MW	57	83	140
Agricultural	37	19	55
Retail Industrial	45	74	118
Commercial	175	79	253
Residential	155	116	271
Total	468	370	838

No spill-over included

A more detailed description of the achievable potential estimated for each sector, for each year to 2014, as well as the change between scenarios, and the increase in potential attributable to each program is presented in Appendix A.

The GHG impact of HONI's CDM activities through 2014 was also estimated based on projections of the electricity system's GHG intensity over the period.

The achievable potential estimated in this study, for the scenario including HONI programs, is shown below in terms of the percentage reduction in energy use in 2014 from the 'base case' load forecast.

Figure 8: Achievable Potential as a Percentage of Forecast Sales

HONI Achievable Potential <i>(relative to projected sales in 2014)</i>	Achievable Potential (% of energy)	
Sector	Low End	High End
Residential	8.2%	8.7%
Commercial	4.9%	5.0%
Agriculture	5.3%	5.5%
Industry – Retail	2.9%	6.0%
Industrial – Sub- Transmission >5MW	3.1%	6.1%
Total (all sectors)-	6.4%	7.2%

The resulting level of potential is in line with prior studies carried out for Ontario as a whole and within the range of other analyses across North America discussed in section 8.

It should be noted that a significant portion of this potential is achieved under the “No OPA Programs” scenario. The Achievable potential associated with OPA and HONI programs as a percentage of forecast electricity sales is shown in the figure below.

Figure 9: Achievable Potential for OPA and HONI Programs as a Percentage of Forecast Sales

Achievable Potential for OPA and HONI Programs* <i>(relative to projected sales in 2014)</i>	Achievable Potential (% of energy)	
Sector	Low End	High End
Residential	1.2%	2.2%
Commercial	2.5%	4.4%
Agriculture	3.8%	4.1%
Industry – Retail	1.9%	6.9%
Industrial – Sub- Transmission >5MW	2.0%	7.0%

Achievable Potential for OPA and HONI Programs* <i>(relative to projected sales in 2014)</i>	Achievable Potential (% of energy)	
	Low End	High End
Total <i>(all sectors)-</i>	1.8%	3.6%

* Excludes CDM Potential associated with "No OPA Programs" Scenario

2. INTRODUCTION

Conservation and Demand Management (CDM) was given a low profile during the initial design of Ontario's restructured electricity market, but in 2004 the provincial government announced its intention to establish a conservation culture and to make Ontario a leader in CDM.

The Ontario Energy Board (OEB) approved over \$160 million in CDM spending by electric Local Distribution Companies (LDCs) between 2005 and September 30, 2007. To encourage LDCs to carry out CDM, the OEB also provided LDCs with a "lost revenue adjustment mechanism" (LRAM) and a performance incentive mechanism (SSM) representing 5% of net societal benefits created through their CDM programs.

Hydro One Networks Inc. (HONI) and other Ontario electric LDCs launched CDM programs in all sectors: residential, commercial, institutional, industrial and agricultural. Many of these programs involved partnerships with local partners - private sector¹ as well as non-profit partners² – and leveraged existing federal programs. These programs involve both retrofits and new construction and a broad array of measures including lighting, appliance replacements, education and awareness, and training.

In July 2006, the Minister of Energy issued a directive to the Ontario Power Authority (OPA) to establish a framework for continuing LDC involvement in CDM beyond September 2007 and after the initial \$160 million funding approved by the OEB was to have been spent. The directive set out the principles for LDC involvement in CDM going forward and established a funding limit of \$400 million over three years. The CDM framework governing Ontario LDC CDM activities established by the OPA and Ontario LDCs in response to this directive has been in place since 2007.

Hydro One has been very active in pursuing Conservation and Demand Management (CDM) since 2005.

Between 2005 and April 2008, HONI brought over 25 CDM programs/initiatives to customers across all sectors and these programs achieved annualized savings of 284 GWh

¹ For example, this includes partnerships with local natural gas companies, HVAC dealers, retailers, builders and lighting companies.

² For example, this includes partnerships with local schools, municipalities, universities, and not-for-profit program deliverers (e.g. Share the Warmth, Clean Air Foundation, Social Housing Services Corporation, Energy Centre of Excellence, University of Waterloo).

and resulted in over 67 MW in peak demand savings. HONI's designed and delivered CDM portfolio encompassed many innovative programs, including:

- The Real-Time Monitoring Program which installed 31,000 real-time monitors, the largest program driven deployment in North America. HONI and Blue Line Innovation were recognized for their achievements by being awarded the *Energy Efficient Technology Deployment of the Year* award by the Association of Energy Services Professionals (AESP) for the successful deployment of the Power Cost Monitor;
- HONI was the first LDC to offer customers remote web access control to their SmartStat (continued under PeakSaver);
- First Low-Income program- \$3,000/home- became Canada wide (EnerGuide for low Income Homes [EGLIH] with NRCAN and CHMC); in addition to that, completed several First Nations and Low Income Pilots after the termination of EGLIH;
- The PowerSaverPlus Online Audits (Residential/Small Commercial) enabled over 30,000 customers to take a self-administered Online Energy Audit and receive recommendations on how they could lower their usage and electricity bill;
- HONI Retired 11,000 secondary refrigerators through the Cold Shoulder program, offered between 2006 and 2007 (continued under Great Refrigerator Roundup);
- Designed and delivered the Double Return program for summer 2006 and winter 2007, targeting large commercial/industrial distribution customers, which achieved 34MW of peak demand reductions.

Starting from 2007, OPA took over responsibility for the design of province-wide conservation programs. HONI has participated in all OPA core programs and one custom HONI program delivered to the end of 2009:

- Over 29,000 programmable thermostats with load control features have been installed in HONI homes (including 10,000 units deployed through the SmartStat program);
- Almost 70,000 secondary old refrigerators and freezers have been retired for free (including the initial 11,000 units retired through the Cold Shoulder program);
- More than 550 medium- large business customers (including farms) received a rebate for upgrading to more energy efficient equipment through the Electricity

Retrofit Incentive Program (including the initial 130 retrofits completed through the *PowerSaver Business* Incentive Program)

- More than 4,500 small businesses (less than 50kw demand) have taken advantage of the Power Savings Blitz program, which offers a lighting audit and up to \$1,000 in energy-efficient lighting upgrades for free; and
- 40 MW of peak demand reduction was achieved through the Double Return custom CDM program offered during summer 2008 and winter 2009 to large commercial/industrial distribution and transmission customers.

HONI's service territory differs from that of most other Ontario LDC's and poses some unique challenges to the successful implementation of CDM including:

- HONI services most of the geography of Ontario but only about 25% of the province's customers;
- Growth in the rural areas served by HONI is slower than in urban with most growth attributed to "suburbanization" of rural communities.
- Reliance on electricity for space and water heating is much higher as natural gas is not available in much of its territory³;
- Seasonal residential customers have a significantly larger presence than in most LDC's;
- Residential and commercial buildings tend to be older, and therefore less efficient than those in other Ontario LDC territories which have experienced population growth in recent years;
- The agricultural sector plays a more significant role in HONI's territory.

Although the Ontario Power Authority offers a number of CDM programs across the province, their programs tend to be designed for "urban" LDCs and don't fully reflect or address HONI's customers' needs. For example, due to HONI's large geographic size but low population density, it is more difficult and less attractive for retailers, suppliers and other partners who participate in OPA initiatives, such as Every Kilowatt Counts Power Savings Event, or Cool Savings programs, to serve HONI's customers.

The 2009 Green Energy and Green Economy Act (GEA) signaled the government's strong focus on renewable generation and CDM as key elements of Ontario electricity future.

³ A slight majority of HONI customers (54%) report having access to natural gas on their street, however, natural gas is not available in the majority of the territory that HONI serves.

For HONI and other LDCs, one of the most important provisions of the GEGEA with respect to CDM is that the Minister of Energy and Infrastructure may issue a directive for the OEB to set CDM target for distributors (and other licensees) to achieve. Navigant Consulting understands that the government, OPA and LDCs have been discussing these targets over the past several months and that a directive from the Minister formally establishing these targets is imminent. Concurrent with these discussions regarding CDM targets, Navigant Consulting understands that the government, OPA and LDCs have been discussing refinements to the current CDM framework to reflect and support the provisions of the GEGEA.

Recognizing the growing importance of CDM to its overall system planning and to ensure it can maximize its CDM achievements under whatever new framework is established, HONI has acted proactively to identify opportunities for energy efficiency and demand reductions. As part of this effort, Navigant Consulting Ltd. (Navigant) was retained to undertake a two-part study:

- The objective of Part A of the study was to fully characterize the CDM potential for energy and demand reductions and market capability for HONI's distribution customers in the 2011 – 2014 period.
- The objective of Part B, was to address an OEB requirement (from its decision on HONI's 2008 distribution rate in proceeding EB-2007-0681⁴) that HONI come forward with a proposal to incorporate CDM into its load forecast.

⁴ Ontario Energy Board, "Decision with Reasons", Hydro One Networks Inc. 2008 Rate Application, EB-2007-0681, December 18, 2008.

3. APPROACH AND METHODOLOGY

As discussed in the previous section, the objective of Part A of this project was to fully characterize the CDM potential for energy and demand reductions and market capability for HONI's distribution customers in order to identify the most appropriate programs for implementation with HONI's customer segments in the 2011 – 2014 period.

The second objective, addressed in Part B, was to address an OEB requirement that HONI come forward with a proposal to incorporate CDM into its load forecast. Deliverables from Part B are presented in a separate report.

Highlights of Navigant Consulting's Approach

The plan which follows was developed to enable HONI to develop its CDM portfolio and project its achievable CDM impacts for the 2011-2014 period, assuming a 2011 start date for the programs. If implementation and execution of these programs are delayed due to funding or other issues, we would expect a corresponding delay in the achievement of the projected impacts.

Development of CDM Portfolio

Many studies of the potential for CDM have been undertaken in various provinces and states over the past decade. For this project, Navigant completed a comprehensive review of electricity end-uses and available CDM measures in order to develop an estimate of "achievable potential" based on an analysis of the existing mix of electricity end uses in HONI's service territory and the mix of programs currently being offered in Ontario by the OPA and HONI. These measures were combined into additional programs and initiatives for development by HONI, which were then selected and developed based on "best practices" from other jurisdictions to address significant areas of end-use potential.

Candidate measures considered for inclusion in the recommended program portfolio were drawn from a variety of source including:

- HONI's existing and planned programs
- The OPA's Mass Market and Commercial and Institutional Measures and Assumptions lists⁵

⁵ Residential and Commercial sector measures were based on: OPA, "2009 Mass Market Measures and Assumptions" and "2009 Commercial and Institutional Measures and Assumptions".

- The U.S. Department of Energy, Energy Efficiency and Renewable Energy, Industrial Technologies Program, Industrial Assessment Centers (IAC) Database⁶
- Assessment of Energy and Capacity Savings Potential in Iowa⁷ and
- Other potential studies and market analysis by HONI, the OPA and others elsewhere in North America.

This list was reviewed and revised to ensure that it focused upon electric technologies and measures that were applicable to the unique characteristics of HONI's distribution territory. As necessary, given HONI's unique customer base, Navigant Consulting also characterized new technology opportunities for potential inclusion in its CDM portfolio.

As part of this effort, Navigant Consulting reviewed current programs available to HONI customers to identify programs that are performing well and that may continue into the future, including the following:

Figure 10: Current Programs offered in HONI Service Territory

Residential	Commercial & Industrial
Great Refrigerator Round Up	Electricity Retrofit Incentive Program (ERIP)
Cool Savings Rebate	Power Savings Blitz (PSB)
PeakSaver	High Performance New Construction
Every Kilowatt Counts Power Savings Event	Demand Response
PowerSaver Plus Online Audits	
Residential Load Control Program (PeakSaver)	

These programs were included in the scenario "Current OPA Programs" discussed in the following section.

HONI-Specific Program Analysis

HONI's service territory reflects a unique customer mix. For example, it includes a significant agricultural and seasonal customer base, higher penetration of electric space

⁶ For the industrial sector, measures were based on: U.S. Department of Energy, Energy Efficiency and Renewable Energy, Industrial Technologies Program, Industrial Assessment Centers (IAC) Database. <http://iac.rutgers.edu/database/index.php>

⁷ Assessment of Energy and Capacity Savings Potential in Iowa, Prepared for The Iowa Utility Association February 15, 2008, In Collaboration with Summit Blue Consulting, Nexant, Inc., A-TEC Energy Corporation, and Britt/Makela Group

and water heating, and lower customer densities relative to other Ontario LDCs. These characteristics not only impact the potential for CDM but also influence program design and the resulting economics of program delivery.

The first step in our analysis was to develop a “sales profile” for each sector of HONI’s customer base and gather information regarding the characteristics of HONI’s service territory and loads. This profile, reconciled against HONI’s total sales, provided a picture of customer electricity use by economic sector at the end-use level, providing the basis for developing an estimate of achievable potential consistent with HONI’s actual sales and load forecast.

Based on information provided by HONI, Navigant Consulting undertook a “re-mapping” of HONI’s customers as follows in developing the final sales profiles used in our CDM potential modeling:

- Agricultural customers eligible for Rural Rate Assistance were split into two components: Agricultural and Residential, with the Residential component representing farmhouses at these customer locations. The consumption, and end-use and equipment saturation of these farmhouses was assumed to be the same as other HONI single-family detached residential customers, with the residual consumption treated as Agricultural.
- Seasonal residences were treated as residential, but with unique consumption and end-use and equipment saturation developed for most of these customers to reflect the typical usage of these facilities. A small portion of these facilities were assumed to be occupied year-round and were modelled with similar characteristics as other HONI single-family detached residential customers.

HONI serves industrial customers connected to its low voltage lines (retail industrial customers) and industrial customers with demand greater than 5 MW connected to its sub-transmission lines (sub-transmission >5MW customers). The two groups of customers are very different in terms of segment consumption and, to a lesser extent, usage patterns. Navigant Consulting analyzed each of these two groups separately and we present our findings separately for each group in the following sections.

For each measure considered, the initial and potential market penetrations of the technologies were estimated over the study period; with and without the candidate programs.

Estimates of the “achievable” electricity peak reduction and energy savings by year, sector and end-use were then developed by applying the measures covered by current programs

to the adjusted sales profile. This provided an estimate of the “achievable potential” under three scenarios:

No OPA Programs	<ul style="list-style-type: none"> Without any electricity ratepayer-funded programs (<i>ie. federal/provincial/gas initiatives only</i>).
Current OPA Programs	<ul style="list-style-type: none"> Current electricity ratepayer-funded programs
Additional HONI Programs	<ul style="list-style-type: none"> Proposed additional HONI programs and initiatives.

The three scenarios are cumulative in that the impacts of each scenario assume the levels of conservation and demand management of the prior scenario.

Achievable Potential

As described in section 3, Navigant developed an estimate of “achievable potential” based on existing patterns of electricity use in HONI’s service territory and the mix of programs currently being offered in Ontario by the OPA and HONI. Navigant believes the results of this analysis are consistent with those of numerous studies reviewed from other provinces and states over the past decade⁸.

Total end use consumption associated with each end use/measure combination was multiplied by projected *future market penetration*, adjusted for *additional market factors* times the estimated *savings as a percentage of end use consumption* to calculate the *achievable potential*. To use a simple example of a lighting measure, say fluorescent office lighting, the process would involve multiplying:

- 1) total lighting use for the application by,
- 2) the market penetration of a more efficient lighting system in a future year by,
- 3) a factor to discount for “other market factors” affecting that penetration by,
- 4) the percentage savings that would be achieved by implementing that measure.

i.e. Existing Technology Energy Use (GWh) x New Technology Market Penetration (%)
x Other Market Factors (%) x New Technology Savings (%) (all for year x).

⁸ More than 20 studies of energy efficiency potential were reviewed from across North America.

The result would equal the “achievable potential” for that measure. The modeling involved calculating these factors for each measure, for each end use, across each economic sector and sub-sector.

The calculation of “*future market penetration*” involved several factors, including:

1. The “*Applicable Market Factor*”, based on the existing saturation of the technology or measure, fuel shares within the end use, the technical feasibility of applying the measure, and the rate of equipment turnover based on the expected useful life (EUL) of the technology/measure.
2. The “*Expected Future Penetration*” of the measure was modeled based on the cost-effectiveness of the measure from the end-users perspective adjusted to reflect a need for some new technologies to “ramp up”; gaining market acceptance and market distribution.
3. *Additional Market Factors* were included in the modeling to recognize other factors that would affect the level of savings achieved. These include:
 - a) The effects of codes and standards and interactive effects (discussed in greater detail below).
 - b) Recognition that some measures may be *complete substitutes* (i.e. choosing a heat pump water heater or a solar assisted water heater) or *partial substitutes*, where the selection of one measure affects the economic attractiveness of another measure (i.e. installing more efficient lighting and occupancy sensors).
 - c) The “*willingness*” of consumers to accept a given level of payback was included to recognize that end-users do not necessarily make energy-related purchasing and investment decisions based solely on economic factors. Factors unrelated to energy choices, combined with market imperfections, such as imperfect information result in choices that diverge from what would be predicted on a purely ‘economic’ basis. These factors range from lack of knowledge of new technologies to consumers making choices due to non-energy factors (appearance, size or performance factors) or concerns over the performance of new technologies. Proprietary Navigant payback acceptance curves were used to represent the effects of these factors.

The level of savings that would result from implementation of a given measure were based on the **measures** as discussed in the previous section on *HONI-Specific Program Analysis*. For each end-use / measure combination, we counted the first decision in the

analysis period and assumed these saving would continue for the remainder of the forecast period regardless of the measure life (i.e. that any future replacement decisions would select equipment as efficient as that first decision).

Interactive Effects

All of the savings reported by Navigant of conservation potential take into account a certain degree of interactivity between measures. This is necessary to avoid double-counting savings.

An example illustrates this succinctly. Suppose that some household replaces a 90 W outdoor incandescent PAR floodlight with a 26 W CFL floodlight. Following the OPA Measures and assumptions, this would deliver 91.1 kWh of energy savings per year.

Suppose the same household then installs an outdoor lighting timer, reducing the time in which the outdoor floodlight is lit by three quarters of an hour a day. According to the OPA Measures and Assumption, this should deliver savings of 41.1 kWh per year.

Both measures together should, in theory deliver 132.2 kWh per year, however, the savings of each measure are driven by assumptions that the other measure renders invalid. Although the CFL bulb reduces the energy required for each hour of operation, fewer hours of operation are required than assumed for the timer, and although the timer reduces the hours of operation (and thus the energy use) of the outdoor floodlight, since the new bulb is much more efficient than the old one, the savings per hour of use reduced are much smaller. The more efficient lamp is an “engine” measure – it operates more efficiently than the base technology and thus requires less energy to produce a fixed amount of light. The lighting timer is an “envelope” measure – it reduces the quantity (in hours) of that fixed amount of light which the lamp is required to produce.

All of the measures included by Navigant in this potential study which have the potential to interact in the manner described above with other measures *within the same end-use* have been classified as either “engine” or “envelope” measures. Engine measures interact with envelope measures and envelope measures interact with engine measures. Engine measures are modeled as not interacting with other engine measures and envelope measures are modeled as not interacting with other envelope measures.

No interactions are modelled across end-uses – lighting measures, for example, are not modelled as interacting with space-conditioning measures.

The effect of measure interactions on achievable potential was found to be relatively small; generally reducing total savings by well under 10%.

Program Ranking and Portfolio Selection

Using the measure level TRC estimates, candidate programs were developed, reviewed and ranked in terms of their appropriateness to the characteristics of HONI's territory and their ability to address significant areas of potential. In developing potential programs, measures were combined to ensure that the overall program achieved a positive TRC. The avoided cost provided by the OPA do not appear to include the impact of the "Global Adjustment" whereas the consumer costs used by Navigant Consulting include all variable electricity costs paid by customers (include the Global Adjustment, Debt Retirement Charge, non-fixed Transmission and Distribution Charges and Wholesale Market Service charges). To highlight the difference between avoided costs and consumer costs, consider 2011. The simple average of the avoided costs for 2011 across the eight periods for which avoided costs are provided by the OPA is just under \$50 / MWh, whereas Navigant Consulting's estimate of the variable electricity costs for HONI residential consumers in 2011 is approximately \$120 / MWh. As a result, some measures which had an unacceptable TRC (based on avoided costs) showed an acceptable payback for electricity consumers (based on variable electricity costs).

The Program Administrator Cost (PAC) test was also calculated for each program.

Consideration was also given to the need to develop a diversified and comprehensive portfolio covering all key market segments. The recommended portfolio was therefore intended to deliver: a) proven results based on prior program experience (from HONI or elsewhere); b) cost-effectiveness based on TRC and PAC tests; and c) programs which HONI can market and deliver across its extensive service territory.

CDM Portfolio Development and Program Refinement

This task focused on identifying additional programs and initiatives and improvements to program design and delivery methods that HONI could undertake to optimally address program barriers for its customers.

Interviews were carried out with several key stakeholders and key market actors serving HONI's key market segments. The goal of these interviews was to seek input from influential and knowledgeable people and organizations in HONI's territory involved in current CDM initiatives.

These interviews yielded valuable local insight, helping to identify segment-specific barriers from both an industry and consumer perspective.

Additional actions and approaches to enhance the achievement of CDM across the HONI distribution territory were identified as part of the review. Potential actions and

approaches were reviewed with an eye to mitigating barriers, building capability and facilitating collaborative efforts. While some of these efforts may not yield immediate results, the objective is to improve CDM performance over the medium term.

Program costs (with incentive costs identified separately) for new HONI programs and initiatives were developed based on experience with the existing programs adjusted to reflect HONI's recent CDM experience and its unique service territory / customer mix. Finally, a TRC analysis was applied at the program level to determine the benefit / cost ratio and net benefits for each of the new programs and initiatives as applied to HONI's customer base.

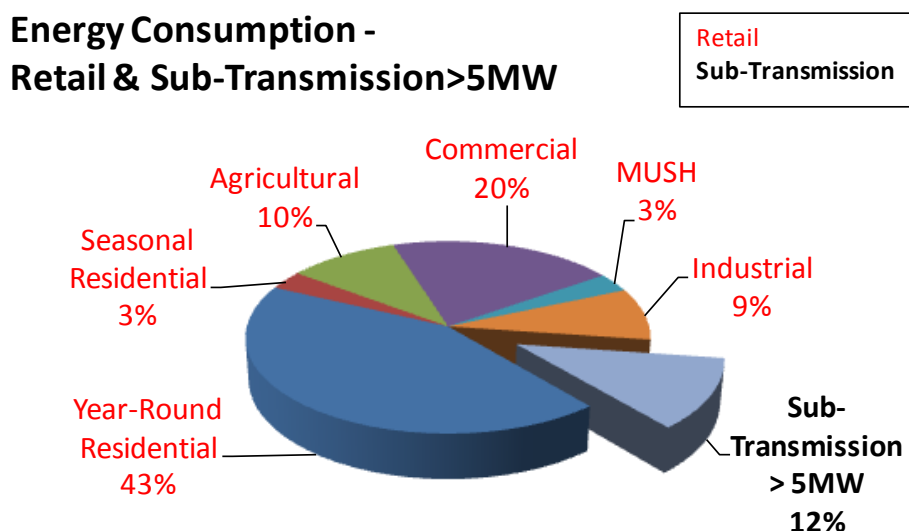
The GHG reductions that would result from implementing the proposed measures over the study period were estimated based on the magnitude of energy savings and the marginal GHG emissions rates for electricity produced over the study period.

4. HYDRO ONE CUSTOMER BASE

Hydro One Networks serves over 1 million customers distributed across Ontario. Its service territory stretches from Petrolia in the southwest to Vankleek Hill in the east and from Kingsville in the south to Kenora in the northwest. Essentially, HONI delivers power to all the areas of Ontario not served by local distribution utilities (LDCs) or Hydro One Remote Communities.

The mix of customers served by HONI reflects the nature of their service territory. HONI customers are differentiated not only by class and geography, but also by the way in which they are connected to the system. HONI customers are classed as “retail” customers, which are served at low voltages, transmission connected customers, and sub-transmission customers. HONI also serves LDCs which may be connected at the sub-transmission level or “embedded” within the HONI distribution system. Only the retail and “Sub-Transmission customers over 5MW” customers are included in this analysis. The characteristics of HONI’s retail customers will be discussed first, followed by a description of the Sub-Transmission >5MW customers.

Figure 11: HONI Sales - Including Sub-Transmission >5MW

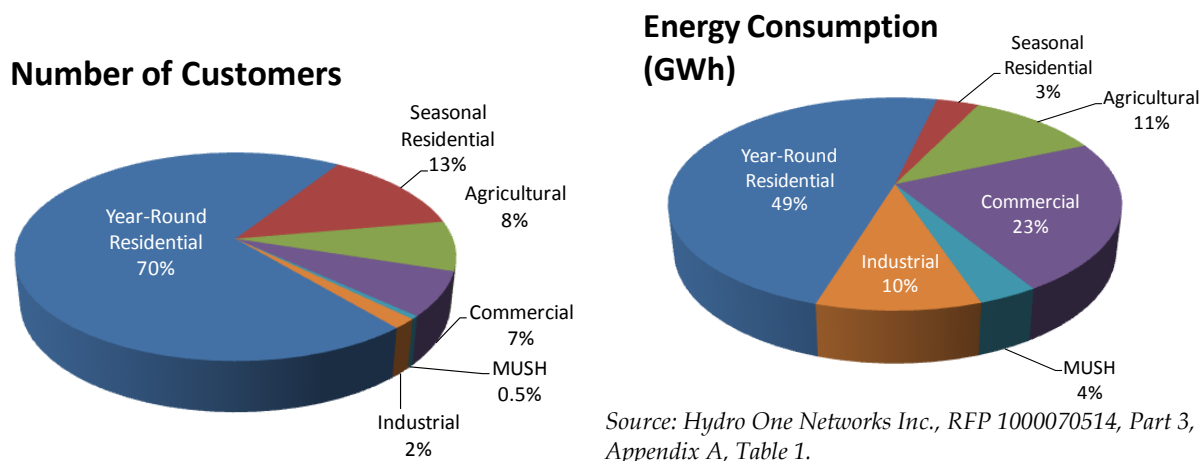


Retail customers account for the bulk of HONI’s electricity sale, however a small group of roughly 40 sub-transmission customers with monthly demand over 5MW account for about 12% of HONI’s total electricity sales. These accounts represent a concentrated opportunity in terms of CDM potential and will be discussed separately following the discussion of retail customers.

Retail Customers

As Figure 12 below shows, 83% of HONI's retail customers are residential. An additional 7.5% of customers are classed as commercial and MUSH (Municipalities, Schools, Universities and Hospitals) and only 2% are industrial.

Figure 12: Distribution of Customers and Sales



Based on information provided by HONI, over 90% of HONI's retail customer sales (GWh) are to residences and small businesses (< 50kW monthly peak demand). By contrast, the average Ontario LDC relies on the residential sector for only 25% of its sales; with large business accounts (over 50kW) taking 50% of total sales⁹. This means that not only are HONI customers more geographically dispersed, but that the average load per customer site is also smaller¹⁰. The average HONI retail customer used 18,867 kWh in 2008 compared to 31,297 kWh for the average LDC customer. While consumption for the average residential customer served by HONI is higher, due to the higher saturations of electric space and water heating, the average size of customers in other sectors is much smaller.

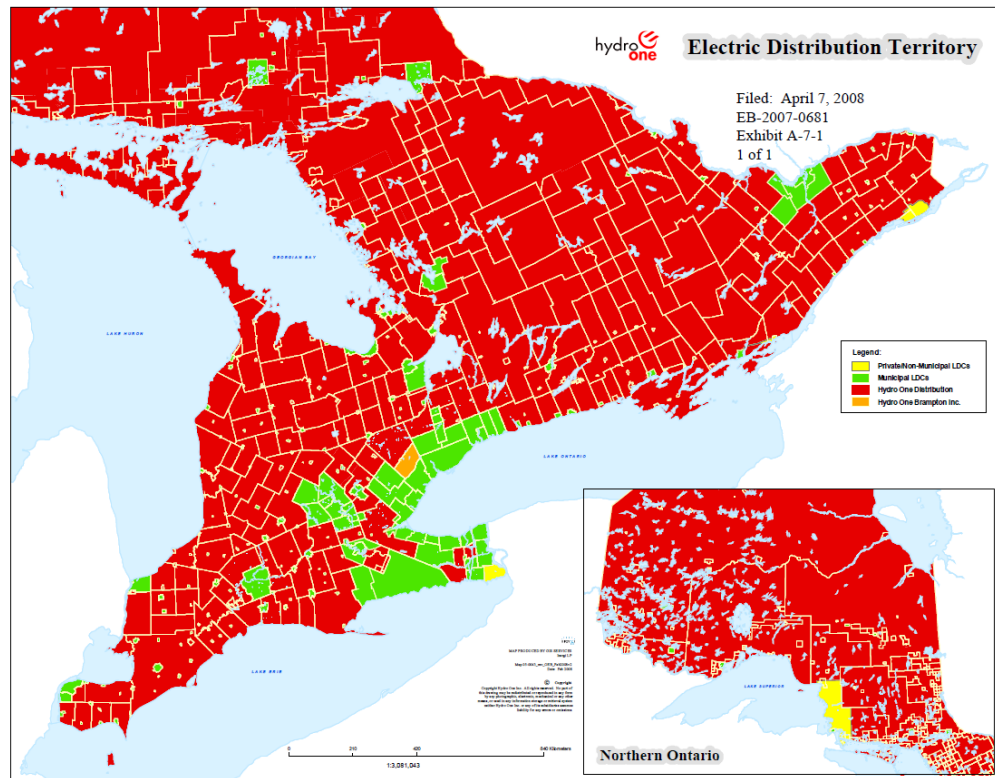
The map below shows the areas of Ontario served by HONI in red. Areas served by municipal LDC's are shown in green, areas served by private LDC's are shown in yellow

⁹ OEB, 2008 Yearbook of Electricity Distributors, published on September 10, 2008.

¹⁰ This is based on an average across all customers. For residential customers, the average use per household may be higher than the average for other LDC's as a result of higher levels of electric space and water heating.

and the area served by Hydro One Brampton, a wholly-owned subsidiary of Hydro One Inc. is shown in orange¹¹.

Figure 13: HONI Service Territory



Load densities measured by customers per km of distribution line, vary widely across Ontario, with urban areas such as those in the GTA serving close to 60 customers per km of distribution line. The average density for LDC's excluding HONI is about 46 customers per km of line. While HONI does serve some urban areas not incorporated in LDC territories as well as some small communities, densities are quite low in comparison. Across the HONI territory, there are approximately 10 customers for each km of distribution line¹², however, in many areas of HONI's service territory, km of line per customer would be a more appropriate measure. Put another way, 75% of the geography served by HONI has less than 10 customers per square km and 10% has fewer than 2 customers per square km.

Both the geographic distribution and the relatively smaller customer loads affect the cost of delivering CDM programs to HONI's service territory relative to other Ontario LDC's.

¹¹ Hydro One Brampton is not included in the scope of this study.

¹² Ibid.

The more rural nature of HONI's service territory is reflected in other characteristics which affect patterns of energy use:

- Natural gas is available to only 54% of HONI customers¹³, leading to higher saturations of electric space and water heating than in the rest of Ontario. HONI reports that 52% of its residential consumers use electric water heating, with market shares reaching close to 80% in some geographic areas. Market shares for electric space heating are also high relative to the Provincial average, with 19% of residential customers using electricity to heat their homes. NRCAN reports that across Ontario, 12.9% of homes use electricity for space heating and 25.1% for water heating¹⁴.

Some of these characteristics also have implications for marketing efforts targeting HONI's customers:

- While more options are becoming available, high speed internet service is less likely to be available in areas served by HONI. More than half of HONI's residential customers with internet service reported using a "dial up" service to access the internet. This should be taken into account in the design of web service options.
- Residential customers served by HONI are much more likely to own their own homes compared to the territories of large urban LDC's in Ontario; reducing issues of split incentives that can occur in rental accommodations.
- Selecting media to reach HONI customers also presents a challenge. In comparison with LDC's serving a specific municipality, HONI would need to access a much larger number of electronic and print media outlets in order to reach its more diverse and distributed customer base. Advertising expenditures would also be expected to result in a much higher rate of spillover into non-HONI serviced areas.
- Roughly 13% of the accounts served by HONI are "seasonal" homes, with much lower energy use, different appliance saturation levels, and consumption patterns compared to other residential customers.

¹³ Based on information from HONI's Residential Appliance Survey conducted in 2005. Fifty four percent of residential respondents indicated that natural gas was available on their street.

¹⁴ NRCAN, Comprehensive Energy Use Database – Residential Sector, Ontario, Tables 21 and 28., reporting as a percentage of residential building stock. Table 5 indicates that electric heat accounts for 13% of secondary energy for space heating and Table 8 reports that 8.1% of secondary energy is used by baseboard heating systems.
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/comprehensive_tables/index.cfm

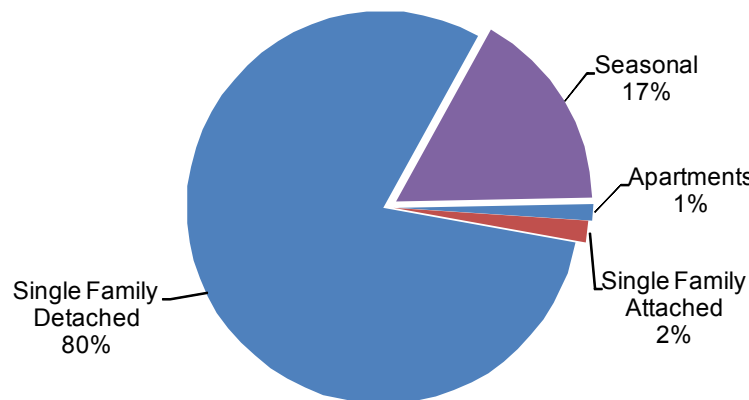
- HONI services 22,500 residential First Nations customers in First Nations communities across Ontario.

Customer Count and Consumption of Retail Customers by Sector

Residential

The majority of residential accounts (80%) are for single family detached homes as shown in the figure below.

Figure 14: Residential Accounts by Structure Type¹⁵

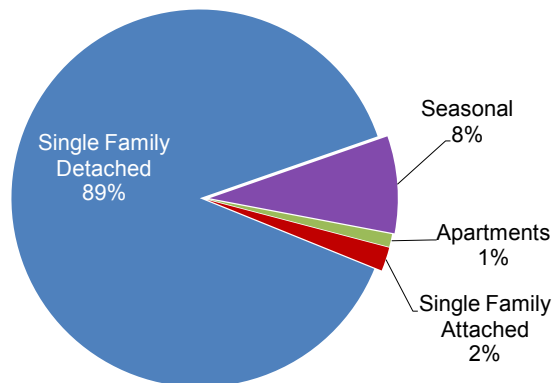


Residential electricity sales are dominated by single family detached dwellings, reflecting the lower density of housing in the HONI territory. Seasonal homes, which represent 17%¹⁶ of residential customers, account for only about 8% of electricity use.

¹⁵ Data obtained from Hydro One Networks; with re-mapping of farm accounts as described in HONI-Specific Program Analysis portion of section 3.

¹⁶ Note that seasonal customers represent about 13% of total customers but 17% of residential customers.

Figure 15: Residential sales¹⁷



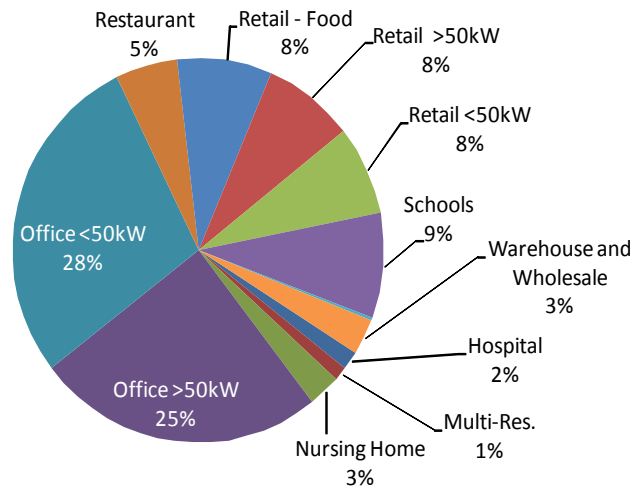
Commercial

HONI, like most Ontario utilities, maintains its sales data by rate class. For the purposes of this analysis, however, it was necessary to assign sales to specific economic sectors. The best available basis for this allocation was to use the NAICS code assigned to each customer account in order to allocate sales by sub-sector. Analysis of the data found that a portion of electricity sales within each sector had not been assigned to a specific sub-sector: “other commercial buildings” in the commercial sector, and “miscellaneous” in the industrial sector. Navigant Consulting allocated these unallocated electricity sales by sub-sector based on the distribution of electricity sales which had been coded by sub-sector.

Figure 16 below shows the distribution of sales identified as being within a particular commercial sub-sector. On this basis, more than half of commercial electricity use in HONI’s service territory goes to offices. A further 24% is used in retail operations, split relatively evenly between large retail, small retail and food stores.

¹⁷ Ibid.

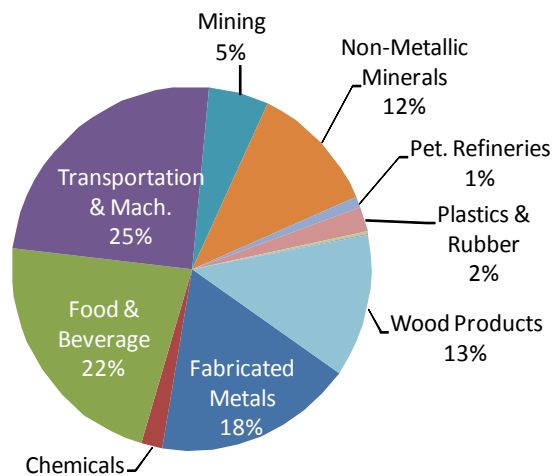
Figure 16: Commercial Sales¹⁸



Industrial

Industrial electricity sales for 2008 are shown in Figure 17 below. As with the commercial sector, “miscellaneous” sales have been allocated across the sub-sectors in proportion to the identified sales. Of the sub-sectors for which sales were identified, Transportation and Machinery (25%), Food and Beverage (22%), Fabricated Metals (18%), Wood Products (13%), and Non-Metallic Minerals (12%) dominate. Together these five sub-sectors account for over 90% of identified sub-sectoral sales.

Figure 17: Industrial Sales

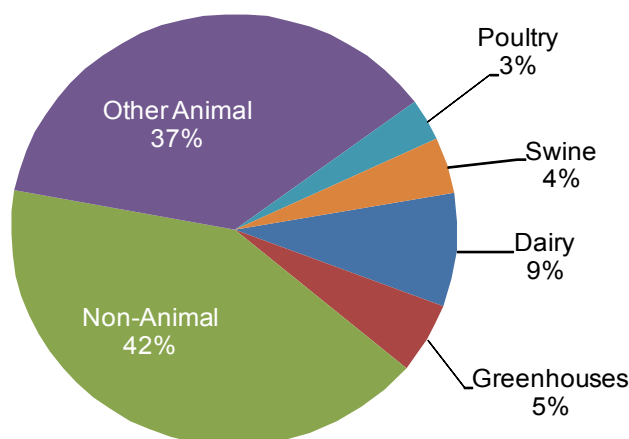


¹⁸ Based on 2008 sales as provided by HONI. Distribution between <50kW and >50kW based on rate class.

Agriculture

The distribution of agricultural sales by type of farming operation for 2008 is shown in Figure 18 below. Poultry, swine, dairy and greenhouse operations have been separated out due to their unique patterns of energy use and resulting CDM opportunities. Only about 20% of agricultural electricity falls into these four categories, with the majority being used in “non-animal” or “other animal” (such as beef cattle, horses, etc.) operations.

Figure 18: Agricultural Sales



Forecast Growth

A projection of expected average demand growth in electricity consumption under a business-as-usual framework was provided by HONI. Under this projection and absent any CDM initiatives, residential energy use is projected to rise by less than 1% per year, while energy use by the agricultural sector is forecast to decline by 1% per year. Retail industrial electricity use is projected to rise by approximately 1% per year as the sector recovers from the current economic downturn.

Figure 19: BAU Electricity Growth Projection

Sector	Forecast Growth Rate (average annual change 2010-2014)
Residential	0.8%
Commercial	1.4%
Retail Industrial	1%
Agricultural	-1%

Sub-Transmission >5MW Customers

This group of customers has annual consumption of approximately 2,000 GWh annually (roughly 22% higher than the retail industrial sector), but the load growth through 2014 for sub-transmission >5MW customers is forecast by HONI to remain largely unchanged from 2010 levels. Electricity consumption for this group of customers was allocated to industrial segments for the purposes of analysing CDM potential based on information from HONI. The breakdown by segment is not presented in order to maintain the confidentiality of consumption data due to the relatively small number of customers in certain segments.

5. CHANNEL FEEDBACK: MARKET BARRIERS & PROGRAM GAPS

Interviews were conducted with a number of stakeholders involved in the market. The list of potential stakeholders to interview was supplied by HONI. Navigant staff spoke with six different stakeholders with experience working with HONI programs, which included:

- HVAC contractors
- Electrical contractors
- Local NGOs
- Engineering design firms

These interviews were relatively informal; generally following the script provided in Appendix E. A number of common themes emerged from these interviews. We have summarized these themes around three topic areas: current programs, education and outreach, and program delivery. It is noteworthy that similar interviews, conducted with stakeholders working in LDC service territories as part of other work being carried out by Navigant Consulting Ltd., yielded a number of similar comments and common themes relating to CDM initiatives in portions of Ontario not served by HONI.

Current Programs:

Local market actors were asked to comment on existing CDM programs offered to gather their thoughts on the effectiveness of current programs, identify appropriate gaps or opportunities, and suggest any enhancements to the programs. Some common perceptions expressed during the interviews:

1. *Lack of consumer awareness of current programs¹⁹.*
Contractors and builders felt that consumer awareness for current conservation programs remains low. Stakeholder's commented that although some customers may have heard about some of the programs, they typically were not aware of the rules and eligibility for current incentives.
2. *Opportunities to achieve energy savings from all end uses (commercial and industrial) are not being pursued equally.*

¹⁹ In the context of these interviews, Navigant notes that this related to both residential and business programs.

- a) Feeling that Electricity Retrofit Incentive Program (ERIP) and Power Saving Blitz (PSB) programs are primarily being used for lighting measures.
 - b) Lighting contractors are typically pushing ERIP and PSB, and hence, other opportunities in the remaining end uses (e.g., motors, ventilation) are not being as actively pursued.
 - c) Perceived lack of contractor knowledge and expertise on energy efficiency available regarding other end uses.
- 3. *Potential to revise and update specific rebate levels for current programs.*
 Some of the prescriptive ERIP rebates were felt not to sufficiently address the large difference in incremental cost between baseline and energy efficient technology (e.g., represent less than 10% of incremental cost), while other ERIP rebates were judged to cover almost the full incremental cost.
- 4. *“One size fits all” program limits the ability to capture savings for different sub-sectors.*
 Having a “plain vanilla” type program such as ERIP was felt to limit the opportunity to target specific needs of different sub-sectors (e.g., restaurants, schools, etc.). Custom marketing a program tailored to the needs of specific sub-sector was felt to be more appealing to various stakeholder groups and would demonstrate an understanding of the measures applicable to specific sub-sectors.
- 5. *Lack of partnerships with industry associations to keep them up to date on current programs.*
 A number of contractors and other key market players had a difficult time in determining which programs were still running and keeping up to date with any changes to the rules or incentives for current programs. One suggestion noted in the discussions was to keep industry associations aware of any changes in CDM programs through attending meetings or conferences.

Education and Outreach

Many of the discussions on barriers and obstacles with local market actors focused on current education and outreach of CDM programs in their region. Common themes from the interviews suggested the following:

- 1. *Limited program awareness and customer confusion regarding current programs.*
 - a) Many stakeholders commented that they feel programs are not being adequately promoted and marketed.

- b) There was some confusion on the part of contractors and customers as to the level and eligibility of current program incentives.
- 2. *Some contractors cautioned that channel partners were creating their own marketing and promotional materials, and these were not always in line with the objectives of the OPA's or LDC's program.*

Stakeholders felt that this resulted in some customer confusion.

- 3. *Lack of consumer confidence in potential savings from energy efficient and demand response technologies.*
- 4. *Stakeholders expressed a desire for un-biased, third party literature to provide and circulate to customers and other stakeholders to confirm potential energy savings of specific energy efficient technologies.*
- 5. *Felt there was a lack of trust and loss of consumer confidence when manufacturers and dealers report on potential savings for their own equipment.*
- 6. *Desire for LDCs to act as un-biased "energy experts" for promotion of specific energy efficient measures (rather than being approached by salesperson).*

There was a recognition that this will require time and training of LDC staff.

- 7. *Desire for forum to share ideas experiences and results from pilot studies.*

Specifically amongst the municipalities, there is a desire to learn from others' experiences (e.g., pilot studies) to determine which projects have worked and resulting savings achieved.

- 8. *Importance of involving upper management to assist in program buy-in*

Having upper management involved in the decision making of the program and knowledgeable on the potential energy and cost savings involved greatly increases the success of program.

Program Delivery:

- 1. *Desire for LDC to have a greater number of "energy experts" who understands the needs and desires of their industry and keeps them up-to-date on programs related to their sub-sector.*
- 2. *Stakeholders would like to see additional channel representatives and points of contact for different sub-sectors.*
- 3. *Desire for a "one-stop-shopping" area that can be a focal point for energy efficient solutions.*

Central location where all applicable programs are located, including relevant literature, forms, contact information, etc.

Ability to direct customers to one central area for their researching needs and to help answer their questions

4. *Opportunity to enhance and leverage existing partnerships between LDCs and NGOs (and other local agencies).*

Ability to help promote programs at the local level

Leverage NGO's and local agencies existing relationships with customers

Common goal to promote energy efficiency in their communities

5. *Desire for unbiased energy audits to help recommend energy savings opportunities.*

Municipalities have strong desire for support in identifying energy saving opportunities (non-salesperson).

6. *Wherever possible, desire for application forms (e.g., ERIP) to be simplified.*

Channel partners do not see the need for complex application forms.

Stakeholders felt that detailed or lengthy forms which take too long to complete may not be worth the hassle and that contractors will be less inclined to promote the program to their customers.

7. *Additional training for contractors could benefit their understanding of the program.*

Training sessions coordinated through associations or industry events would be beneficial to help contractors understand the program and have greater confidence in promoting the program to their customers.

8. *Additional materials on proven energy savings from eligible energy efficient measures.*

Summary of Stakeholder Feedback:

The following figure summarizes the feedback received from stakeholders participating in the Ontario market.

Figure 20: Summary of Stakeholder Feedback

Current Programs	<ul style="list-style-type: none"> • Lack of partnerships/communication with industry associations to keep up to date on the latest programs • Commercial (and to some extent, the industrial market) market is being reached primarily through lighting -low hanging fruit • Desire for HONI/OPA to further promote programs and build consumer confidence in energy efficient measures
Education and Outreach	<ul style="list-style-type: none"> • Lack of program awareness by consumers and knowledge on latest technologies • Programs would have greater uptake if management was involved and aware of program and potential savings
Program Delivery	<ul style="list-style-type: none"> • Importance of having dedicated channel representatives to maintain relationships • Creation of a “one-stop shopping” area for energy efficient solutions • Additional training could be beneficial for some contractor to understand programs • Leverage existing partnerships created through NGO work to promote programs

Based on the feedback received from stakeholders, Navigant notes that:

- The comments made regarding the predominance of lighting projects under ERIIP reflect the balance struck in such programs. The use of prescriptive measures has the advantage of simplifying program design and access to the incentives, but may also de-emphasize the benefits available from taking a more “whole-building” approach
- With regards to the desire of municipalities to share their experience, we are aware that the Association of Municipalities of Ontario (AMO) has offered workshops and conferences in past to allow municipalities to share success stories and to meet contractors/suppliers, etc. Such sessions may be an opportunity for HONI to reach these customers and facilitate information sharing.
- Comments with regards to market players creating their own marketing collateral suggest that there is an opportunity for the OPA and/or HONI to make it easy for customers to access program information on their website.

Other Barriers:

A number of widely recognized barriers to successful CDM programs have been identified in past work by Navigant Consulting. These barriers typically include such issues as:

- Cost and difficulty of program participation (transaction costs);
- Capital costs and access to capital;

- Split incentives between decision makers and those who pay for energy;
- Lack of education and awareness of consumers and industry;
- Lack of skilled workers and training to ensure proper installation and infrastructure support;
- Relatively low priority placed on energy efficiency by consumers in purchase decisions;
- Distrust of energy savings claims.

In addition to these general barriers, the characteristics of HONI's territory add a number of additional challenges:

- Marketing and delivering program services to a large, low-density customer base,
- Lack of common media communications channel and resulting higher costs for coordination and marketing,
- Establishing communications and relationships with a large number of small contractors serving its distributed territory, and,

Higher program delivery costs driven by geographic diversity and generally smaller customers. It is interesting to note that many of the issues identified by stakeholders, such as education and awareness, desire to simplify forms (reducing "costs" of participation), distrust of savings claims, etc., align with these broad market barriers.

6. BEST CDM PRACTICES FROM OTHER JURISDICTIONS

Navigant Consulting has undertaken energy efficiency potential and program design work for a number of other utilities and agencies across North America. As part of this project, we reviewed more than two dozen programs identified as industry leading or “best practice” programs. The basis for selecting “best practices” varies, but are generally consistent with the criteria used by the American Council for an Energy Efficient Economy (ACEEE) to select exemplary programs ²⁰:

- *Direct energy savings*
- *Market transforming effects*
- *Good quality evaluation methodologies used to establish results*
- *Qualitative assessment in terms of implementation, customer participation and satisfaction, stakeholder support, etc.,*
- *Innovation*
- *Transferability*

Our assessment, based on a wide-ranging review of these program, is that many of the elements which differentiate these programs are independent of the type of measures undertaken, but rather relate to design and operational ‘best practices’ which make the programs exemplary. We have therefore identified a number of ‘generic’ best practices found in most successful and established CDM programs which can be incorporated in HONI’s CDM efforts:

- Simplified customer decision making
- “One-stop shopping” and easy linkages to incentives and financing (where applicable)
- Streamlined applications and incentives processes
- Certification and/or training of qualified contractors, technical assistance experts and trade allies,
- Move towards a “hand holding” approach
- Centralized program focus that facilitate/coordinate as many program elements as feasible
- Central facilitation/coordination of multi-contractor bidding and installation

²⁰ ACEEE, Compendium of Champions: Chronicling Exemplary Energy Efficiency Programs from Across the U.S., February 2008, page 4.

- Incentives focused where they can be most effective (e.g., customer plus contractor; customer plus appliance dealers; point-of-sale for retail).
- Keen focus on targeted market and sub-market segmentation
- Technology bundles and menus matched to sub-segment needs

Some of these practices develop over time as CDM efforts become more comprehensive. For example, targeted marketing and increased segmentation tend to develop as more of the CDM potential is exploited. For HONI, we noted several practices (i.e. increased hand-holding) that could be incorporated in program designs to increase market penetration.

It is noteworthy that several of these ‘best practices’ align with the feedback received in discussions with stakeholders involved in HONI’s CDM initiatives. Stakeholders clearly identified a greater need for one-stop shopping, training and technical assistance.

Two examples of exemplary programs are provided in the side-bars²¹.

In addition to identifying generic best practices, we also reviewed a number

Example 1 - Home Performance with Energy

Star (HPwES) is a national retrofit program for existing homes which uses rebates and loans to help homeowners bring their homes up to Energy Star energy efficiency standards. This is a national program sponsored by the US Energy Information Administration (EIA) and the U.S. Environmental Protection Agency (EPA), and is executed by participating agencies through a series of sub-programs. Participating contractors are the point of contact for clients and facilitate integrated upgrades for energy savings by performing an energy assessment and then making upgrade recommendations. Incentives include rebates through local utilities and [federal tax credits](#). Eligible upgrades include energy star-approved lighting and appliance upgrades, Energy Star heating and cooling system upgrades, sealing air leaks and insulating, and sealing ductwork etc.

New York State Energy Research and Development Authority (NYSERDA) is a public entity that developed the first Home Performance with ENERGYSTAR Program. NYSERDA allocated an annual budget of approximately \$5 million for implementation, training and quality assurance to support this program. The program’s mission was to transform New York’s trade contractor infrastructure by facilitating training and requiring mandatory contractor certification and accreditation by the Building Performance Institute (BPI). The program focused on:

- Providing incentives to the contractors for training, certification and equipment
- Providing incentives to customers through subsidized loans for energy improvements.

The contractor incentives included subsidies for up to 75 percent of the cost of training and certification, partially forgivable equipment purchase loans, and a 5% total job cost incentive. For consumers, NYSERDA arranged for and bought down the interest rate on financing to help pay for comprehensive jobs. Consumer incentives include unsecured Home Improvement loans (through Energy Finance Solutions) at a subsidized rate, and an unsecured New York EnergySmart Loan (at the participating lenders option)

²¹ HPwES program description from Patricia Plympton and Sarah Boman, Navigant Consulting, Inc., Terry Logee, Lani MacRae and Edward Pollock, U.S. Department of Energy, Paul Norton, National Renewable Energy Laboratory, Julie Hawkins, D & R, International Home Performance with ENERGY STAR: Accelerating Energy Efficiency Improvements in Existing Homes.

of “best practice” programs that might be appropriate for implementation by HONI, given the characteristics of its load and customer base.

Building on the assessment of the specific CDM potential in HONI’s service territory a best practice programs from across North America were reviewed to identify opportunities specific to HONI’s situation. Potential measures and programs were selected and ranked based on an assessment of CDM potential relative to existing provincial initiatives and their ability to meet the following criteria:

1. Must not conflict with or offer incentives to markets covered by current or known planned provincial programs offered by the OPA,
2. Applicability to HONI’s current and expected energy and capacity requirements,
3. Avoidance of lost opportunities,
4. Ability to leverage existing market delivery infrastructures of service providers, distributors and installers of energy efficiency program equipment,
5. Builds toward a “critical mass” of programs needed to enhance customer take-up of HONI energy efficiency initiatives,
6. HONI staffing resources
7. Market transformation,
8. Reduces customer bills, Improves system reliability,
9. Environmental goals,
10. Renewable energy goals,
11. Addresses underserved markets,

Example 2 - PSE Commercial Efficiency Programs: Prescriptive Approach to EE Building Design

Puget Sound Energy in Washington State has a grant program offering incentives for new construction. It will provide funding up to 100 percent of the installed cost for any energy-efficiency project resulting in increased efficiency of equipment fueled by electricity or natural gas supplied by PSE to a non-residential business. PSE's grant programs help fund new construction and expansions, efficiency retrofits, and contractor services.

PSE’s Prescriptive Approach to New Building Design program targets mid to small sized clients (<100,000 sq ft) which are commercial and classified as an office, school or retail. It uses a whole building prescriptive approach and offers grants on a per-square-foot basis, when certain benchmark energy reduction ratios are reached. Project packages will result in buildings that exceed efficiency levels prescribed in applicable energy codes by at least 10 percent for electricity savings measures, and exceed code for natural gas measures.

Clients have a choice of standard, ready to implement measures in HVAC, building envelope and lighting design. These off-the-shelf set of measures are designed to be easier to implement, flexible and simple. Specific component technologies include: innovative HVAC systems or system components, including evaporative assist cooling and heat recovery, control systems to optimize savings of new efficient technologies, ENERGY STAR® TP-1 Transformers, day lighting to allow for high quality, energy-efficient lighting and improved productivity in the space, and building thermal improvements such as class 35 glazing.

The program also works in concert with LEED and BPA programs. PSE will pay for up to 100% of the incremental cost of the package of measures. Incentives range from 50 cents to \$2.60 per square foot for the basic package plus substantially more for optional enhanced measures.

12. Addresses markets identified as provincial priorities; such as low income households.

The key constraint in this review was clearly the requirement that potential programs not duplicate or expand upon initiatives already available through the OPA. Programs offered through the OPA and others already address many of the key areas of potential addressed in past assessments. As a result, the review focused on areas not already addressed by other incentives and programs which were identified as offering significant potential within HONI's service territory.

A number of programs from across North America were reviewed for potential application or expansion. Two illustrative programs are described in the sidebars above. The figure below lists some of the programs reviewed. More detailed summaries of these programs are included in Appendix C.

Figure 21: Best Practice Programs Reviewed

Utility	Program Name
NYSERDA	Home Performance with Energy Star
NSTAR	Residential Energy Efficiency Program In-Home Display during the energy audit
Southern California Edison	Smart Connect
ConEdison	Smart Grid, and Smart Meter Pilot Program
Nebraska Public Power District	EnergyWise Pricing
PG&E	Refrigerant Charge and Air Flow Tune-Up Program
Austin Energy	Power Saver Commercial Small Business Bonus
Austin Energy	Power Saver Commercial Rebates Programs
Wisconsin Focus on Energy	Guestroom Energy Management Controls
Wisconsin Focus on Energy	Food Service Equipment Program
Arizona	Foundation for Senior Living (FSL) Home Improvement Program - HPwES
California	Monitoring Based Commissioning (MBCx) Program
New Jersey Clean Energy	Municipal/Local Government Energy Audit Program
Austin Energy	Power Saver Commercial Municipal Energy Conservation Program
California	Savings By Design
Puget Sound	Multifamily New Construction Energy Efficiency Program (residential and Commercial)
Puget Sound	Commercial Efficiency Programs: Prescriptive Approach to EE Building Design
Enbridge Gas	Monitoring and Targeting (M and T)
Focus on Energy	Industrial Program

Utility	Program Name
Eugene Water and Electric Board	Eugene Centsible Heat Program (Geothermal)
Focus on Energy	Wisconsin Focus on Energy Compressed Air System Audit and Leak Survey Incentive
EERE - DOE	Save Energy Now Industrial Audits Program
Focus on Energy	Agricultural Programs
PG&E	California Dairy Energy Efficiency Program (DEEP)
Interstate Power and Light Company	Agriculture Energy Efficiency Program
PG&E	Data Centre Program
Austin Energy	Thermal Storage

Summary findings from this review are provided at the beginning of this section and incorporated into the proposed HONI programs and initiatives listed in the following section. Illustrative programs specific to HONI, reflecting the lessons learned from this review are also provided in Appendix D.

7. ACHIEVABLE CDM POTENTIAL

This section presents Navigant Consulting’s estimate of the achievable energy efficiency and fuel switching potential for HONI through 2014. Three scenarios were modeled to determine the effects of increasing levels of intervention to encourage conservation and demand management. The three scenarios are cumulative in that the impacts of each scenario assume the levels of conservation and demand management of the prior scenario.

- The **“No OPA Programs”** case represents the achievable energy efficiency and fuel switching potential without electricity ratepayer-funded programs, but with consideration of current government incentives (i.e., federal government ecoENERGY program) and participation rates. This scenario essentially represents what would otherwise happen in the market without the intervention of HONI, the OPA and other LDCs in the Ontario market. The achievable potential under this scenario is the lowest of the three scenarios analyzed.
- The **“Current OPA Programs”** case represents the achievable energy efficiency and fuel switching potential with current electricity ratepayer-funded programs available at the end of 2009.
- Finally, the **“Additional HONI Programs”** case represents the achievable energy efficiency and fuel switching potential if HONI implemented a set of proposed programs and initiatives. The achievable potential under this scenario is the highest of the three scenarios analyzed.

No OPA Programs	<ul style="list-style-type: none"> • Without any electricity ratepayer-funded programs (<i>ie. federal/provincial/gas initiatives only</i>).
Current OPA Programs	<ul style="list-style-type: none"> • Current electricity ratepayer-funded programs
Additional HONI Programs	<ul style="list-style-type: none"> • Proposed additional HONI programs and initiatives

The impact of TOU rates was estimated to avoid potential double-counting, however, it should be noted that the expected customer response to TOU rates is not included as part of the CDM potential for HONI in this assessment. Demand response impacts were estimated separately.

Finally, the combined potential incorporating the achievable energy efficiency and fuel switching potential with additional HONI programs and the estimated impact of demand response is provided.

CDM Measures Considered in Analysis

OPA Measures

The OPA has published lists of potential measures for the residential (mass market) and commercial and institutional sectors. These “measures lists” describe the “prescriptive input assumptions” (PIA’s) for some 68 measures specific to the residential (mass market) sector and 33 measures for the commercial/institutional sector; as well as a further dozen measures for low income residential households.

As appropriate, a limited number of PIA’s were modified to reflect the unique characteristics of HONI’s customers. Note, however, that most of the unique characteristics were reflected in the sales profiles to which these measures were applied (i.e. relatively higher percentage of HONI residential customers with electric water heating and/or electric space heating and lower percentage of residential customers with central air conditioning).

Unlike the residential sector where buildings tend to be relatively homogenous by segment (apartment, single-family detached, etc.), the agricultural, industrial and commercial segments are characterized by a much wider variety within each segment. In this case it is not always possible to apply savings by unit (i.e. household, square meter or unit of production) since the number of occurrences of each measure are often not known.

Navigant Consulting is therefore following the example set by the MidAmerican Energy Company, in its 2008 *“Assessment of Energy and Capacity Savings Potential in Iowa”*²², submitted to the Iowa Utilities Board and expresses the savings of commercial, agricultural and industrial measures as some percentage of end-use consumption by segment.

If a particular measure delivers savings equal to 25% of lighting (end-use) consumption for the Large Office segment, it may be understood that if every Large Office were to install this measure, the annual energy consumption for lighting in the Large Office segment would fall by a quarter.

²² <http://www.thecadmusgroup.org/pdfs/iua.pdf>

For many measures, Navigant Consulting has used the savings as a percentage of end-use reported in the Iowa report cited above, modified where necessary to take into account the regional differences between Hydro One's territory and the MidAmerican Energy Company's.

For a number of other measures, Navigant Consulting has adapted the savings reported in the 2009 OPA Measures and Assumptions to this "percentage of end-use format" using a combination of building archetypes reported in other Potential studies and publicly available audit reports and studies of measure savings.

IAC Database for Industrial

Energy use and the associated opportunities for efficiency improvements in the industrial sector are largely process and industry specific. The Energy Efficiency and Renewable Energy (EERE) section of the US Energy Information Administration (EIA) has compiled data on the level of energy savings attained following energy surveys/audits and retrofit projects. The results, available through the *"Industrial Assessment Centers (IAC) Database"*, provide a conservative indication of the level of energy and demand reduction possible for each industrial sub-sector through energy retrofits.

The IAC provides *"a collection of all the publicly available assessment and recommendation data. This includes information on the type of facility assessed (size, industry, energy usage, etc.) and details of resulting recommendations (type, energy & dollars savings etc.)"*. The database contains more than 14,000 assessments and over 107,000 recommendations.

Experience from facilities in the Northern U.S. having audits completed after 2003 from this database was used to assess the achievable potential for CDM based on electricity consumption by North American Industry Classification System (NAICS) category within HONI's territory. The included facilities and audits represent approximately 25% of the assessments and recommendations in the database.

Navigant Consulting notes that the assessments – conducted by university engineering faculty and students – are likely to provide an accurate representation of the savings potential for relatively ubiquitous measures, but may underestimate the savings potential for highly-customized or facility-specific processes. As such, Navigant Consulting acknowledges that the achievable potential based upon the IAC database is likely to understate the industrial potential.

Measure Listing and TRC Test Results

Appendix B provides an illustrative list of sector-specific measures showing the cost/benefit (TRC) ratios for each measure. For simplicity, only the measures for

residential single family dwellings are presented, however, segment specific analysis was undertaken to consider the unique end-use consumption and saturation by segment. Measures with benefit/cost ratios of less than unity, after consideration of transmission and distribution losses, were eliminated from consideration.

Note that the achievable potentials presented below reflect the availability of these measures for purchase by customers (and their inclusion in some existing programs, both non-electricity ratepayer funded and electricity ratepayer-funded programs), however, measures with an unacceptable TRC were not targeted in any of the proposed HONI programs discussed herein; with the exception of Electric Thermal Storage Heater Retrofits targeted specifically to low-income customers.

Codes and Standards

The following potentials are taken after considering the impact of the OPA's projection of the impact of new codes and standards (provided by the OPA to HONI and Navigant Consulting on a confidential basis). Specifically, the achievable potentials are lower than without the new codes and standards since codes and standards reduce the potential savings from programs. To illustrate, consider a new standard that required the minimum Seasonal Energy Efficiency Rating (SEER) for central air conditioners to be 15 (versus the current minimum of 13) at some point during the forecast period. The potential savings for SEER 14 and 15 central air-conditioners would be reduced to zero after the implementation of this standard and the savings for higher SEER units would be reduced (eg, savings for a SEER 16 unit would be relative to the new illustrative SEER 15 unit, instead of relative to the SEER 13 unit). Although the savings from the codes and standards would likely be tracked by the OPA, we do not expect the new codes and standards would contribute to the energy and demand saving results from HONI's (or other LDCs') CDM programs.

Also, note that given the confidential nature of the information provided to HONI and Navigant Consulting, the specific impact of the OPA's projections with respect to codes and standards on the various potentials shown below cannot be provided separately.

What is Not Reflected in Achievable CDM Potential

The analysis of CDM potential is based on an assessments of potential reductions in energy use from business-as-usual (BAU) levels. The BAU level of energy use assumes that new buildings and equipment must meet existing standards, such as current building codes or appliance standards. Therefore reductions in energy use as a result of improvements in codes and standards are already included in the underlying BAU projection.

Savings accruing from the natural replacement of old equipment at the end of its life with new, minimum efficiency equipment are not reflected in the following potentials. For example, if an existing central air conditioning unit with a Seasonal Energy Efficiency Rating (SEER) of 8 had to be replaced, and the current standard for such a system required a SEER of 13, the resulting reduction in energy use in going from an 8 SEER to a 13 SEER unit is not included in the achievable potential presented below. Only purchases of equipment that are more efficient than the minimum efficiency units are counted towards the achievable potential. For example, the savings from a customer choosing to purchase a 14 SEER central air conditioning unit instead of the minimum efficiency 13 SEER unit would count towards the achievable potential.

Non-Electricity Ratepayer Programs

As described in section 3, “achievable potential – No OPA Programs” was estimated based on what would be achieved under existing programs and incentive levels. The summary of federal and provincial electricity efficiency initiatives prepared for the OPA in 2007²³ was reviewed and changes identified. In addition, programs available from natural gas LDCs and non-government organizations were reviewed for applicability to HONI’s territory. The modelling assumed that programs in place at the time of the modelling would be continued through the study period.

The Ontario and federal governments have taken a number of initiatives to increase energy efficiency and encourage conservation; ranging from regulations requiring higher levels of lighting and equipment efficiency to tax incentives, to more conventional CDM programs such as the ecoENERGY home retrofit. A short description of current federal and provincial initiatives is provided below.

Federal Initiatives

- ecoENERGY Retrofit – Homes Program – provides incentives for a number of energy efficiency retrofits, including insulation, air sealing, window upgrades, HVAC and water heating system upgrades, and water efficiency measures.
- ecoENERGY Retrofit for Buildings – provides incentives of up to \$10 per gigajoule of estimated energy savings, 25% of project costs, or \$50,000 per project for commercial, institutional and multi-residential buildings. A pre-project energy

²³ OPA, Overview and Analysis of Ontario Provincial and Federal Electricity Conservation and Efficiency Initiatives, July 13, 2007, prepared by Marbek Resource Consultants Ltd. and SeeLine Group Inc..

audit is required in order to qualify. Program is scheduled to end in 2012 or when all funds are committed.

- ecoENERGY Retrofit Incentive for Industry offers “up to 25% of project costs to a maximum of \$50,000 per application and \$250,000 per corporate entity to help small and medium sized industrial facilities implement energy-saving projects”²⁴. This program was initially slated to end on March 31, 2011 has been extended by one year, subject to funds being available.

Provincial Initiatives

- Home Energy Savings program
 - Offers 50% of the cost of a home energy audit up to \$150.
 - Federal (ecoENERGY) Provincial incentives will reimburse up to \$10,000 of retrofit costs.
- Retail Sales Tax exemption for ENERGY STAR household appliances and lighting products purchased before August 31, 2009, includes²⁵:
 - Qualifying household appliances are non-commercial refrigerators, dishwashers, clothes washers (including inseparable clothes washer-dryer combinations), freezers, dehumidifiers and room air conditioners
- A “point-of-sale exemption is also available for certain lighting products listed as ENERGY STAR® qualified by the Office of Energy Efficiency, Natural Resources Canada. Qualifying lighting products are energy-efficient light bulbs and decorative light strings”²⁶.
 - Note – for modelling purposes it was assumed that this incentive would not be continued for the study period
- Solar Energy Systems Rebate Program:
 - Tax rebates are available for qualifying alternative energy systems, including solar energy systems. The rebate applies to “components that are required to operate a solar energy system. This includes solar collector

²⁴ Natural Resources Canada, Office of Energy Efficiency, ecoENERGY Retrofit Incentive for Industry site, <http://oee.nrcan.gc.ca/industrial/financial-assistance/retrofit/index.cfm?attr=0>

²⁵ Ontario Ministry of Revenue, Retail Sales Tax Information Notice, Retail Sales Tax Exemption for ENERGY STAR Household Appliances and Lighting Products, <http://www.rev.gov.on.ca/en/notices/rst/pdf/68.pdf>

²⁶ Ibid.

panels (photovoltaic or thermal), charge converters, inverters and other applicable components such as wiring, controllers, pumps, tubing, heat exchangers and energy storage tanks. The rebate also applies to the first battery purchased to store the energy produced by the system”²⁷.

- The rebate was originally offered up to November 2007, but was extended to systems purchased and installed before January 1, 2010.
- Note – for modelling purposes it was assumed that this incentive would be continued for the study period.
- Wind, Micro Hydro-electric and Geothermal Energy Systems Rebate:
 - A tax rebate is available for “geothermal energy systems”.
 - Includes both ground and water source heat pumps, including piping, fluid pumps and heat pumps, including heat exchangers sold as part of the system.
 - Rebate does not cover internal heat distribution system.
 - Rebate equal to 3% of installed cost including GST²⁸.

Natural Gas LDC Programs

Customers in HONI’s service territory with access to gas receive service from either Union Gas or Enbridge. The other two gas utilities in Ontario, Kitchener Utilities and Kingston Utilities, serve metropolitan areas not served by HONI.

Enbridge

- Offers energy efficiency tips, information and advice.
- No rebates are currently available
- Home Weatherization Retrofit program - for eligible low income customers.
- Solar water heating – information is made available on federal and provincial incentives

Union Gas

- Offers information and tools to help its customers save energy.
- No rebates or incentives are currently available from the utility, however, links are provided to industry programs available from the federal government.

²⁷ Ontario Ministry of Revenue, <http://www.rev.gov.on.ca/en/refund/sesr/index.html>

²⁸ Ontario Ministry of Revenue, <http://www.rev.gov.on.ca/en/refund/windgeo/index.html>

Non Government Organizations (NGO's)

- A number of non-government organizations offer energy management information and services across Ontario. Some examples of specific interest to HONI include:
- “*Green Ontario*”, operated by the Conservation Council of Ontario, provides information on municipalities across Ontario which have established programs to support environmental conservation and energy efficiency.
- *Green Communities Canada* similarly links green community groups across Ontario, and Canada. Eighteen green community groups are listed for Ontario. Many of these NGO's operate within specific municipal boundaries, such as the *Toronto Green Community* or *Waterloo Region Green Solutions*, and may not serve areas serviced by HONI. Others, such as the *Elora Centre for Environmental Excellence* or *Durham Sustain Ability* provide services to a broader region; including areas served by HONI. A number of these non-profit Green Community groups offer pre- and post- home energy assessments under the ecoENERGY program.

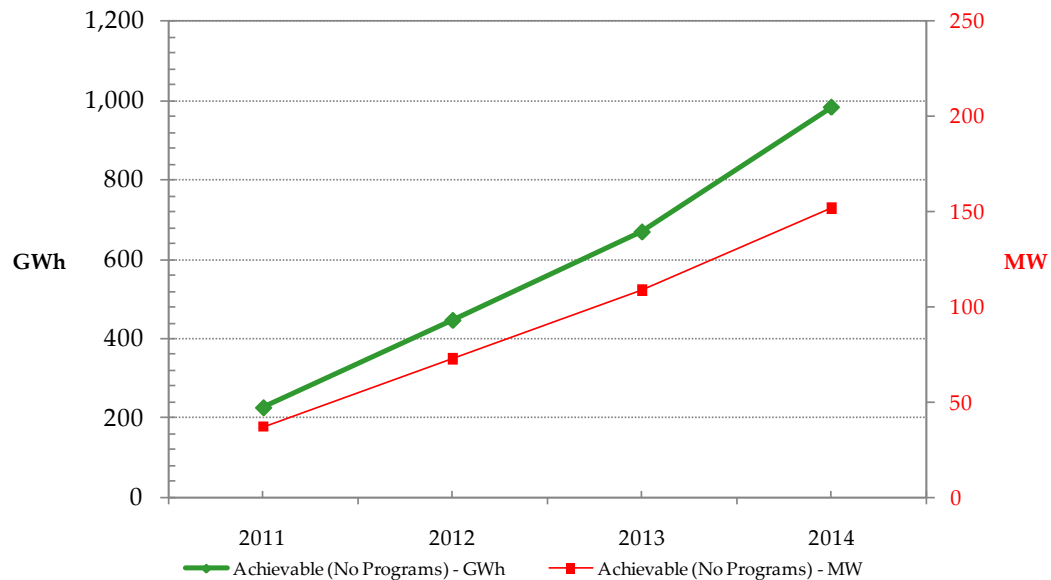
Achievable Conservation Potential without OPA Programs

No OPA Programs	<ul style="list-style-type: none"> • Without any electricity ratepayer-funded programs (ie. federal/provincial initiatives only).
Current OPA Programs	<ul style="list-style-type: none"> • Current electricity ratepayer-funded programs
Additional HONI Programs	<ul style="list-style-type: none"> • Proposed additional HONI programs and initiatives

As stated, the achievable conservation potential without electricity ratepayer funded or OPA programs reflects expected customer decisions based on the availability of energy efficient measures and the ongoing availability of non-electricity ratepayer funded programs (such as the federal government's ecoEnergy program for residential customers).

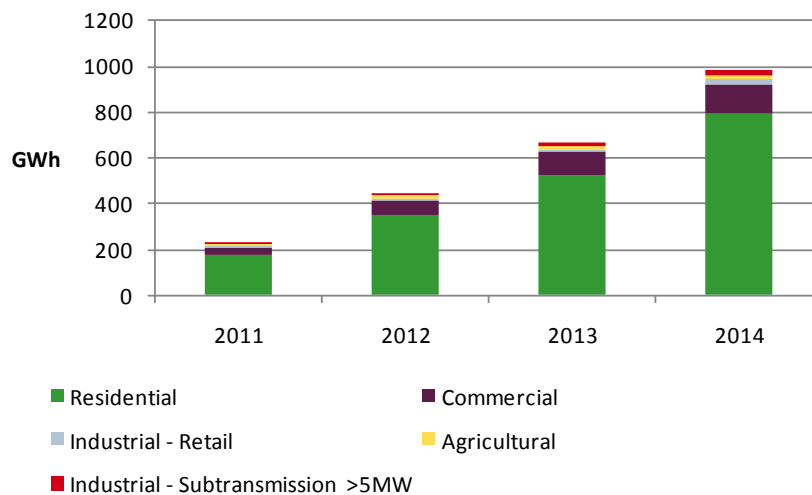
The forecast cumulative achievable potential through 2014 without electricity ratepayer funded programs across all sectors is presented in Figure 22. (Note: All figures which follow are for CDM potential within HONI's service territory).

Figure 22: Cumulative Achievable Potential through 2014 (No OPA Programs)



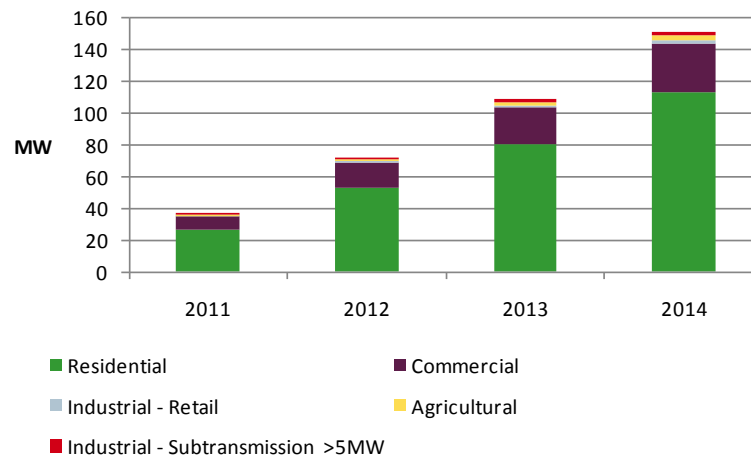
The forecast cumulative achievable energy savings potential by sector through 2014 without electricity ratepayer funded programs is presented in Figure 23.

Figure 23: Cumulative Achievable Potential (GWh) by sector through 2014 (No OPA Programs)



The forecast cumulative achievable summer demand savings potential by sector through 2014 without electricity ratepayer funded programs is presented in Figure 24.

Figure 24: Cumulative Achievable Potential (MW) by sector through 2014 (No OPA Programs)



Appendix A provides a breakdown of the forecast energy and demand savings by segment for each of the sectors covered in our analysis.

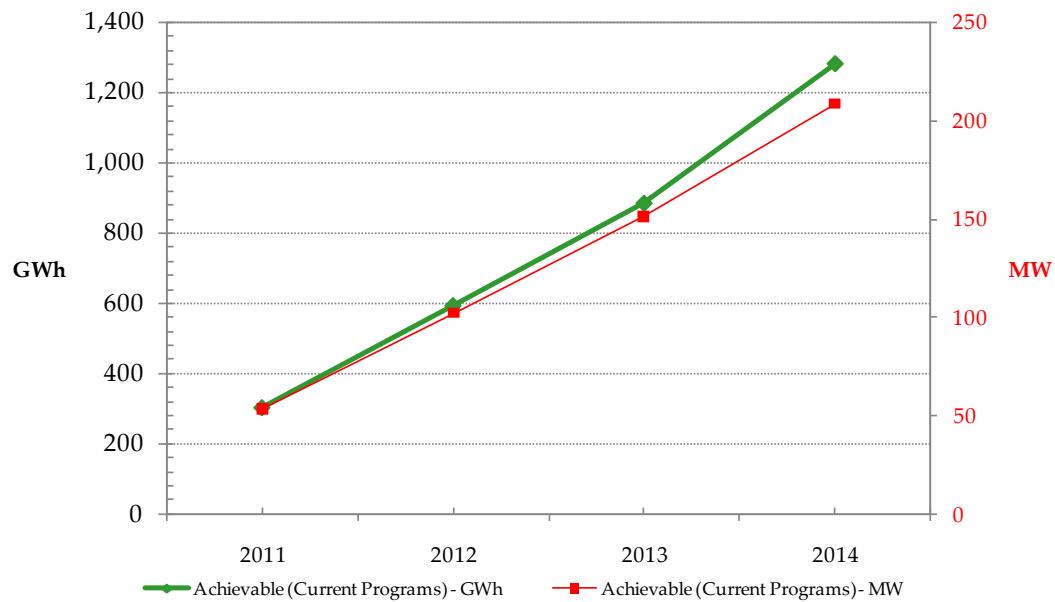
Achievable Potential with Current OPA Programs

No OPA Programs	<ul style="list-style-type: none"> Without any electricity ratepayer-funded programs (<i>ie. federal/provincial initiatives only</i>).
Current OPA Programs	<ul style="list-style-type: none"> Current electricity ratepayer-funded programs
Additional HONI Programs	<ul style="list-style-type: none"> Proposed additional HONI programs and initiatives

In modeling the “achievable” CDM potential it is assumed that the current electricity-ratepayer-funded programs operating in the market will continue in their present form over the forecast period. One exception to this assumption is ERIP. The current level of incentive under this program was under review at the time of the study. For modeling purposes it is assumed that the ERIP incentive level will be raised within the “base case.” The electricity-ratepayer funded programs are referred as OPA programs below for simplicity

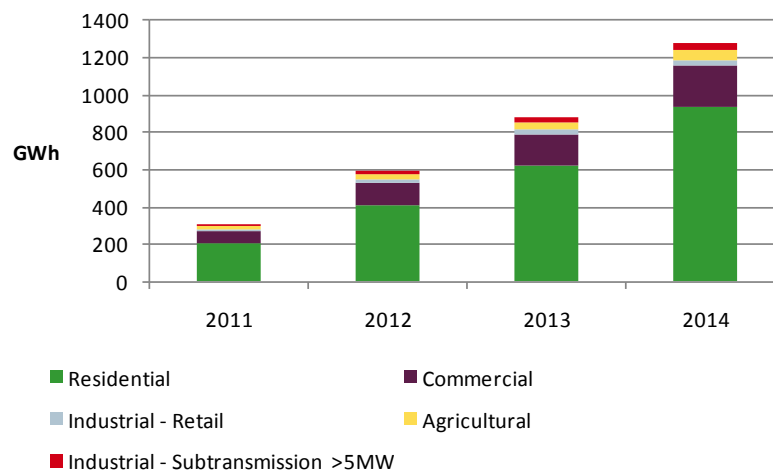
The forecast cumulative achievable potential through 2014 with the current electricity ratepayer funded programs across all sectors is presented in Figure 25.

Figure 25: Cumulative Achievable Potential through 2014 (Current OPA Programs)



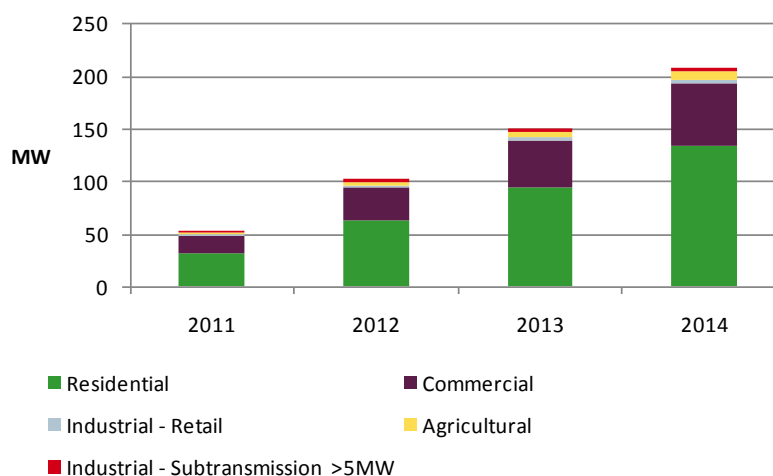
The forecast cumulative achievable energy savings potential by sector through 2014 with electricity ratepayer funded programs is presented in Figure 26.

Figure 26: Cumulative Achievable Potential (GWh) by sector through 2014 (Current OPA Programs)



The forecast cumulative achievable summer demand savings potential by sector through 2014 with electricity ratepayer funded programs is presented in Figure 27.

**Figure 27: Cumulative Achievable Potential (MW) by sector through 2014
(Current OPA Programs)**



Appendix A provides a breakdown of the forecast energy and demand savings by segment for each of the sectors covered in our analysis.

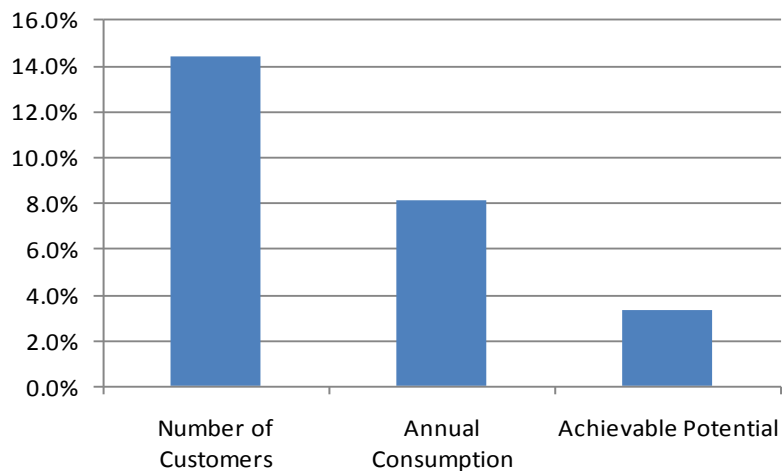
Very Limited CDM Potential for Seasonal Customers

The residential potentials given above include CDM potential for seasonal customers, but it is important to note that the CDM potential per seasonal customer is significantly less than for other HONI residential customers.

Seasonal dwellings account for approximately 17% of customers in Hydro One's residential rate class²⁹, but represent only 8% of annual electricity consumption and less than 3.5% of residential achievable potential through 2014 (see Figure 28 below).

²⁹ And about 13% of total customers.

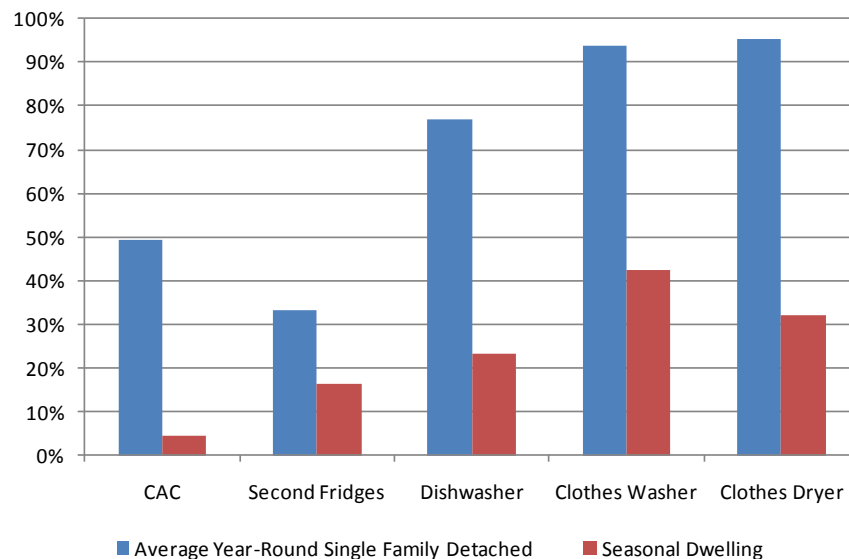
Figure 28 - Seasonal Dwellings as a % of Overall Residential Sector



This segment is, in general, not a good candidate for CDM programs. Seasonal dwellings tend to have much less discretionary electricity use than year-round occupied single-family homes and consequently far fewer opportunities for energy conservation. According to Hydro One surveys of its seasonal customers, they tend to own far fewer energy-consuming appliances than year-long occupancy single-family homes, greatly reducing the potential from energy efficient appliance replacement.

Most tellingly, seasonal dwellings have a much lower incidence of central air-conditioning than the average Hydro One year-round single-family dwelling. This means that a great deal of high-impact and low-cost energy efficient measures on the market – envelope improvements, behavioural changes, etc. – are simply not feasible for these customers. Figure 29 below compares the percent of seasonal dwellings possessing a given appliance with the population-weighted average percent of single-family year-round dwellings possessing the same appliance in all of Hydro One's territory in 2010.

Figure 29 - Percent of Dwellings With Appliances



Finally, the very occupancy patterns that characterize seasonal dwellings mean that the owners of such dwellings are less likely to acquire an energy efficient technology that has an incremental cost over and above that of the base technology. Since it is almost inevitable that any energy efficient technology installed in a seasonal dwelling will be in operation less frequently than in a year-round occupied dwelling, it will tend not to deliver the same energy savings as if it were installed in a year-'round occupied dwelling. The cost in most cases will, however, remain the same, meaning that the savings acquired by the technology will take longer to cover the costs, making the technology less attractive for seasonal dwellings than it is for year-'round occupied dwellings.

Expected Net Energy and Demand Savings from OPA Programs Operating in HONI Territory through 2014

The achievable potentials given above for the "current OPA programs" case implicitly includes the achievable potential with no OPA or other electricity ratepayer funded programs. As such, it should not be taken as the net energy and demand savings that would be attributable to OPA programs for the programs modeled.

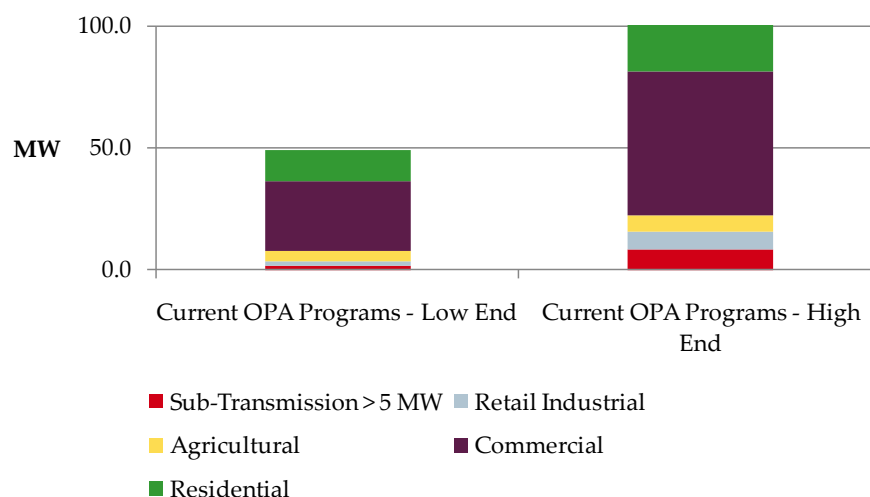
Estimating the net energy and demand savings attributable to CDM programs is complicated by uncertainty with respect to attribution and uncertainty related to the level of free-ridership, free-driver-ship and spillover for each of the program implemented over the forecast period. As well, the attributable savings could vary by evaluation approach and rigour.

The simplest (and most conservative) estimate of the net savings attributable to the OPA programs would be derived by simply subtracting 1) the achievable potential with no OPA programs from 2) the achievable potential with OPA programs only for those measures targeted under current programs. This would represent the low end of the range of achievable potential from energy efficiency and fuel switching measures operating within the HONI service area as shown in the figure below.

Navigant Consulting believes the above approach is conservative given that the above figures do not reflect any spillover from program participants who undertake additional energy saving actions. Further, as noted previously, given limitations regarding robust information on “*deep dive, process-specific*” measures, the industrial potential is likely to be understated, perhaps by as much as 50%.

Given these considerations, Navigant Consulting developed an upper estimate of potential net savings from energy efficiency and fuel switching measures. The figure below shows the lower and upper estimate of achievable potential.

Figure 30: Likely Range of Net EE and FS Demand Savings



	Current OPA Programs - Low End	Current OPA Programs - High End
Residential	12.8	21.7
Commercial	28.5	59.1
Retail Industrial	1.6	7.5
Sub-Transmission > 5 MW	1.7	8.1
Agricultural	4.2	6.6
Total	49.0	103.1

A similar analysis for the energy savings potential yields a range of net energy savings of between 245 and 468 GWh from HONI customers under current OPA programs.

Achievable Demand Management Potential

In addition to the energy efficiency and fuel switching potential presented in the previous sections, Navigant Consulting also estimated the achievable demand management potential from the implementation of TOU rates to residential and small business customers and demand response (DR) from all sectors. The impact of the move to TOU rates has not been included in the overall estimates of HONI's achievable CDM potential.

Demand Response

Navigant Consulting's estimate of demand response (DR) within HONI's service territory assumes:

- For *Residential and Small Business* (<50 kW)
 - an expanded penetration of PeakSaver or similar devices,
- For *> 50 kW customers*
 - a program similar to the OPA's current DR3 program.

The analysis estimates a mid-term (2014) DR potential and projects a linear "ramp-up" (i.e. 25% of the 2014 potential being realized each year) towards these levels from today:

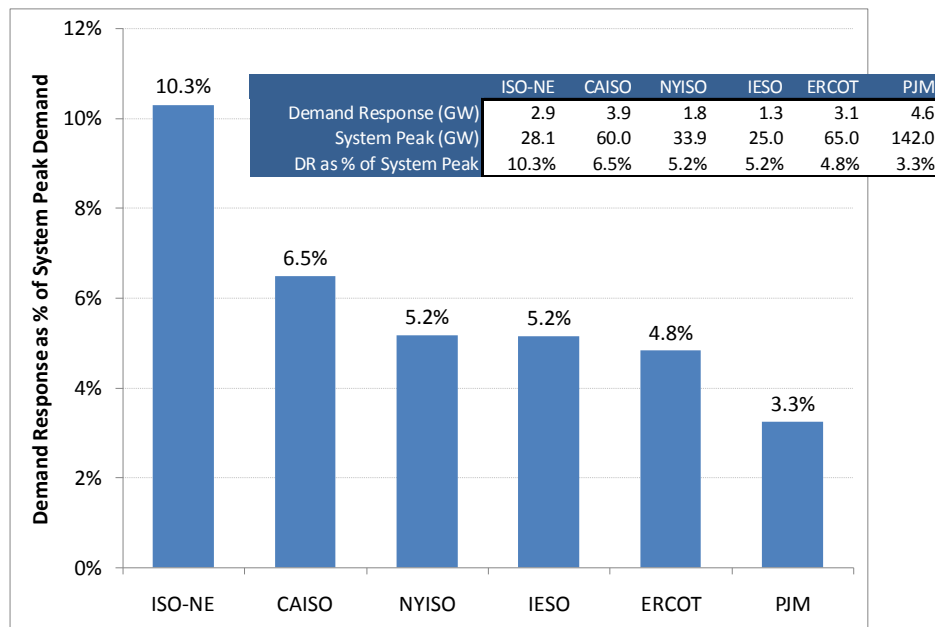
- Residential = 1.2% of peak demand
- Commercial = 1.6% of peak demand
- Industrial = 2.8% of peak demand

Navigant Consulting expects very limited, if any, DR potential from HONI's agricultural customers and has modelled this potential as zero.

These assumptions reflect recent Navigant Consulting research indicating that system operators across North America have DR resources equivalent to between 3% to 10% of system peak demand. The weighted average across the 355,000 MW of peak demand among the system operators surveyed is 5%.

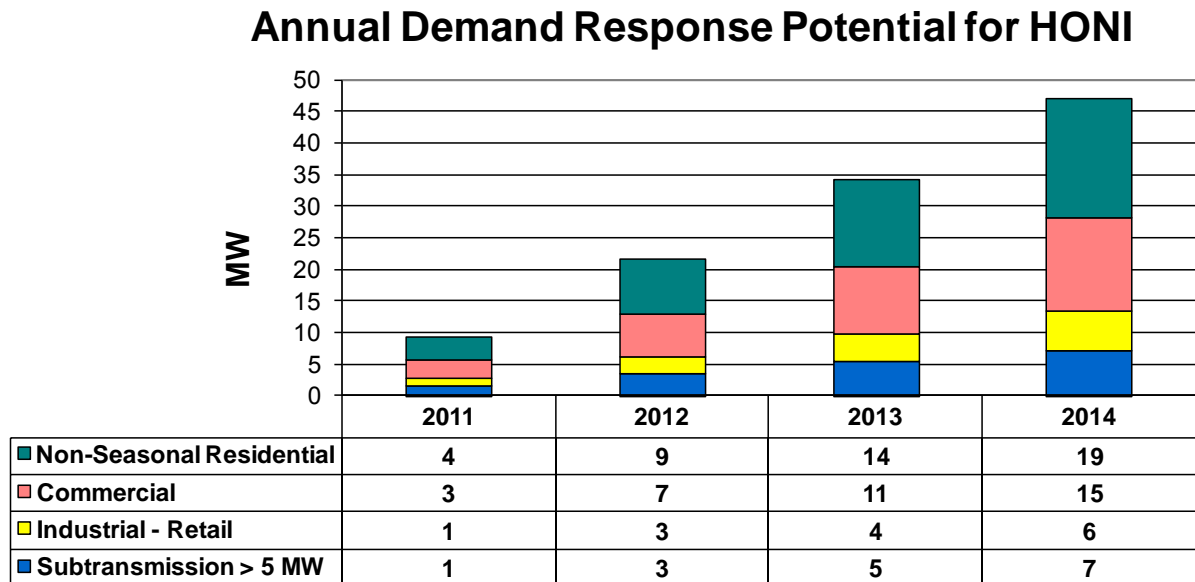
Most of this capacity came from large industrial customers, but Navigant Consulting anticipates further development of the DR market such that other sectors would provide incremental DR capacity.

Figure 31: Demand Response Capacity as % of Total System Peak Demand



For the industrial sector, the estimates of incremental DR potential provided below assume that Sub-transmission > 5 MW customers representing 50% of the 2014 potential for this sector are currently participating in one of the OPA's DR programs. Similarly, Navigant Consulting has assumed that customers representing 25% of the 2014 potential for the retail industrial sector are currently participating in one of the OPA's DR programs. We have adjusted the incremental DR potential for these sectors downward to reflect this assumption regarding current participation rates.

Figure 32: Estimated Demand Response Impacts by Sector



The estimated DR potential is just under 2% of HONI's estimated summer peak demand of just over 3500 MW.

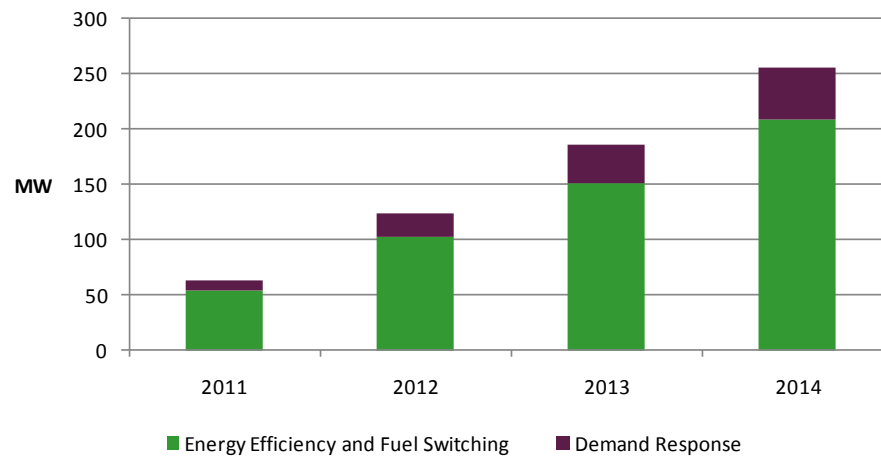
If the type of programs envisioned are not available or the incentive levels and payment structure are materially different, then the expected potential may not be achieved.

Combined Potential with DR Impacts

The combination of the above EE and FS potential (current OPA programs), and DR potential yield a combined potential of over 250 MW through 2014 as shown in

Figure 33.

Figure 33: Achievable Potential (Current OPA Programs) with DR Impacts



Proposed Additions to HONI's Portfolio

No OPA Programs	• Without any electricity ratepayer-funded programs (ie. federal/provincial initiatives only).
Current OPA Programs	• Current electricity ratepayer-funded programs
Additional HONI Programs	• Proposed additional HONI programs and initiatives

Existing programs were reviewed in order to compare the coverage of current initiatives with the achievable CDM potential. Potential new programs or initiatives were then considered where appropriate. A list of current programs and initiatives, with comments regarding gaps in coverage and potential additional HONI programs and initiatives, is presented in Appendix C.

Building on the review of existing initiatives and consideration of the achievable CDM potential in the HONI service territory, the following programs were selected for consideration.

Figure 34: Residential Sector Programs

Potential Programs	
Enhancement to OPA program	Additional rebated items for EKC with potential extension of program duration.
Enhancement to ecoENERGY	Working with ecoENERGY to implement more electric saving measures and claiming additional savings
In-home Display Promotions	Continue promoting in-home displays to increase awareness of plug load and other household consumption; potential to offer free monitors as an add on to other programs (new and existing)
TOU and Education/Online Audits	Educational / awareness program for TOU rates implementation, may include online audit portion to help customers determine potential saving opportunities
AC Tune Up Program	Incentives for contractors to offer reduced/free space cooling tune ups
Proper AC sizing / Installation Program	Program linked to the replacement or new installation of CAC units to ensure proper sizing and fitting of installed units ³⁰
ECM	Incentives to encourage adoption of Electronically Commutating Motors in new housing.
ETS	Incentives to promote the adoption of Electric Thermal Storage units in homes with electric heating (both in broad residential sector and for low-income households).
Heat Pump Water Heater	Rebates for promoting the installation of heat pump water heaters
Load Control for Water Heaters	Similar to PeakSaver but installing on electric water heaters for peak demand reduction (increased promotion in HONI territory)
New Construction Program	Program to promote the construction of Energy Star rated homes and incorporate additional electricity saving measures

Figure 35: Commercial Sector Programs

Potential Programs	
Enhancement to Power Saving Blitz	<ul style="list-style-type: none"> • Program which would focus on additional, easy to install measures (direct installation) and specific to the segment • Free low-cost items to get beyond lighting savings for other end-uses, such as refrigeration controls, sensors and coil-cleaning, programmable thermostats • Encourage other contractors (non-lighting) to participate in program through additional reward incentives

³⁰ Some municipalities, such as the City of Brampton, require sizing calculations as part of the permitting process for any installation or modification of heating or air conditioning systems.

Potential Programs	
Segment-specific support	<ul style="list-style-type: none"> • Package and target program to meet segment needs and provide segment expertise • Audits to enable “deep dive” into savings potential of business • Additional prescriptive rebates • Revision of incentive levels to promote increased uptake
Enhancement to High Performance New Construction (HPNC)	<ul style="list-style-type: none"> • Additional electricity saving measures • “Off-the-shelf” set of measures available for specific segments with streamlined rebates • Additional incentives for design teams/engineering teams to promote efficient design
Food and Commercial Refrigeration Program	<ul style="list-style-type: none"> • Specific prescriptive rebates targeted to commercial kitchens and refrigeration
Lodging Program	<ul style="list-style-type: none"> • Specific prescriptive rebates targeted to lodging industry including lighting, HVAC, vending/ice machines
Municipal Audits Program	<ul style="list-style-type: none"> • Availability of free audits for municipal facilities when recommendations are implemented

Figure 36: Agriculture and Industrial Sector Programs

Potential Programs	
Compressed Air System	Cross segment approach for compressed air systems, involving audits, leak surveys and incentives for installing air compressors equipped with variable speed drives
Segment-specific support	<p>Largest segments are</p> <ul style="list-style-type: none"> • Miscellaneous (~58% of industrial sales) • Fabricated Metals (~8%) • Food and Beverage (~8%) • Wood Products (~6%) <p>Target these segments with approach similar to the enhancements discussed for the commercial sector.</p>
Agricultural programs	<ul style="list-style-type: none"> • Continue with promotion of ERIP to agribusiness, however include additional enhancements to ERIP. • Focus on the high energy consumption sectors (dairy, poultry, swine and greenhouses) <ul style="list-style-type: none"> • California’s Dairy Energy Efficiency Program provides an example of a dairy-focused program. • Continue working with trade allies in promoting available rebates

Programs Selected

After review of the potential measures and programs, ten programs were selected as providing the largest and most focussed opportunity for increasing HONI's achievable CDM potential. It should be noted that the recommended programs are not necessarily those with the highest TRC test results. Many of the measures with high TRC scores are already being achieved without program intervention or as a result of existing initiatives and were therefore not addressed in the proposed additional HONI programs.

Five of these programs address opportunities in the residential sector, including low income households, while the remaining programs propose new programs or initiatives for the commercial, industrial and agricultural sectors. We recommend HONI develop the following programs as Tier 2 (Regional) or Tier 3 (LDC service territory-specific) programs.

Please note that the PAC test for the first two programs – the Heat Pump Water Heater and Electric Thermal Storage programs fall just below one. We anticipate that further refinement of these programs by HONI could reduce the overall program costs to achieve a ratio of one or more under the PAC test. The Electric Thermal Storage Retrofit (Low Income) – has both a TRC and PAC benefit/cost ratio less than one, but would provide significant electricity costs savings for the target low income customers. As such, we have included it for possible inclusion in any HONI program targeted to Low Income customers.

Figure 37: Program Summary – Heat Pump Water Heater Incentive

Program Summary: Heat Pump Water Heater Incentive	
Description	Incentive to encourage installation of heat pump water heaters to displace conventional electric water heaters.
Target Market	Homes currently served with an electric water heater. High level of correspondence between electric space and water heating and homes with high efficiency gas furnace.
Strategy	<ol style="list-style-type: none"> 1. Investigate equipment availability and provide advance communication re program to contractors, equipment suppliers, distributors and retailers used by plumbing and electric contractors and homeowners. 2. Target communications to homes with electric space heating 3. Design assumes decision making on timing of tank replacements is very dispersed and may not always involve contractors.

Program Summary: Heat Pump Water Heater Incentive	
	<ol style="list-style-type: none"> Communicate incentive availability to both customers and through contractor associations (use multiple channels). Provide collateral marketing materials to contractors and through ecoEnergy audits, home shows, etc.. Design incentive applications to make process as simple as possible. Provide forms and information through HONI website. Periodically adjust program based on feedback from EM&V process.
Incentive Levels	Buy down incremental cost to a 2 year payback for single family homes (average incentive \$461 per home).
Program Costs (exclusive of incentives)	Incentive Cost (2011-2014) - \$ 15 - \$18.6 million Incremental Measure Cost over BAU - \$ 18 - 32 million Program Cost (excluding incentives) - \$ 2 million
Expected Participation Rate	Estimated incremental sales over BAU case 21,000 – 38,000 units
Impact:	Net GWh - 37 – 67
	Winter MW - 7 – 12
	Summer MW - 4 – 6
	TRC Test - 1.08
	PAC Test - 1.28
	GHG Reduction through 2014: 21 – 50 kt CO ₂ e
EM &V Requirements	<ul style="list-style-type: none"> Track applications and incentive approvals Monitor type, age and size of water heaters replaced. Monitor system installation costs submitted for incentives Survey program participants periodically to identify any issues with systems or program.
Comments	<ol style="list-style-type: none"> Winter savings may be overstated as device will extract heat from heated space. Summer savings may be understated since device provides dehumidification with resulting cooling effect. Limited availability currently. Unclear how quickly availability could ramp up. May be able to incorporate some load shifting via water heater controls. This effect is not included in the analysis.

Figure 38: Program Summary – Electric Thermal Storage Heater Promotion

Program Summary: Electric Thermal Storage Heater Promotion							
Description	Incentive to encourage the installation of Electric Thermal Storage Heaters on a replacement basis.						
Target Market	Existing homes with electric baseboard heaters.						
Strategy	<ol style="list-style-type: none"> 1. Provide advance communication re program to contractors, equipment suppliers, distributors and electric contractors. 2. Target communications to homes with electric space heating using baseboard or radiant/ceiling cable heating (<i>assumes these are identified in HONI CIS</i>). 3. Communicate incentive availability to both customers and through contractor associations (use multiple channels). 4. Program communications should explain economic value of ETS under TOU pricing structure, but also focus on features and benefits relating to comfort, air circulation, and environmental benefits. 5. Provide collateral marketing materials to contractors and through ecoEnergy audits, home shows, etc.. 6. Design incentive applications to make process as simple as possible. 7. Provide forms and information through HONI website. 8. Periodically adjust program based on feedback from EM&V process. 						
Incentive Levels	Provide incentives sufficient to ensure an average two-year payback over period of analysis. Cost varies by size of home, averaging \$2,084 for single family detached homes and \$1,600 for each single attached home.						
Program Costs (exclusive of incentives)	<table> <tr> <td>Incentive Cost (2011-2014)</td><td>- \$ 22 - 35 million</td></tr> <tr> <td>Incremental Measure Cost over BAU</td><td>- \$ 25 -46 million</td></tr> <tr> <td>Program Cost (excluding incentives)</td><td>- \$ 1.1 million</td></tr> </table>	Incentive Cost (2011-2014)	- \$ 22 - 35 million	Incremental Measure Cost over BAU	- \$ 25 -46 million	Program Cost (excluding incentives)	- \$ 1.1 million
Incentive Cost (2011-2014)	- \$ 22 - 35 million						
Incremental Measure Cost over BAU	- \$ 25 -46 million						
Program Cost (excluding incentives)	- \$ 1.1 million						
Expected Part. Rate	Estimated incremental sales over BAU case 15,000 – 27,000 units						
Impact:	Net GWh - 0						
	Winter MW - 69 - 124						
	Summer MW - 0						
	TRC Test - 1.1 <i>Note - TRC savings based on difference in avoided cost between on-peak, mid-peak and off-peak periods</i>						

Program Summary: Electric Thermal Storage Heater Promotion	
	PAC Test - 1.27
EM &V Requirements	<ul style="list-style-type: none"> • Track applications and incentive approvals • Monitor type, age and size of units replaced. • Monitor system installation costs submitted for incentives • Survey program participants periodically to identify any issues with systems or program • Compare participant consumption pattern with control group customers without ETS heater.
Comments	<ul style="list-style-type: none"> • Reported to provide some energy savings in addition to shifting given fan-forced circulation but have not been able to confirm. Results provided above assume no energy savings (only load shifting). • Assumes that ETS is installed when replacing or renovating, based on a 20 year expected useful life for baseboard heaters.

Figure 39: Program Summary – Electric Thermal Storage Heater Retrofit (Low Income)

Program Summary: Electric Thermal Storage Heater Retrofit (Low Income)	
Description	Incentive to encourage the installation of Electric Thermal Storage Heaters on a retrofit basis to Low Income customers.
Target Market	Low Income customers with electric baseboard heaters.
Strategy	<ol style="list-style-type: none"> 1. Direct communication with subsidized housing agencies 2. Indirect communication via low income support agencies.
Incentive Levels	Provide installed unit at no cost to eligible customers. Cost varies by size of home, averaging \$5,493 for single family detached homes and \$4,209 for each single attached home.
Program Costs (exclusive of incentives)	Incentive Cost (2011-2014) - \$ 3.9 – 6.9 million Incremental Measure Cost over BAU - \$ 3.8 – 6.9 million Program Cost (excluding incentives) - \$ 0.4 million
Expected Part. Rate	Estimated incremental sales over BAU case 1000 – 1,700 units
Impact:	Net GWh - 0
	Winter MW - 6 – 11
	Summer MW - 0
	TRC Test - 0.6 <i>Note - TRC savings based on difference in avoided cost between on-peak, mid-peak and off-peak periods</i>

Program Summary: Electric Thermal Storage Heater Retrofit (Low Income)	
	PAC Test - 0.6
	GHG Reduction through 2014: 0 kt CO ₂ e
EM &V Requirements	<ul style="list-style-type: none"> • Track applications and incentive approvals • Monitor type, age and size of heaters replaced. • Monitor system installation costs submitted for incentives • Survey program participants periodically to identify any issues with systems or program. • Compare participant consumption pattern with control group customers without ETS heater.
Comments	Reported to provide some energy savings in addition to shifting given fan-forced circulation but have not been able to confirm. Results provided above assume no energy savings (only load shifting).

Figure 40: Program Summary - In-Home Displays (IHD)

Program Summary: In-Home Displays	
Description	Incentive to install in-home energy use displays.
Target Market	Residential customers.
Strategy	Promote IHDs to increase customer understanding of electricity usage and complement TOU communications
Incentive Levels	Provide incentive to cover one-half of the cost of an in-home display (or approximately \$69 per home).
Program Costs	Incentive Cost (2011-2014) - \$ 6.8 – 9.8 million Incremental Measure Cost over BAU - \$ 7 - 13 million Program Cost (excluding incentives) - \$ 1.7 million
Expected Part. Rate	Estimated incremental sales over BAU case 80 to 144 thousand units
Impact:	Net GWh - 27 – 49
	Winter MW - 5 – 8
	Summer MW - 4 – 8
	TRC Test - 1.7
	PAC Test - 1.8
	GHG Reduction through 2014: 14 – 36 kt CO ₂ e
EM &V	Econometric analysis to determine relative contribution of

Program Summary: In-Home Displays	
Requirements	IHD to load shifting and conservation
Comments	<p>Build on lessons learned from HONI's past IHD programs and deployments.</p> <p>Monitor market developments to ensure HONI customers have access to the latest technology at the best price</p>

Figure 41: Program Summary – Re-Commissioning Program

Program Summary: Commercial Re-Commissioning Program	
Description	Provide assistance to Commercial customers in re-commissioning buildings to improve energy performance.
Target Market	Commercial customers, with a focus on offices.
Strategy	<ol style="list-style-type: none"> 1. Market program through building owner and manager associations, Chambers of Commerce or other business groups. 2. Develop clear, simple marketing materials that communicate and reinforce key messages (how to participate, what is offered, benefits, etc.). 3. Engage customer representatives from multiple levels of customer organizations; from management to facility engineering and operations staff. 4. Obtain firm customer commitments early in process (i.e. an MOU or other vehicle) so that efforts under program are more likely to result in customer action and energy savings. 5. Develop effective pre-screening protocol to target outreach efforts to ensure program efforts are focussed on customers most likely to implement CDM actions. 6. Provide adequate technical assistance and support to guide customers through the program process, including providing training and assistance with collection of facility data to support benchmarking.
Incentive Levels	No incentives assumed for this program.
Program Costs	<p>Incentive Cost (2011-2014) - \$ 0 million</p> <p>Incremental Measure Cost over BAU - \$ 1.7 – 2.9 million</p> <p>Program Cost (excluding incentives) - \$ 0.5 million</p>
Expected Participation Rate	Impact modeled across all applicable measures for commercial sector.

Program Summary: Commercial Re-Commissioning Program	
Impact:	Net GWh - 9 – 17
	Winter MW - 2 - 3
	Summer MW - 2 – 4
	TRC Test - 5.6
	PAC Test - 27.8
	GHG Reduction through 2014: 4.8 – 12.4 kt CO ₂ e
EM & V Requirements	<ul style="list-style-type: none"> • Track contacts, number of customers making commitments, and any resulting incentive applications and approvals. • Obtain historic building energy consumption data for period prior to program and monitor changes over course of and subsequent to program (measure reductions achieved and persistence of savings). • Track number and type of actions/projects undertaken and types of equipment/systems replaced. • Where possible conduct simple pre and post installation metering (i.e. measure load in kW pre and post retrofit). • Monitor installation costs submitted for incentives. • Survey program participants and non-participants periodically to identify any issues with program, information needs, etc..
Comments	Program costs reflect significant hand-holding / customer interaction. Magnitude of benefits allow such costs.

Figure 42: Program Summary – Commercial Energy Audit Program

Program Summary: Commercial Energy Audit Program	
Description	Energy Audit and technical support program specifically tailored to commercial customers.
Target Market	Commercial customers.
Strategy	<ol style="list-style-type: none"> 1. Offer complimentary energy audit and associated technical support to assist customers in identifying CDM opportunities. Audits may be delivered on-line, on-site by HONI staff or through pre-approved contractors; depending on facility size and processes. 2. Provide technical assistance and software tools to aid clients in understanding and managing energy use, and technology and process options, as well as in evaluating projects and accessing products and services.

Program Summary: Commercial Energy Audit Program							
	<ol style="list-style-type: none"> 3. Incorporate training and education components in program to help build capacity and commitment. 4. Work with clients to introduce energy management best practices to organizations as well as technical best practices in facilities and processes. 5. Provide channel support to key delivery channels to develop capability to support developing market. 						
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.						
Program Costs	<table> <tr> <td>Incentive Cost (2011-2014)</td><td>- \$ 5.3 - \$6.7 million</td></tr> <tr> <td>Incremental Measure Cost over BAU</td><td>- \$ 4 - 7 million</td></tr> <tr> <td>Program Cost (excluding incentives)</td><td>- \$ 1 million</td></tr> </table>	Incentive Cost (2011-2014)	- \$ 5.3 - \$6.7 million	Incremental Measure Cost over BAU	- \$ 4 - 7 million	Program Cost (excluding incentives)	- \$ 1 million
Incentive Cost (2011-2014)	- \$ 5.3 - \$6.7 million						
Incremental Measure Cost over BAU	- \$ 4 - 7 million						
Program Cost (excluding incentives)	- \$ 1 million						
Expected Participation Rate	Impact modeled across all applicable measures for commercial sector.						
Impact:	Net GWh - 31 -56						
	Winter MW - 5 -8						
	Summer MW - 9 – 16						
	TRC Test - 5.9						
	PAC Test - 4.7						
	GHG Reduction through 2014: 16.4 – 40.8 kt CO ₂ e						
EM &V Requirements	<ul style="list-style-type: none"> • Track number of facilities approached and number receiving services, type and level of support provided (i.e. type of audit provided) as well as the type, size and economics of opportunities identified. • Conduct periodic follow-up contacts with clients to identify which identified opportunities have been implemented. • Monitor system installation costs submitted for incentives. • Contacts should also be used to answer any concerns, identify barriers to action and provide any additional support required. • Follow up contacts should also identify extent to which energy management best practices are being implemented/maintained by the client organization. 						

Program Summary: Commercial Energy Audit Program	
	<ul style="list-style-type: none"> • Survey program participants and non-participants periodically to identify any issues with program, information needs, etc..
Comments	Program costs reflect significant hand-holding / customer interaction. Magnitude of benefits allow such costs and recognize costs associated with more geographically dispersed customer base.

Figure 43: Program Summary – MUSH Sector

Program Summary: Segment Focus – MUSH Sector	
Description	Offer enhanced support for Commercial customers.
Target Market	Municipalities, Schools, Universities and Hospitals.
Strategy	<ol style="list-style-type: none"> 1. Identify MUSH sector accounts and links to particular municipalities, Board's, and Agencies and the appropriate contacts for each organization. 2. Identify key accounts with multiple facilities and highest energy use for contact and research current activities and status. 3. Strategically focus customer contacts on 'key accounts' (those with the greatest sales, multiple locations, etc.) to offer technical support and build relationships with customers. 4. Develop service offering with range of services appropriate to each sector. This may include benchmarking, audits, re-commissioning, or sub-metering assistance depending on sector and client needs. 5. Establish HONI as the one-stop source for energy management information. Build on current information provision offered through HONI website to address targeted end-uses and best practices for energy management programs. 6. Provide a source of unbiased advice on energy management opportunities, technologies and energy audits. 7. Use web site to provide sector-specific success stories and facilitate opportunities for organizations to share experience (i.e. organize or support seminars and

Program Summary: Segment Focus – MUSH Sector	
	workshops for municipalities or school boards). See Appendix D for a more detailed description of a potential Strategic Approach for the MUSH sector.
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.
Program Costs (exclusive of incentives)	Incentive Cost (2011-2014) - \$ 0.7 - \$0.9 million Incremental Measure Cost over BAU - \$ 0.5 – 0.9 million Program Cost (excluding incentives) - \$ 0.1 million
Expected Participation Rate	Impact modeled across all applicable measures for commercial sector as a whole
Impact:	Net GWh - 3 - 6
	Winter MW - 0.6 – 1.1
	Summer MW - 0.7 – 1.3
	TRC Test - 4.5
	PAC Test - 3.15
	GHG Reduction through 2014: 1.6 – 4.4 kt CO ₂ e
EM &V Requirements	<ul style="list-style-type: none"> • Track customer contacts, web activity and resulting actions, applications and incentive approvals. • Monitor measures undertaken. • Where possible conduct simple pre and post installation metering of projects (i.e. measure load in kW pre and post retrofit). • Monitor system installation costs submitted for incentives. • Survey program participants and non-participants periodically to identify any issues with program, information needs, etc..
Comments	Program costs reflect significant hand-holding / customer interaction. Magnitude of benefits allow such costs, but still need fine-tuning for most remote customers

Figure 44: Program Summary – Compressed Air Program

Program Summary: Compressed Air Program	
Description	Offer technical support to customers in identifying compressed air system savings.
Target Market	Industrial customers (Retail and Sub-Transmission >5MW)

Program Summary: Compressed Air Program	
	accounts)
Strategy	<ol style="list-style-type: none"> 1. Provide information and technical support in identifying solutions and savings related to compressed air system design and operation, use of efficient tools and equipment and on-going maintenance of systems. 2. Use multiple delivery channels to disseminate information on program and potential for cost and energy savings (i.e. web site, marketing collateral, seminars, client visits, etc.). 3. Utilize and leverage existing programs and information resources (i.e. Natural Resources Canada and US Energy Efficiency and Renewable Energy (EEERE) programs on compressed air: http://www1.eere.energy.gov/industry/utilities/compressed_air_tools.html. 4. Engage contractors and equipment suppliers in program. 5. Incorporate strong educational component and processes for on-going monitoring of systems to encourage maintenance of savings.
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.
Program Costs	Incentive Cost (2011-2014) - \$ 0.3 - \$0.4 million Incremental Measure Cost over BAU - \$ 0.1 – 0.5 million Program Cost (excluding incentives) - \$ 0.4 million
Expected Participation Rate	Incentive levels were modeled to be consistent with levels of support now available in market.
Impact:	Net GWh - 5 – 18
	Winter MW - 0.3 – 1.0
	Summer MW - 0.6 – 2.1
	TRC Test (Industrial – Retail) - 2.3
	TRC Test (Industrial – Sub-Trans.>5MW) – 2.9
	PAC Test (Industrial – Retail) - 1.3
	PAC Test (Industrial – Sub-Trans.>5MW) – 1.2
	GHG Reduction through 2014: 5.1 – 18.3 kt CO ₂ e.
EM &V Requirements	<ul style="list-style-type: none"> • Track number of inquiries, customer contacts and site visits • Monitor type of projects undertaken (including O&M initiatives), type of equipment and /or systems installed or

Program Summary: Compressed Air Program	
	<p>replaced.</p> <ul style="list-style-type: none"> • Where possible conduct simple pre and post installation metering (i.e. compressor energy use before and after retrofit or maintenance). • Monitor repair, equipment or retrofit costs where possible, including costs submitted for incentives. • Survey program participants and non-participants periodically to identify any issues with program, information needs, persistence of savings, etc..
Comments	<p>Much of energy saving potential will arise from low/no cost changes; such as improved maintenance (repairing leaks) and operational changes (shutting off equipment during breaks and when not in use). Including education, processes and tools that encourage and facilitate on-going attention to these issues is critical to ensuring persistent savings. Moving beyond these improvements to the use of more efficient compressed air devices and equipment will yield further benefits.</p> <p>Compressed air systems should also be addressed where appropriate in any monitoring and targeting efforts.</p>

Figure 45: Program Summary –Monitoring and Targeting – Industrial

Program Summary: Monitoring & Targeting (M&T)	
Description	Offer technical support and sub-metering to assist customers to identify and pursue CDM opportunities.
Target Market	Industrial customers (<i>Retail and Sub-Transmission >5MW accounts</i>)
Strategy	<ol style="list-style-type: none"> 1. Offer technical assistance in understanding and relating available metering data to equipment operation to assist customers in identifying CDM opportunities. 2. Offer technical assistance in implementing M&T-specific software to better allow customers to understand their own consumption patterns, with an emphasis on cumulative sum control chart (CUSUM³¹) and related techniques and analysis. 3. Develop benchmarking capability to facilitate a focus on sites with the greatest CDM potential. 4. Utilize existing metering systems, including utility interval

³¹ CUSUM is a statistical quality control technique used for monitoring change detection.

Program Summary: Monitoring & Targeting (M&T)	
	<p>meter(s), and customer sub-metering where available.</p> <ol style="list-style-type: none"> Assist with provision of sub-metering installation where appropriate to supplement available data. Provide technical assistance in identifying CDM opportunities, program assistance and incentives available and through any resulting application process. Support implementation of on-going monitoring and continuous improvement processes to improve persistence and refine energy management systems over time.
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.
Program Costs	<p>Incentive Cost (2011-2014) - \$ 1.8 - 4.3 million</p> <p>Incremental Measure Cost over BAU - \$ 4 – 13 million</p> <p>Program Cost (excluding incentives) - \$ 0.5 million</p>
Expected Participation Rate	Impact modeled across all applicable measures for industrial sector as a whole
Impact:	Net GWh - 22 – 80
	Winter MW - 1 – 5
	Summer MW - 3 -10
	TRC Test (Industrial – Retail) - 2.9
	TRC Test (Industrial – Sub-Trans.>5MW) – 2.5
	PAC Test (Industrial – Retail) - 5.2
	PAC Test (Industrial – Sub-Trans.>5MW) – 4.4
	GHG Reduction through 2014: 12 – 59 kt CO ₂ e.
EM &V Requirements	<ul style="list-style-type: none"> Track number of facilities approached, number participating, and number where metering installed. For participants, track initial consumption levels, number of metering points installed and associated costs. Record number and type of measures taken as a result of monitoring and targeting efforts. Report pre-/post- installation metering results where possible.
Comments	Past programs have demonstrated energy efficiency improvements ranging from 5-25% as a result of monitoring and targeting efforts. For the purpose of this program Navigant conservatively assumed that average savings of 6% could be achieved.

Figure 46: Program Summary – Industrial Energy Audit Program

Program Summary: Industrial Energy Audit Program	
Description	Energy Audit and technical support program specifically tailored to industrial customers.
Target Market	Industrial customers (<i>Retail and Sub-Transmission >5MW accounts</i>)
Strategy	<ol style="list-style-type: none"> 1. Offer complimentary energy audit and associated technical support to assist customers in identifying CDM opportunities. Audits may be delivered on-line, on-site by HONI staff or through pre-approved contractors; depending on facility size and processes. 2. Provide technical assistance and software tools to aid clients in understanding and managing energy use, and technology and process options, as well as in evaluating projects and accessing products and services. 3. Incorporate training and education components in program³² to help build capacity and commitment. 4. Work with clients to introduce energy management best practices to organizations as well as technical best practices in facilities and processes. 5. Provide channel support to key delivery channels to develop capability to support developing market. 6. Assist customers in accessing available programs and incentives that can assist in achieving energy management goals and provide support through any resulting application process. <p>Survey program participants and non-participants periodically to identify any issues with program, information needs, etc..</p>
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.
Program Costs	<p>Incentive Cost (2011-2014) - \$ 1.8 - \$2.8 million</p> <p>Incremental Measure Cost over BAU - \$ 2 - 8 million</p> <p>Program Cost (excluding incentives) - \$ 0.5 million</p>
Expected	Incentive levels were modeled to be consistent with levels of

³² See EERE/DOE Save Energy Now Industrial Audit program and Wisconsin's Focus on Energy Industrial program descriptions in section on Best Practice programs in Appendix C.

Program Summary: Industrial Energy Audit Program	
Participation Rate	support now available in the market.
Impact:	Net GWh - 16 – 58
	Winter MW - 1 - 4
	Summer MW - 2 -7
	TRC Test (Industrial – Retail) - 2.7
	TRC Test (Industrial – Sub-Trans.>5MW) – 3.2
	PAC Test (Industrial – Retail) - 3.8
	PAC Test (Industrial – Sub-Trans.>5MW) – 3.2
GHG Reduction through 2014: 8.6 – 42.8 kt CO ₂ e.	
EM &V Requirements	<ul style="list-style-type: none"> • Track number of facilities approached and number receiving services, type and level of support provided (i.e. type of audit provided) as well as the type, size and economics of opportunities identified. • Conduct periodic follow-up contacts with clients to identify which identified opportunities have been implemented. • Contacts should also be used to answer any concerns, identify barriers to action and provide any additional support required. • Follow up contacts should also identify extent to which energy management best practices are being implemented/maintained by the client organization.
Comments	HONI has a varied customer base. Level and type of support should be tailored to the size and type of facility and complexity of client needs.

Figure 47: Program Summary –Agricultural Sector Audit Program

Program Summary:	
Description	Energy Audit program specifically tailored to agricultural customers.
Target Market	Farm, greenhouse and other customers in the agricultural sector.
Strategy	1. Seek input from sector experts regarding potential approach, key issues, and the timing of program

Program Summary:	
	<p>activities for each sector.</p> <ol style="list-style-type: none"> Identify co-benefits and position CDM opportunities in terms of key interests for each sub-sector (i.e. Use of longer-life equipment that limits the need for maintenance in areas where bio-security is a concern). Develop flexible service offering, ranging from audits to specific measures, depending on needs and the ability of measures to provide sub-sector-specific co-benefits. Provide high level of support as needed to assist customers in identifying opportunities, finding suppliers/contractors and applying for assistance.
Incentive Levels	Incentive levels were modeled to be consistent with levels of support now available in market.
Program Costs	<p>Incentive Cost (2011-2014) - \$ 1 – 1.1 million</p> <p>Incremental Measure Cost over BAU - \$ 1 – 1.1 million</p> <p>Program Cost (excluding incentives) - \$ 0.2 million</p>
Expected Participation Rate	Impact modeled across all applicable measures for agriculture sector as a whole
Impact:	Net GWh - 17 – 19
	Winter MW - 3 – 4
	Summer MW - 2 – 2.5
	TRC Test - 6.0
	PAC Test - 4.3
	GHG Reduction through 2014: 9.0 – 13.7 kt CO ₂ e.
EM &V Requirements	<ul style="list-style-type: none"> Track customer contacts, applications and incentive approvals Monitor type of project and type of systems replaced. Where possible conduct simple pre and post installation metering (i.e. measure load in kW pre and post retrofit). Monitor system installation costs submitted for incentives. Survey program participants and non-participants periodically to identify any issues with program, information needs, etc.. Surveys and customer contacts should also focus on identifying co-benefits that contribute to decisions to implement CDM

Program Summary:	
	projects.
Comments	<p>The agriculture sector has generally been quite hard to reach and has typically placed a relatively low priority on electricity costs. We therefore suggest that success will depend on identifying the ancillary benefits associated with CDM measures that will appeal to different agricultural business needs.</p> <p>Experience indicates that achieving program success requires significant levels of hand-holding and support³³. Majority of achievable potential lies in lighting with some potential for motors/ventilation.</p> <p>Program costs allow for significant hand-holding / customer interaction. Magnitude of benefits allow such costs but some targeting is recommended to manage program costs.</p>

For the industrial sector, Navigant Consulting has assumed that a program similar to the OPA’s current Industrial Transmission-Connected Energy Efficiency Program could be made available to HONI’s retail industrial and Sub-Transmission > 5 MW customers. This program offers the stronger segment support described above for the commercial sector.

Two illustrative programs – strategic approach to the MUSH sector and industrial “hand-holding – reflecting Navigant Consulting’s proposed additional HONI programs and initiatives in the commercial and industrial sector are presented in Appendix D along with two residential program concepts that may hold promise (but were not included in the recommended portfolio).

A summary of the energy and demand potential from the above programs is provided in the figure below.

³³ National Center for Appropriate Technology, Farm Energy Audits: Availability, Usefulness and Cost, September 2009. Funded by the USDA Risk Management Agency.

Figure 48: Cumulative Achievable Potential

Cumulative Achievable Potential 2011 - 2014	Demand				Energy	
	Winter MW		Summer MW		GWh	
	Low	High	Low	High	Low	High
Residential						
Heat Pump Water Heater Incentive	7	12	4	6	37	67
Electric Thermal Storage (ETS) Heater Promotion	69	122	0	0	0	0
ETS Heater Retrofit (Low Income)	6	11	0	0	0	0
In-Home Display	5	8	4	8	27	49
Sub-Total	87	154	8	14	65	116
Commercial						
Re-Commissioning	2	3	2	4	9	17
Commercial Energy Audit Program	5	8	9	16	31	56
Support for MUSH Sector	1	1	1	1	3	6
Sub-Total	7	12	12	21	44	79
Industrial						
Compressed Air Program	0	1	0	1	2	7
Industrial Energy Audit Program	1	3	1	3	8	30
Monitoring & Targeting	1	4	1	4	10	37
Sub-Total	3	8	3	7	20	74
Sub-Transmission > 5MW						
Compressed Air Program	0	1	0	1	3	11
Industrial Energy Audit Program	1	3	1	3	8	28
Monitoring & Targeting	1	4	1	4	12	43
Sub-Total	3	8	3	7	23	83
Agricultural						
Energy Audit Program	3	4	2	3	17	19
Sub-Total	3	4	2	3	17	19
Total Portfolio	103	185	27	52	169	370

Recommended CDM Portfolio and Forecast Achievable Potential

Navigant Consulting's recommended EE & FS CDM portfolio includes the current OPA programs plus the new programs described in the previous section. Navigant Consulting notes that the achievable potential is likely to be higher than shown to the extent that the

current OPA programs are enhanced or further niche opportunities are targeted through Tier 2 or 3 programs.

Forecast CDM Results with Recommended Portfolio

The achievable potential has been estimated in terms of peak (MW) and energy (GWh) savings projected to be achieved, first under current OPA programs and under the set of additional HONI programs described above. Note that this potential does not include the TOU and DR impacts. The achievable potential with the additional HONI programs is presented in Figure 49. Potential estimates for each sector are presented in Figure 50 and Figure 51 below.

Figure 49: Cumulative Achievable EE and FS Potential through 2014 (with Additional HONI Programs)

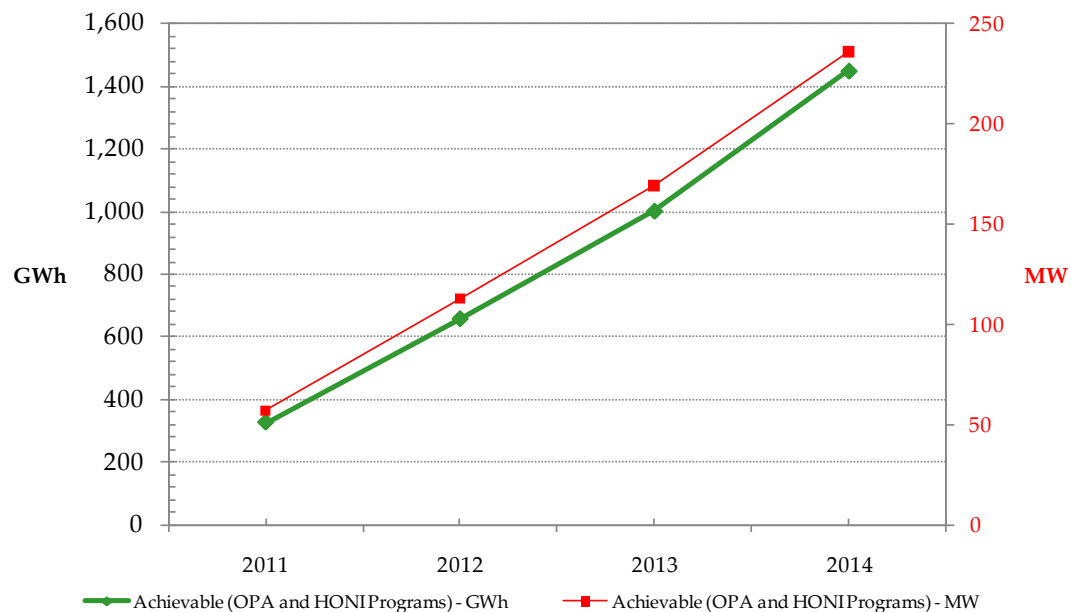


Figure 50: Cumulative Achievable EE and FS Potential (GWh) by sector through 2014 (with Additional HONI Programs)

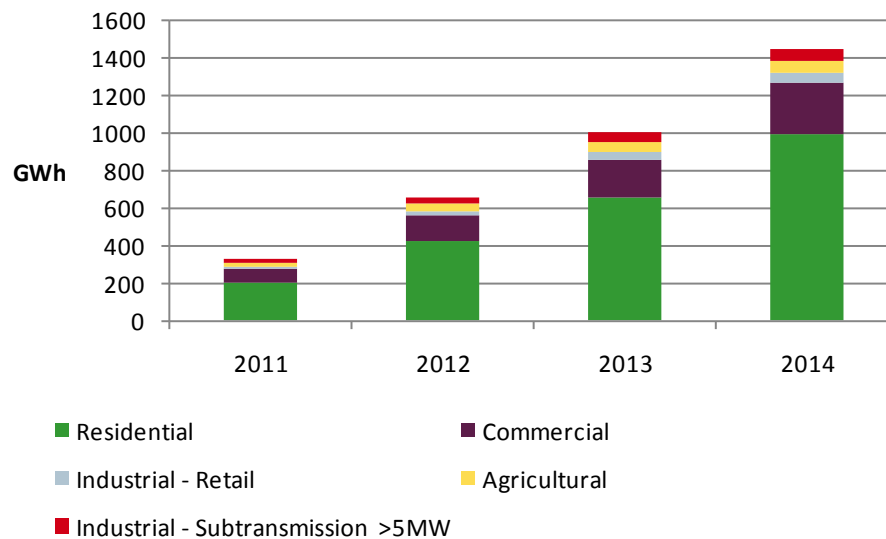
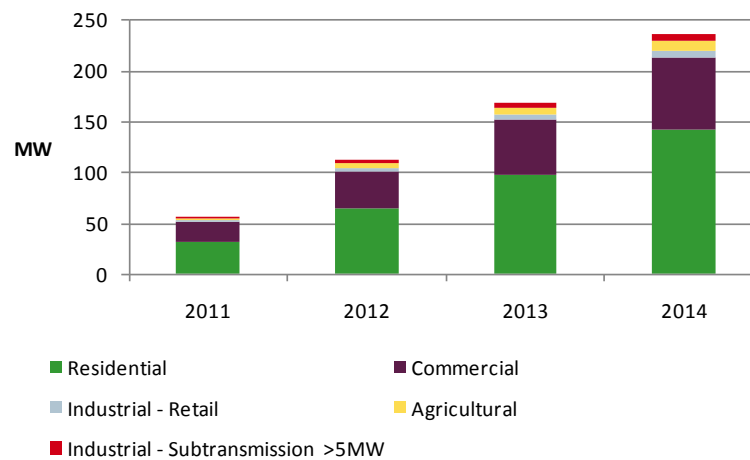


Figure 51: Cumulative Achievable EE and FS Potential (MW) by sector through 2014 (with Additional HONI Programs)



Expected Net Energy and Demand Savings Attributable to HONI through 2014

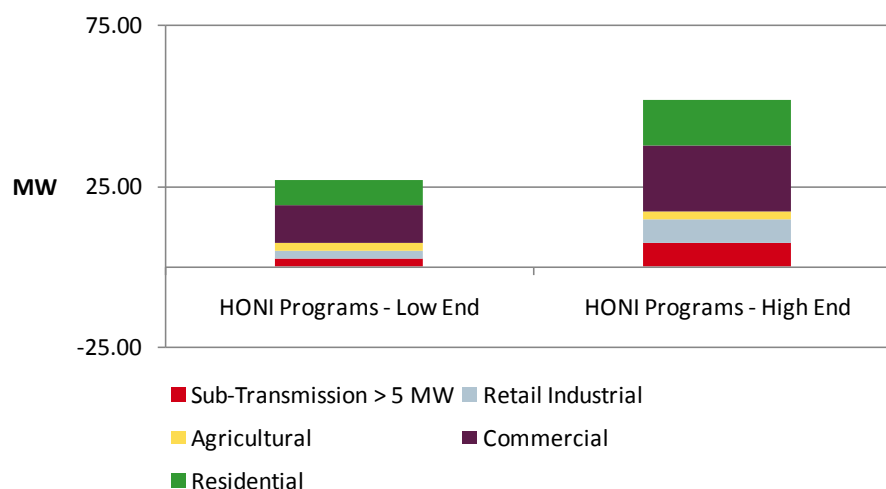
The achievable potentials given above for the “Additional HONI Programs” case implicitly includes the achievable potential of the “No OPA Programs” and “OPA Programs” cases. As such, it should not be taken as the net energy and demand savings that would be attributable solely to HONI if it implemented the programs modeled under the respective scenario.

As indicated in the earlier discussion of net energy and demand savings attributable to OPA programs, estimates of net energy and demand savings attributable to a particular set of programs is complicated by uncertainty regarding attribution, free-ridership and free-driver-ship levels as well as spillover. As well, the attributable savings could vary by evaluation approach (i.e. HONI-specific, provincial average extrapolated to HONI, etc.) and the level of rigour involved in the assessment.

The simplest (and most conservative) estimate of the net savings attributable to HONI under a set of additional HONI programs would be derived by simply subtracting 1) the achievable potential with current OPA programs from 2) the achievable potential under the “Additional HONI Programs” case only for those measures targeted under current and additional programs. The results of this analysis are shown below by sector for the peak demand impact from energy efficiency and fuel switching measures. This would represent the low end of the range of achievable potential within the HONI service area.

The above estimates are conservative, for the same reasons discussed with regards to the OPA programs. Given these considerations, Navigant Consulting has estimated the following upper estimate for net savings from energy efficiency and fuel switching measures.

Figure 52: Expected Range for Net EE and FS Demand Savings from HONI Programs



	HONI Programs - Low End	HONI Programs - High End
Residential	7.8	13.8
Commercial	12.1	20.8
Retail Industrial	2.7	7.3
Sub-Transmission > 5 MW	2.5	7.3
Agricultural	2.1	2.5
Total	27.2	51.7

A similar analysis for energy yields potential net energy savings of 177 to 278 GWh attributable to the proposed HONI programs.

GHG Impacts

The GHG intensity of electricity used to estimate the GHG impact of HONI's CDM activities through 2014 was based on a modified version of the emissions calculator model/spreadsheet provided by Bullfrog Power and available at:

<http://www.bullfrogpower.com/clean/Bullfrog%20Ontario%20Emissions%20Calculator%202010.xls>

Navigant Consulting's estimate of GHG intensity was based upon the "system (operating margin)" calculation from this spreadsheet³⁴ with the following modification.

Peaking (storage) hydro was assumed to be the marginal resource 50% of the time when hydro facilities were reported to be on the margin. However, because peaking hydro facilities are generally energy constrained and hence dispatched to maximize the value of this available energy, Navigant Consulting expects they would continue to operate as they currently do even with the level of CDM expected through 2014. In essence, operators of these facilities will "reserve" their available energy output for periods when it has the most value and reductions in demand from CDM during periods when peaking hydro is on the margin are expected to reduce output of natural gas generators (with the peaking hydro output remaining largely unchanged). Based on this, the percentage of time that hydro facilities are on the margin was reduced by 50% and the percentage of time natural gas facilities (listed as oil/gas in the Bullfrog Power model) are on the margin was increased by the same amount.

With this modification, the GHG intensity of marginal electricity consumption in Ontario, as estimated using the Bullfrog Power model, changes from 0.676 tonnes / MWh to 0.73 tonnes / MWh.

Navigant Consulting also notes that the Bullfrog Power model reflects data from the period November 2008 through April 2009. Given recent declines in Ontario demand and the provincial government regulations restrictions on GHG emissions from OPG's coal-fired generating facilities, Navigant Consulting believes the above analysis may overstate the marginal GHG intensity of electricity in Ontario through 2014. Navigant Consulting also notes that coal-fired generation was on the margin significantly less time in April

³⁴ The system (operating margin) approach better reflects the marginal reduction in GHG emissions from a reduction in electricity use. The alternative approach (the "footprint" method) reflects average GHG intensity of all electricity generated.

2009 than in the previous five months. The GHG intensity for April 2009 with the above modification to reflect our expectations with respect to peaking hydro operation was estimated to be 0.525 tonnes/ MWh using the Bullfrog Power model. This value is almost identical to the 0.515 tonnes MWh GHG intensity of oil/gas generation as provided in the Bullfrog Power model.

Based on the above analysis, Navigant Consulting has estimated the GHG reductions from HONI's expected CDM impacts based on a range of marginal GHG intensity values. The low end of the range is 0.525 tonnes / MWh³⁵ based on data from April 2009 and the high end of the range is 0.73 tonnes / MWh based on the analysis described above.

Given this range and significant uncertainty associated with the operation of coal-fired generation in Ontario over the period through to its planned phase-out in 2014, Navigant Consulting has not developed separate estimates of the marginal GHG intensity for each of the eight different seasonal periods for which CDM savings have been estimated. Instead, the above range of GHG intensities was used.

Assuming a linear ramp-up in energy savings over the forecast period, the GHG saving from the current and additional HONI CDM programs through 2014 as described above are estimated to fall in the range of 1.0 to 1.7 Mt³⁶ with a median estimate of 1 Mt CO₂e.

Potential Impact of Expanded ERIP Eligibility

Navigant Consulting understands that under the current ERIP rules, customers who participate in the Power Savings Blitz (PSB) program cannot also participate (even for other, non-PSB eligible measures) in the ERIP program. Navigant also modeled the incremental impact of allowing such customers to participate in ERIP for other, non-PSB eligible measures. Overall, we anticipate that the incremental energy and peak demand savings from such an expanded ERIP eligibility would be approximately 13 GWh and 6 MW through 2014.

Potential Impact of Delays in Program Implementation

As stated, the above results assume the programs covered are implemented at the beginning of 2011 and run through the end of 2014. To the degree that program implementation is delayed or any of the programs are terminated or significantly revised,

³⁵ Approximately equivalent to assuming oil / gas generating units are always on the margin.

³⁶ 1.0 Mt CO₂e based on 2014 savings of 574 GWh x 0.525 tonnes / MWh x 5 years / 2. 1.7 Mt based on 2014 savings of 922 GWh x 0.73 tonnes / MWh x 5 years / 2. Both cases assume linear ramp-up in savings through the end of 2014.

the expected savings for such programs through 2014 would not be realized. For example, a one year delay would likely “slide” the expected savings back by one year such that the net savings for the period from 2012 through 2014 would be equal to the savings originally estimated for the period 2011 through 2013.

Review of Prior DSM/CDM Potential Analysis for Ontario

Navigant Consulting has reviewed past CDM potential assessment carried out in Ontario and across North America. Two analyses of CDM potential have been carried out for the OPA, by ICF International in 2005³⁷ and by Marbek Resource Consultants Ltd. and MK Jaccard and Associates Inc. in 2006³⁸. The latter study was based on a national assessment carried out for the Canadian Gas Association which was completed in 2007 and was referenced in the IPSP Discussion Paper 3: Conservation and Demand Management.

Achievable potential was estimated in the ICF study based on an experience or accounting model approach, and at different levels of incentives or program aggressiveness, over the period to 2025. The estimate in the Marbek/MKJ study was based on modelling using the CIMS model.

The level of achievable potential due to incentives varies over time relative to the ‘normal’ turnover of equipment and expectations with respect to changing standards. The table below shows the level of achievable potential estimated for each sector under differing assumptions for each study. Note that the results for the ICF study are shown for 2014 to coincide with the period of this analysis while the results for the Marbek study are for the entire period to 2025 as no interim values were provided.

37 Assessment of Energy Efficiency Potential: 2006-2025, Final Report, prepared for the Ontario Power Authority by ICF Consulting, August 25, 2005.

38 Demand Side Management Potential in Canada: Energy Efficiency Study - Summary Report, Appendix C - Achievable Potential Scenarios, prepared for Canadian Gas Association, prepared by Marbek Resource Consultants Ltd and MK Jacard and Associates inc., May 2006.

Figure 53: Past CDM Assessments for Ontario

Achievable Potential (<i>reduction in energy use</i>)				
	ICF 2005		Marbek/MKJ 2007	
Sector	Minimally Aggressive	Very Aggressive	Status Quo	Aggressive
Residential	4.2%	11.2%	4.4%	27.2%
Commercial	2.7%	7.0%	4.7%	17.5%
Industrial	2.1%	8.6%	2.9%	14.3%

A sampling of recent DSM potential studies from across Canada and the US indicates a wide range of estimates for achievable potential. The range of estimates depends in part on the base levels of efficiency in each region, and in part on the methodology and assumptions used in the analysis.

Figure 54: Past DSM Studies across North America

Sector	Achievable Potential (<i>reduction in energy use</i>)
Residential	2% - 35%
Commercial	5% - 40%
Industrial	3% - 33%

The range in estimates in the level of “achievable” potential also varies significantly between analyses, depending on both the period of time covered by the study and the methodology and assumptions. Many of the studies reviewed vary the level of economic incentive provided to end-users (i.e. as a percentage of incremental costs of more efficient equipment). Others apply “best practice” energy management experience or change the level of consumer acceptance or other ‘non-price’ factors influencing decisions around the purchase of more efficient equipment.

The range of achievable potential estimated for HONI programs in this study, as shown in the table below, fall into the range of the prior studies carried out for Ontario. The estimated range of achievable potential is above the minimal or status quo levels found in prior analyses, while the upper estimate is generally just below the “very aggressive” scenario results from the ICF analysis.

Figure 55: HONI Achievable Potential as a Percentage of Forecast Sales

HONI Achievable Potential <i>(relative to projected sales in 2014)</i>	Achievable Potential (% energy)	
Sector	Low End	High End
Residential	8.2%	8.7%
Commercial	4.9%	5.0%
Agriculture	5.3%	5.5%
Industry – Retail	2.9%	6.0%
Industrial – Sub-Transmission >5MW	3.1%	6.1%
Total (all sectors)-	6.4%	7.2%

It should be noted that a significant portion of this potential is achieved under the “No OPA Programs” scenario. The Achievable potential associated with OPA and HONI programs as a percentage of forecast electricity sales is shown in the figure below.

Figure 56: Achievable Potential for OPA and HONI Programs as a Percentage of Forecast Sales

Achievable Potential for OPA and HONI Programs* <i>(relative to projected sales in 2014)</i>	Achievable Potential (% of energy)	
Sector	Low End	High End
Residential	1.2%	2.2%
Commercial	2.5%	4.4%
Agriculture	3.8%	4.1%
Industry – Retail	1.9%	6.9%
Industrial – Sub- Transmission >5MW	2.0%	7.0%
Total (all sectors)-	1.8%	3.6%

** Excludes CDM Potential associated with "No OPA Programs" Scenario*

APPENDIX A: CDM RESULTS BY SEGMENT

The results of the analysis are presented for each sector, for each of the three scenarios analysed, in two sets of tables below.

- The first series of tables show the “total achievable potential” for each scenario for each year to 2014. The three scenarios are cumulative in that the impacts of each scenario start with and builds on the levels of conservation and demand management of the prior scenario.
- The second set of tables then shows the incremental change between scenarios attributable to 1) current OPA programs and 2) additional HONI program.

The results displayed in this Appendix represent the low end estimate described in the body of the report. The considerations used in developing the high end estimate are described in the section on *“Expected Net Energy and Demand Savings from OPA Programs Operating in HONI Territory through 2014”* in section 7 of the report.

The total potential and incremental change between scenarios differ slightly from the values shown for individual scenarios in the main body of the report due to the inclusion of spillover effect. As noted (i.e. figures 4 to 7) the estimates in the body of the report do not include spillover. The figures in this Appendix include spillover effect in the residential sector for both OPA-incented and non-incented measures.

Total Achievable Potential:

Residential

Total				
MW Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	27	53	80	114
Achievable (Current OPA Programs)	32	63	94	135
Achievable (Additional HONI Programs)	33	65	98	142

Total				
GWh Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	174	349	527	797
Achievable (Current OPA Programs)	205	410	618	936
Achievable (Additional HONI Programs)	208	423	657	1001

Commercial

Total				
MW Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	8	16	23	31
Achievable (Current OPA Programs)	17	31	45	59
Achievable (Additional HONI Programs)	19	37	54	71

Total				
GWh Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	36	67	98	128
Achievable (Current OPA Programs)	65	119	173	225
Achievable (Additional HONI Programs)	73	141	206	269

Industrial - RETAIL

Total				
MW Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	1	1	2	2
Achievable (Current OPA Programs)	1	2	3	4
Achievable (Additional HONI Programs)	1	3	5	7

Total				
GWh Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	4	8	12	16
Achievable (Current OPA Programs)	7	14	22	29
Achievable (Additional HONI Programs)	10	23	36	49

Industrial - Subtransmission >5MW

Total				
MW Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	1	1	2	2
Achievable (Current OPA Programs)	1	2	3	4
Achievable (Additional HONI Programs)	1	3	5	7

Total				
GWh Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	6	11	17	22
Achievable (Current OPA Programs)	10	19	29	38
Achievable (Additional HONI Programs)	13	29	45	61

Agricultural

Total				
MW Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	1	1	2	3
Achievable (Current OPA Programs)	2	4	6	7
Achievable (Additional HONI Programs)	3	6	7	9

Total				
GWh Savings	2011	2012	2013	2014
Achievable (No OPA Programs)	6	11	16	21
Achievable (Current OPA Programs)	18	31	44	54
Achievable (Additional HONI Programs)	23	43	58	71

Change in Total Achievable Potential Attributable to Programs:

The following tables present the increments from:

- Achievable (No OPA Programs) to Achievable (Current OPA Programs), and
- Achievable (Current OPA Programs) to Achievable (with Additional HONI Programs)

The results of the programs build over the modeled period. Demand savings are cumulative from year to year.

Residential

Total				
MW Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	6	10	14	21
Achievable (Additional HONI Programs)	0	1	4	8

Total				
GWh Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	30	61	91	139
Achievable (Additional HONI Programs)	3	12	39	65

Commercial

Total				
MW Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	8	15	22	28
Achievable (Additional HONI Programs)	2	6	9	12

Total				
Achievable (Current OPA Programs)	29	52	75	97
Achievable (Additional HONI Programs)	8	21	33	44

Industrial - RETAIL

Total				
MW Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	0	1	1	2
Achievable (Additional HONI Programs)	0	1	2	3

Total				
GWh Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	3	6	9	12
Achievable (Additional HONI Programs)	3	9	14	20

Industrial - Subtransmission >5MW

Total				
MW Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	0	1	1	2
Achievable (Additional HONI Programs)	0	1	2	3

Total				
GWh Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	4	8	12	16
Achievable (Additional HONI Programs)	3	10	16	23

Agricultural

MW Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	2	3	4	4
Achievable (Additional HONI Programs)	1	1	2	2

Total				
GWh Savings	2011	2012	2013	2014
Achievable (Current OPA Programs)	12	20	28	33
Achievable (Additional HONI Programs)	5	11	14	17

APPENDIX B: LIST OF POTENTIAL MEASURES

Residential Measures:

Note:

- TRC shown is a snapshot based on current values. Actual modeling reviewed TRC for each year.
- TRC value of 999 indicates measures with no net incremental cost compared to base technology
- For simplicity measures are only shown for Single Family Dwellings. Actual modeling differentiated measures by housing type.

Segment	Vintage	Measure	TRC
SFD	Existing	Higher temperature setting for CAC	999.0
SFD	Existing	CFL Screw-in 15W	999.0
SFD	Existing	Energy Star® Dehumidifier	999.0
SFD	Existing	Water Heater Thermostat Setback (115 F)	999.0
SFD	Existing	Low-Flow Showerhead (Electric Water Heating)	26.1
SFD	Existing	Duct Sealing-Electric Fired (Case 1: Furnace Fan with PSC Motor)	25.5
SFD	Existing	Duct Sealing-Electric Fired (Case 2: Furnace Fan with ECM Motor)	25.3
SFD	Existing	Domestic Hot Water Pipe Insulation (3')	22.4
SFD	Existing	Programmable Thermostat (Space Cooling & Forced-Air Electric Heating) -Forced Air Electric Heating Only	16.8
SFD	Existing	Electric Water Heater Tank Blanket	14.2
SFD	Existing	Programmable Thermostat (Space Cooling & Gas Forced-Air Heating) -Gas Forced Air Heating Only	10.0
SFD	Existing	Heavy Duty Plug-In Timers for Pools (Above Ground)	10.0
SFD	Existing	Multi-Setting Block Heater Timer	8.8
SFD	Existing	Duct Sealing-Gas Fired (Case 1: Furnace Fan with PSC Motor)	8.2
SFD	Existing	Heavy Duty Plug-In Timers for Spas	7.6
SFD	Existing	Duct Sealing-Gas Fired (Case 2: Furnace Fan with ECM Motor)	7.5
SFD	Existing	Energy Star® Windows-Electric Fired (Case 1: Furnace Fan with PSC Motor)	6.4
SFD	Existing	Energy Star® Windows-Electric Fired (Case 2: Furnace Fan with ECM Motor)	6.3

Segment	Vintage	Measure	TRC
SFD	Existing	Faucet Aerator – Bathroom	6.1
SFD	Existing	Basement Insulation-Electric Fired (Case 3: R20; Furnace Fan with PSC Motor)	5.6
SFD	Existing	Basement Insulation-Electric Fired (Case 4: R20; Furnace Fan with ECM Motor)	5.4
SFD	Existing	Heavy Duty Plug-In Timers for Pools (In-Ground)	5.3
SFD	Existing	Energy Star® Windows-Gas Fired (Case 1: Furnace Fan with PSC Motor)	4.7
SFD	Existing	Energy Star® CFL Indoor Flood Light (26W)	4.6
SFD	Existing	Energy Star® Room Air Conditioner	4.5
SFD	Existing	Programmable Thermostat (Space Cooling & Forced-Air Electric Heating) -Space Cooling Only	4.4
SFD	Existing	Programmable Thermostat (Space Cooling & Gas Forced-Air Heating) -Space Cooling Only	4.4
SFD	Existing	Energy Star® Windows-Gas Fired (Case 2: Furnace Fan with ECM Motor)	4.2
SFD	Existing	Refrigerator Retirement	4.2
SFD	Existing	Energy Star® CFL Outdoor Flood Light (26W)	3.5
SFD	Existing	Faucet Aerator – Kitchen	3.3
SFD	Existing	Attic Venting - Power Venting PSC	2.8
SFD	Existing	Attic Venting - Power Venting ECM	2.8
SFD	Existing	In-Home Energy Use Display (Electric Heating)	2.8
SFD	Existing	Indoor Lighting Timers	2.8
SFD	Existing	Residential Attic Insulation - Electric Heating(R40)	2.7
SFD	Existing	Energy Star® Qualified Lighting Fixture - Indoor Torchieres	2.7
SFD	Existing	Basement Insulation-Gas Fired (Case 3: R20; Furnace Fan with PSC Motor)	2.4
SFD	Existing	Residential Attic Insulation - Natural Gas Heating (r40)	2.3
SFD	Existing	Window Solar Film-Electric Fired (Case 1: Base Window #321; Furnace Fan with PSC Motor)	2.2
SFD	Existing	Freezer Retirement	2.2
SFD	Existing	Basement Insulation-Gas Fired (Case 4: R20; Furnace Fan with ECM Motor)	2.2
SFD	Existing	Clotheslines (Outdoor)	2.2
SFD	Existing	Window Solar Film-Electric Fired (Case 2: Base Window #321; Furnace Fan with ECM Motor)	2.2
SFD	Existing	Basement Insulation-Electric Baseboard (Case 2: R20)	2.1
SFD	Existing	High Efficiency Pool Pump and Motor	2.1
SFD	Existing	Central Air Conditioner Tune Up	1.9

Segment	Vintage	Measure	TRC
SFD	Existing	Infiltration Control - Blower Door Test	1.9
SFD	Existing	Proper Sizing - Central Air Conditioner	1.9
SFD	Existing	Programmable Thermostat (Baseboard Space Heating)	1.7
SFD	Existing	Window Solar Film-Gas Fired (Case 1: Base Window #321; Furnace Fan with PSC Motor)	1.6
SFD	Existing	LED Lights 6W	1.5
SFD	Existing	Window Solar Film-Gas Fired (Case 2: Base Window #321; Furnace Fan with ECM Motor)	1.4
SFD	Existing	In-Home Energy Use Display (Natural Gas Heating)	1.4
SFD	Existing	Power Bar with Integrated Timer	1.4
SFD	Existing	Heat Pump Water Heater	1.4
SFD	Existing	Indoor Lighting Motion Sensors	1.3
SFD	Existing	Furnace with ECM (Gas Heating & Elec Cooling)	1.3
SFD	Existing	Outdoor Motion Sensors	1.2
SFD	Existing	Air Source Heat Pump (SEER 16)	1.2
SFD	Existing	Fluorescent T-8 Fixtures	1.1
SFD	Existing	Energy Star® Ceiling Fan	1.1
SFD	Existing	Furnace with ECM (Elec Heating & Cooling)	1.0
SFD	Existing	Heat Pump - Ground Source	0.9
SFD	Existing	Electric Thermal Storage Heater	0.9
SFD	Existing	Energy Star® Dishwasher -Electric Water Heating	0.9
SFD	Existing	Electric Thermal Storage Furnace	0.9
SFD	Existing	Furnace with ECM (Gas Heating)	0.8
SFD	Existing	CEE Tier 2 Room Air Conditioner (11.8 EER)	0.8
SFD	Existing	Dimmer Switch	0.8
SFD	Existing	Weatherstripping and door sweeps	0.8
SFD	Existing	Solar Assisted Water Heater	0.8
SFD	Existing	Whole House Fan (Case 1: CAC & Furnace Fan with PSC Motor)	0.7
SFD	Existing	Domestic Hot Water Heater (Fuel Switch from Electric to Natural Gas)	0.7
SFD	Existing	Clothes Dryer (Fuel Switch from Electric to Natural Gas)	0.7
SFD	Existing	Energy Star® Freezer (Chest Freezer)	0.7
SFD	Existing	Energy Star® Freezer (Chest Freezer)- Premium efficiency	0.7
SFD	Existing	Energy Star® Refrigerator	0.6
SFD	Existing	Furnace with ECM (Elec Heating Homes)	0.6
SFD	Existing	Whole House Fan (Case 2: CAC & Furnace Fan with ECM Motor)	0.6
SFD	Existing	CEE Tier 2 Refrigerator	0.5

Segment	Vintage	Measure	TRC
SFD	Existing	Solar Attic Fan- PSC	0.5
SFD	Existing	Solar Attic Fan- ECM	0.5
SFD	Existing	Energy Star® Clothes Washer -Electric Water Heating	0.5
SFD	Existing	Energy Star® Central Air Conditioner (16 SEER)	0.4
SFD	Existing	Smart Strip	0.4
SFD	Existing	Outdoor Lighting Timers	0.4
SFD	Existing	Energy Star® Central Air Conditioner (15 SEER)	0.4
SFD	Existing	Furnace/Air Conditioner Filter	0.4
SFD	Existing	Energy Star® Central Air Conditioner (14 SEER)	0.4
SFD	Existing	Seasonal LEDs	0.4
SFD	Existing	Gas Range (Fuel Switch from Electric to Natural Gas)	0.4
SFD	Existing	Solar Landscape Lights	0.3
SFD	Existing	Metal Halide Fixture 39 W CHM PAR	0.3
SFD	Existing	Wall Insulation (Space Heating) - External	0.3
SFD	Existing	Residential Low E-Windows -Electric Heating ¹	0.3
SFD	Existing	Convection Oven	0.2
SFD	Existing	Drain Water Heat Recovery	0.2
SFD	Existing	Whole House Fan (Case 3: Room AC)	0.1
SFD	Existing	Energy Star® Battery Chargers	0.0
SFD	Existing	ETS Heater Low Income	

APPENDIX C: PROGRAMS REVIEWED

Current Programs/Initiatives:

Residential Single Family Dwellings:

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
AC Room	Low	Minor coverage given the end use consumption and potential reduction in peak demand	Program targeted at room AC and offer rebates for HE units (by adapting ECK or Cool Savings)
AC Central	Med	Lack of proper sizing/fitting for CAC installation or rebates for tuning old units Cool Savings applies only to replacement market PeakSaver may reduce demand, but only happens few times a summer ecoENERGY CAC / heat pump rebates good however low program uptake	Program targeted to tuning up existing CACs (awareness program / through online audits?) Encourage proper sizing / fitting of CAC units (Adding on to existing programs or new program?)
Domestic Hot Water	Low	EKC promotes pipe insulation and water heater blankets only, nothing on replacing with more EE units. ecoENERGY offers rebates for solar, integrated systems and DWHR, but low uptake	Program focused on installing high EE electric units, solar or heat pump water heaters Load shifting program for water heaters
Lighting	Low	EKC is wide reaching program and promoting EE lighting and controls, however only runs 2 months/year None for ecoENERGY	Year long program promoting EE lighting, fixtures and control products. Working with ecoENERGY to include lighting measures
Appliances	Low	GRRP promotes the early retirement of refrigerators/freezers only	Program to promote Energy Star appliances
Other	Low	Growing end use, some EKC measures to control standby power and plug loads Cool Savings / ecoENERGY helps reduce furnace fan load	Education/Awareness program to reduce standby power In-home display promotion to increase awareness of plug load Year long EKC program promoting more plug load controls.
Space Heating	Med	OPA programs cover some weatherization measures and PTs, and promotes HE furnaces. ecoENERGY building envelope although minor uptake on program	Promoting increased weatherization and insulation measures (DIY) Increased awareness for benefits of tuning up furnaces / furnace filters Working with ecoENERGY for electric

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
			heating savings Larger promotion of baseboard heater PTs and proper usage
Heat pump	Med	Weatherization and PT measures through OPA programs. Cool Savings and ecoENERGY offer rebates of heat pumps	Additional rebates / opportunities for GSHP either through existing (Cool Savings) or new program

Residential Multifamily:

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
AC Room	Low	Minor coverage given the end use consumption and potential reduction in peak demand	Same as single family residential
Domestic Hot Water	Low	EKC promotes pipe insulation and water heater blankets only, nothing on replacing with more EE units. ecoENERGY /MEER offers rebates for solar and DWHR, but low uptake for apartments	Same as single family residential
Lighting	Low	EKC is wide reaching program and promoting EE lighting and controls, however only runs 2 months/year MEER offer some lighting measures	Same as single family residential Working with MEER to promote in-suite lighting
Appliances	Med	GGRP promotes the early retirement of refrigerators/freezers MEER offers rebates for Energy Star appliances	Same as single family residential
Other	Low	Growing end use, some EKC measures to control standby power and plug loads	Same as single family residential
Space Heating	Med	OPA programs cover some weatherization measures and baseboard PTs	Promoting increased weatherization measures (DIY) through education / awareness program or additional rebates

Commercial/Industrial/Agricultural:

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
GS < 50 kW	Low	PSB is available for less than 50 kW, but mostly lighting measures (primarily lighting contractors) ecoENERGY has custom audit program but very low uptake	Enhancement to PSB program which would focus on additional item, including free (easy to do) items, and encouraging other non-lighting contractors to participate and more specific rebates for the segment AC Tune up program for small HVAC units Food and commercial refrigeration program targeted at segment (for small business)
GS>50 kW	Med	ERIP covers mostly lighting, but has not been able to reach into other end uses ecoENERGY has custom audit program but very low uptake Note: Current ERIP success can be attributed to agribusiness (21% of participants), industrial (20%) and retail (19% of participants).	Enhancement to ERIP with segment focused, with additional prescriptive rebates, increased incentives and front-end audits available where required Lodging program targeted at segment needs Food and commercial refrigeration program targeted at kitchen area Thermal storage program for large users Municipal audit program where applicable Work with MEER to increase uptake of program and potentially claim some electricity savings

New Construction – Residential:

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
Residential	Low	Currently no OPA sponsored single family residential new construction program. NRCAN's Energy Star for New homes is the most common, although currently no incentives	Potential to work with OPA on developing new construction program (using/enhancing NRCAN's criteria) with added incentives (both builders and homebuyers) and additional electricity saving measures, including GSHPs

End Use	Current Coverage	Gaps and Opportunities	Potential Program Additions/Initiatives
Multi-Family Residential	Med	High Performance for New Construction (HPNC) available for multi-family new construction.	Prescriptive rebates for in-suite appliances (Energy Star) and in-suite temperature controls (thermostat / occupancy sensors), in addition to lighting and HVAC measures (for building).
Commercial	Med	<p>High Performance New Construction program currently available through OPA.</p> <p>Applicable to most segments and end-uses.</p>	<p>Although many prescriptive measures are available, there is still opportunity to increase number of rebated measures</p> <ul style="list-style-type: none"> • HVAC measures (chiller upgrades) • Commercial kitchen measures • Automated ventilation controls <p>For small to medium sized developments, availability of “off-the-shelf” set of measures targeted towards segment needs to streamline rebates, encourage multiple measure uptake and simplify savings estimates</p> <p>Additional incentives for energy efficient design (engineering and architectural firms)</p>

Best Practice Programs Reviewed:

NYSERDA - Home Performance with Energy Star

Utility/Agency	New York State Energy Research and Development Authority (NYSERDA)
Target Sector	Existing residential market - retrofit
Measures	Incentives for Energy Star lighting, appliances, HVAC, weatherproofing and insulation
Key Attributes	<ul style="list-style-type: none"> • Incentives for contractors for training, certification and equipment – mandatory contractor certification • Subsidized loans for customer retrofits • Rebates through LDC and federal tax credits

Home Performance with Energy Star (HPwES) is a national retrofit program for existing homes which uses rebates and loans to help homeowners bring their homes up to Energy Star energy efficiency standards. This is a national program sponsored by the US Energy Information Association (EIA) and the U.S. Environmental Protection Agency (EPA), and is executed by participating agencies through a series of sub-programs. Participating contractors are the point of contact for clients and facilitate integrated upgrades for energy savings by performing an energy assessment and then making upgrade recommendations. Incentives include rebates through local utilities and [federal tax credits](#). Eligible upgrades include energy star-approved lighting and appliance upgrades, Energy Star heating and cooling system upgrades, sealing air leaks and insulating, and sealing ductwork etc.

New York State Energy Research and Development Authority (NYSERDA) is a public entity that developed the first Home Performance with ENERGYSTAR Program. NYSERDA allocated an annual budget of approximately \$5 million for implementation, training and quality assurance to support this program. The program's mission was to transform New York's trade contractor infrastructure by facilitating training and requiring mandatory contractor certification and accreditation by the Building Performance Institute (BPI). The program focused on:

- Providing incentives to the contractors for training, certification and equipment
- Providing incentives to customers through subsidized loans for energy improvements.

The contractor incentives included subsidies for up to 75 percent of the cost of training and certification, partially forgivable equipment purchase loans, and a 5% total job cost

incentive. For consumers, NYSEDA arranged for and bought down the interest rate on financing to help pay for comprehensive jobs. Consumer incentives include unsecured Home Improvement loans (through Energy Finance Solutions) at a subsidized rate, and an unsecured New York Energy Smart Loan (at the participating lenders option).

NCI Discussion Points:

- Is there a need for contractor training and certification for a similar program
- Ability to provide incentives to contractors for training

NSTAR Residential Energy Efficiency Program In-Home Display Pilot

Utility/Agency	NSTAR
Target Sector	Residential
Measures	Energy audits and free in-home displays
Key Attributes	Free monitors during the energy audit

This 2007 Pilot program through NSTAR offered free in-home consumption display units (PowerCost Monitor) to customers during energy audits, or to customers who had previously had an energy audit (normally \$140). The meters update every 15 seconds and the program resulted in a 2.6% demand reduction among customers who used the monitor, and a 60% behavior change.³⁹ It is reportedly the first program in the US.⁴⁰

SmartConnect

Utility/Agency	Southern California Edison
Target Sector	Residential and Commercial.
Measures	Smart meters and time-of-use pricing
Key Attributes	<ul style="list-style-type: none"> • Realtime data viewable by cell phone, internet • Interfaces with smart appliances, plug-ins

Southern California Edison's is placing 5.3 million smart electricity meters into houses and small-business sites from 2009 until 2012. The California Public Utilities Commission (CPUC) in September 2008 approved a \$1.63 billion funding program for the program.

³⁹ Research to Inform Design of Residential Energy Use Behavior Change Pilot. Franklin Energy. <http://www.slideshare.net/dthiede/research-to-inform-design-of-residential-energy-use-behavior-change-pilot>. See also recent in-home display pilots by Dominion Virginia Power, Seattle City of Light, and Energy Trust of Oregon.

⁴⁰ NSTAR nomination for Alliance to Save Energy's "Innovative" Star of Energy Efficiency Award. See: http://ase.org/uploaded_files/dinner_nominations/Innovative%20Star/NSTAR%20Electric%20&%20Gas%20Corp%20-%20Innovative%20Nom.pdf

The metering program, SmartConnect, got started in 2005 when Southern California Edison (SCE) began R&D on the smart meter device. The program includes installation of smart meters (starting early 2009) which will later be paired with time-of-use pricing based on rebates for peak reduction. Meter data is viewable online and via cell phone. A Programmable Communicating Thermostat can be programmed by the customer to direct appliances to respond in a certain way to hourly power rates, maintain a certain temperature at certain times, etc. The program is designed to support smart appliances as well plug-in vehicles. SCE expects the adoption of the several million meters to reduce the overall peak power consumption by about 1 gigawatt.

Smart Grid, and Smart Meter Pilot Program

Utility/Agency	Con Edison
Target Sector	Residential and Commercial
Measures	Smart meters, web portals and in-home displays
Key Attributes	<ul style="list-style-type: none"> • Part of an overall smart grid program

Con Edison recently kicked off its smart meter program installation in an 8.3-square-mile swath in the Long Island City area. According to Con Ed, the \$6 million smart grid pilot program will test how various technologies support efforts to modernize the electric grid. About 1,500 customers will receive smart meters under the pilot program, and by the end of the month Con Ed will file proposals with the Department of Energy requesting \$375 million in stimulus funds to expand the program. The money would help pay for more than 40,000 additional meters. It is an 18-month demonstration project.

The meters are the main component of an Advanced Metering Infrastructure (AMI). Other AMI features include automatic outage notification, remote meter reading, remote reconnection and the ability to communicate energy usage information via other smart building technology to Web portals or in-home displays. The Web portals and in-home displays can show energy usage by appliance. Nearly 300 eligible customers will test this technology.

The demonstration program also tests the integration of: intelligent underground systems that can monitor, isolate and correct distribution problems to improve reliability; a commercial customer's energy generator and renewable energy resources, such as solar energy, into the grid, and plug-in electric vehicles and their charging stations. Con Edison's smart grid pilot project was developed after five years of research and development. Smart grid technology is part of the company's EnergyNY plan

(www.coned.com/energyNY), a blueprint that balances energy-efficiency initiatives with infrastructure investments to meet the region's increasing need for energy.

EnergyWise Pricing Pilot Program

Utility/Agency	Nebraska Public Power District (NPPD)
Target Sector	Residential
Measures	Smart meters and time-of-use pricing
Key Attributes	<ul style="list-style-type: none"> • Offering \$50 rebate and free smart meter

The EnergyWise Pricing Pilot Program is being offered to NPPD retail residential and commercial customers in Chadron, Milford and Plattsmouth, with the new pricing starting November 2009 through October 2010. Savings are offered for shifting time of use to off-peak times, and for overall reduced consumption. NPPD will include information in a customer's monthly electric bill showing the difference between what they are paying under in the EnergyWise Pricing Pilot TOU rate compared to NPPD's standard electric rate. Upon request, TOU energy data relevant to a customer's account will also be available on a more frequent basis through email.

Upon joining the program, customers will have the option to receive a PowerCost Monitor (real-time smart meter). By staying in the program until its conclusion, pilot program participants will receive a \$50 bill credit and may keep their PowerCost Monitor (retail value \$109). The program received such an enormous response from residential customers in the three pilot locations, that it has stopped accepting new application (the program goal of 200 customers was met). Commercial applicants are still being accepted.

Refrigerant Charge and Air Flow Tune-Up Program

Utility/Agency	PG&E
Target Sector	Residential/Small Commercial
Measures	Training and incentives to customers and contractors to perform refrigerant charge and airflow tune-ups
Key Attributes	<ul style="list-style-type: none"> • Funded by ratepayers through Public Goods Charge • Innovative targeting improves efficiency and lifetime of equipment

This program contracts with verified service providers (VSPs) to recruit and train licensed C-20 air conditioning contractors to perform refrigerant charge and airflow tune-ups on

residential and small business central air conditioning systems. This service, not widely provided before the advent of PG&E's program, can significantly increase the efficiency of air conditioning units, helping to lower energy costs and extend the life of the equipment. It seeks to transform the market so that checking RCA becomes a standard part of routine maintenance for all air conditioners.

Formally rolled out in 2006, the RCA Program delivered thousands of charge and airflow tests and corrections to residential and small commercial customers using licensed and trained contractors. It saved 7.9 GWh in 2006 and about 11.5 GWh in 2007, at a program cost of \$0.49/kWh for residential and \$0.55 for commercial (the budget of 7.5 million/year). The program is facilitated via incentives and rebates given to the VSP, contractor/technician, and customer.

Measures include:

- In-field training to air conditioning and heat pump contractors
- Upstream incentives to air conditioning and heat pump contractors (\$50 - \$150 for each tune-up)

Power Saver Commercial Small Business Bonus

Utility/Agency	Austin Energy
Target Sector	Mid-Size Commercial
Measures	Lighting, HVAC, windows, reflective roofs
Key Attributes	<ul style="list-style-type: none"> • Mix of free equipment (PTs, Energy Misers) and rebates • Extra rebates used on top of standard program to target a certain sector

Small Business Rebates and Incentives are offered to help qualified small-to-midsize (average peak demand not exceeding 100-kW) and not-for-profit organizations implement a variety of energy efficiency measures. The Small Business Incentive offerings provide financial incentives to offset initial investment and including discounted direct installation of lighting, free thermostats including installation, free Energy Misers (which reduce vending machine and freezer power consumption), and conventional equipment rebates (see Commercial Rebate Program) including the 20% Bonus Rebate.

To encourage greater participation in the small business sector in equipment rebates, Austin Energy began offering the 20% bonus rebates. This has effectively increased participation in the small business market and helped commercial rebates to exceed the MW goal. Qualified businesses and organizations can receive an additional 20% bonus on

one or more of AE's Commercial Rebates (with the sole exception of a Solar PV rebate). Projects that are classified as "New Construction" under AE's Guidelines will also qualify for the bonus if the project's account is assigned for a qualified tax-exempt not-for-profit business or organization.

Power Saver Commercial Rebates Programs

Utility/Agency	Austin Energy
Target Sector	Commercial New Construction and Retrofit
Measures	Inspections and commercial rebates
Key Attributes	<ul style="list-style-type: none"> • No-cost energy audits • Utilizes equipment suppliers to promote the program

Austin Energy's Power Saver Commercial program includes no-cost energy audits of commercial buildings to identify energy efficiency opportunities. An experienced staff of energy engineers and energy technicians perform walk-through energy surveys of facilities, educate building owners and operators on facility energy management and identify cost saving opportunities. AE provides pre-inspections of major equipment prior to its replacement and 100% of all projects are inspected before any rebate funds are disbursed.

Commercial Rebates. AE's commercial customers can get utility rebates for investing in new energy efficient equipment. The Commercial Rebates Program is offered for both retrofits and new construction, for energy efficient technologies that reduce summertime electric peak demand. Up to \$350 per kW reduced is offered, with a maximum of \$100,000.

This program has been applied to a grocery chain retrofit, with 22 locations under way. Two hundred fans and motors are being replaced in each store, yielding an estimated \$10,000 in savings per year. It was also applied to a children's hospital with installations of a 4.5 MW CHP plant, a chiller plant with 2,400-tons capacity, and a thermal energy storage unit with 8,000 ton hours capacity, resulting in a 60% energy reduction.

Eligible measures include lighting retrofits including LEDs (for exit signs for instance), thermal cool storage, AC units, solar film/screens, ceiling/roof insulation, reflective roof coverings, HVAC, premium efficiency motors, variable frequency drives, retro commissioning, building envelope and other custom technologies. Trade allies have been

very instrumental in helping create awareness among AE's commercial customers. AE has strong and productive relationships with local equipment suppliers. Austin Energy utilizes Key Account Managers and sales staff to better promote these programs to the large and mid market commercial accounts.

Wisconsin Focus on Energy Guestroom Energy Management Controls

Utility/Agency	Wisconsin Focus on Energy
Target Sector	Hospitality Commercial
Measures	Guestroom temperature control systems for heating and cooling based on room occupancy
Key Attributes	<ul style="list-style-type: none"> • Innovative targeting to hospitality industry • Strategic vendor relationships

This program utilizes a guestroom temperature control system that based on infrared sensors or keycard mechanisms which sense room occupancy and can therefore control climate equipment. It targets heating and cooling which is the largest use of energy in lodging. Overall, the success of this initiative was due to the strategic relationships with the vendors of the product and their work with the market, the persistence of the initiative's lead team member, and all the energy advisors work with their key account customers. Direct mail pieces and other marketing have had minimal impact on this offering's success. Currently offering a prescriptive rebate of \$75 per PTAC.

Wisconsin Focus on Energy Food Service Equipment Program

Utility/Agency	Wisconsin Focus on Energy
Target Sector	Hospitality Commercial
Measures	Incentives for energy-efficient equipment installation
Key Attributes	<ul style="list-style-type: none"> • Targets a wide variety of establishments and wide variety of equipment • Partnership with industry allies helped improve the program • Promoted by market providers and program staff.

This program offers clients incentives for installing energy-efficient equipment as certified by ENERGY STAR, Consortium for Energy Efficiency, and the Food Service Technology Center. The program partially attributes its success to its being made available to a wide variety of participants including restaurants, lodging, healthcare, grocery, schools, state and federal facilities including prisons, though about half the electric savings came from hospitality establishments. It is promoted by market providers and program staff. A bonus incentive for investing in multiple pieces of equipment was helpful especially among foodservice providers which have a high failure rate.

The program also attributes its success to partnerships with the national Energy Star program,⁴¹ the Consortium for Energy Efficiency's (CEE) Commercial Kitchens Committee, and the Food Service Technology Center (FSTC). With feedback from these market providers, the Program was able to expand its portfolio of equipment offerings to include a nationally recognized portfolio and to standardize its portfolio. Distributors were found to be more willing to participate when more equipment potentially qualified. Equipment categories include refrigerators, griddles, fryers, ovens, ice machines, and hot holding cabinets.

Foundation for Senior Living (FSL) Home Improvement Program - HPwES

Utility/Agency	Foundation for Senior Living
Target Sector	MUSH – Senior Living Facilities
Measures	Training for building contractors in weatherization, energy efficiency and building science.
Key Attributes	<ul style="list-style-type: none"> • Hands-on training and technical experience • Geared toward certification by the BPI and Energy Star designation

The Foundation for Senior Living is a HPwES partner that uses the program to target low income seniors, families, and disabled homeowners. The Home Improvement program of the Foundation for Senior Living operates the Arizona Building Science & Energy Efficiency Training Facility. The facility is sponsored by the US Department of Energy, the Arizona Department of Commerce-Energy Office, Southwest Gas, and APS along with a one-time contribution from Salt River Project.

The FSL Training Facility provides weatherization, energy efficiency and building science training for building contractors, weatherization auditors and repair technicians located throughout the southwestern United States. Participants receive classroom and hands-on experience in a laboratory specifically designed to teach pressure diagnostics and combustion safety techniques. It also assists their technicians in achieving certification from the Building Performance Institute, in and qualifying to display the national ENERGY STAR designation.

⁴¹ "Without partnerships on a national level, the food service program would not be what it is today. ENERGY STAR provided a great foundation for launching our program. By coordinating with ENERGY STAR, the program developed joint marketing materials for Wisconsin market providers to use in their showrooms capitalizing on the brand awareness of the ENERGY STAR label."

In 2006, FSL has begun partnering with the Building Performance Institute to begin certifying Energy Analysts and Building Shell Technicians. All contractors sign participation agreements, there is a 100% review by staff of all paperwork and 15% of all jobs are reviewed by FSL staff. The program, which is just starting, already has 6 BPI certified technicians more than 12 have the required diagnostic equipment. The program has developed a strong contractor outreach component. It offers many non-certification classes in addition to the Energy Analyst and Building Shell Technician courses.

Monitoring Based Commissioning (MBCx) Program Overview

Utility/Agency	Statewide (California)
Target Sector	MUSH: University and Community College systems
Measures	Monitoring Based Commissioning
Key Attributes	<ul style="list-style-type: none"> • Utilizes existing expertise and human resources in the university systems • Utilizes innovation and technology resources of the university systems, and California Energy Commission's Public Interest Energy Research Program (PIER) • Funded by utility Public Goods Charges

The University of California (UC), California State University (CSU), and Investor-Owned Utility (IOU) Energy Efficiency Partnership is a California-wide energy efficiency program that establishes a permanent framework for a long-term, comprehensive energy management program at the 33 UC and CSU campuses served by California's four large IOUs⁴² (UC/CSU/IOU EEP 2007). The program employs three key strategies to meet its goals: 1) energy efficiency retrofits; 2) monitoring based commissioning (MBCx) for retrofitted and non-retrofitted buildings; and 3) training and education. The Partnership is funded by California's investor owned utility customers through Public Goods Charges (PGC), and administered by the utility companies under the auspices of the California Public Utilities Commission.

The Partnership has identified itself as an "innovative" program with all three elements supported by the California Energy Commission's Public Interest Energy Research Program (PIER). The retrofit component is supported by demonstration of PIER R&D

⁴² These are Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison, and Southern California Gas.

products on participating campuses. This has led to scaled-up proposals for deployment of these technologies with Partnership and campus funding. Course development for the training and education program was enhanced by the inclusion of the latest PIER program findings and technology information. Development of the MBCx approach was enhanced by PIER program support. The deployment of MBCx in the Partnership first received PIER support in the form of a campus case studies and needs assessments report, then by an evaluation of EIS Architectures for MBCx implementation.

Complementing traditional hardware-based energy savings strategies, MBCx is a “soft” process of verifying performance and design intent and correcting deficiencies. It can also be thought of as monitoring-enhanced building operation that incorporates three components:

- 1) permanent energy information systems (EIS) and diagnostic tools at the whole-building and sub-system level;
- 2) retro-commissioning based on the information from these tools and savings accounting emphasizing measurement as opposed to estimation or assumptions; and
- 3) on-going commissioning to ensure efficient building operations and measurement-based savings accounting.

MBCx is thus a measurement-based paradigm which affords improved risk-management by identifying problems and opportunities that are missed with periodic commissioning.

The MBCx program represented \$5.2 million of the total program budget and was performed on 37 building projects and 9 plant systems, representing over seven million gross square feet. It has three components:

- Installation of permanent energy information systems (EIS) and diagnostic tools, at the whole-building and sub-system level including both hardware (meters), as well as software to analyze and display data. Telemetry and trending software are brought to bear to support the use of raw data generated by the monitoring infrastructure.
- Retro-commissioning of selected buildings and plants based on the information from the EIS and other tools.
- Ongoing commissioning to ensure persistently efficient operations, and measurement-based savings accounting using the metered data.

The utilization of existing in-house expertise is a distinct strength of the program. All three components are implemented by a team including campus facilities staff, working

with private commissioning agents qualified by the program. The campus facilities staff received training to implement the MBCx program.

A June 2009 study of the program⁴³ found that the most common location of deficiencies was in HVAC equipment (65% of sites), followed by air-handling and distributions systems (59%), cooling plant (29%), heating plants (24%), and terminal units (24%). The most common interventions were adjusting setpoints, modifying sequences of operations, calibration, and various mechanical fixes (each done in about two-thirds of the sites). From these interventions flowed significant and highly cost-effective energy savings. For the MBCx cohort, source energy savings of 22 kBTU/sf-year (10%) were achieved, with a range of 2% to 25%. Median electricity savings were 1.9 kWh/sf-year (9%), with a range of 1% to 17%. Peak electrical demand savings were 0.2 W/sf-year (4%), with a range of 3% to 11%.

Municipal/Local Government Energy Audit Program

Utility/Agency	New Jersey Office of Clean Energy
Target Sector	Municipal Entities (Local Government Agencies)
Measures	Subsidized energy audits
Key Attributes	<ul style="list-style-type: none"> Reimburses up to 100% of energy audit costs to Municipal Agencies

The Program is designed to provide incentive to subsidize the cost of an energy audit for facilities owned by municipalities or other local government agencies. Agencies can request an audit proposal from pre-approved contractors, then submit a request for partial reimbursement of associated costs. Incentives are provided in two phases: (1) 75% of the audit fee, and (2) the remaining 25% of the audit fee is reimbursed upon installation of the upgrades outlined in the audit, provided that the net cost of the installation (after any NJ Clean Energy Program incentives), is equal to or greater than 25% of the total audit fee. Energy Audit incentives are limited to \$100,000 per agency per calendar year. Participants in the Municipal/Local Government Energy Audit Program are eligible to take advantage of other incentives available under existing NJ Clean Energy incentive programs to implement specific measures recommended in the energy audit.

Power Saver Commercial Municipal Energy Conservation Program

⁴³ Evan Mills, Ph.D and Paul Mathew, Ph.D. Lawrence Berkeley National Laboratory, Berkeley, California. See <http://eetd.lbl.gov/emills/pubs/pdf/MBCx-LBNL.pdf>

Utility/Agency	Austin Energy
Target Sector	MUSH: Municipal
Measures	Street and traffic lighting, and municipal building energy management
Key Attributes	<ul style="list-style-type: none"> Utilizing ESCOs

AE's Municipal Energy Conservation Program (MECP) comports with the COA's aim to make all facilities, fleets and operations carbon neutral by 2020. The MECP provides technical support, employee awareness training, and funding for energy conservation projects, and is targeting street and traffic lighting and municipal building energy management. The MECP installed a number of lighting retrofits, as well as about 400 occupancy sensors. The program has provided technical support to serve new construction and renovation projects.

MECP staff executed a \$10 million performance contract with three Energy Service Companies (ESCOs) to implement energy conservation in City of Austin facilities over the next two to three years. The ESCOs have started numerous Preliminary Energy Audits in various departments and some Detailed Energy Audits (DEA) have also been commissioned. The result of the DEA will be a proposal to implement recommended energy conservation measures with a granted energy cost reduction amount.

The program is in its third year of a seven year program, so in this phase audits are completed and equipment is being ordered and installed. Measures include converting 5,500 traffic signals to LED.

Savings By Design

Utility/Agency	State-wide California
Target Sector	New construction for Commercial, Industrial, Institutional and Agriculture
Measures	Design and installation of lighting systems, HVAC, building envelope, hot water and process systems
Key Attributes	<ul style="list-style-type: none"> Incentives for simulations where whole building performance exceed 10% of standard baseline Owner incentives for full systems rather than just equipment Design teams receive incentives

The *Savings By Design* program is a California state-wide, non-residential new construction program that provides design assistance and financial incentives to commercial, industrial, institutional and agricultural building owners and design teams to promote energy efficient design and construction practices. Qualifying projects include, but are not limited to day lighting systems, interior lighting systems, heating, cooling and ventilation systems, building envelope systems, service hot water systems and process systems. Administered by four of California's largest utilities⁴⁴ under the auspices of the Public Utilities Commission, *Savings By Design* offers building owners and their design teams:

- [Design Assistance](#) provides information and analysis tailored to the needs of the client's project
- [Owner Incentives](#) help offset the costs of energy-efficient buildings
- [Design Team Incentives](#) reward designers who meet ambitious energy efficiency targets

Design Assistance and Owner Incentives are approached in two ways including firstly the **Whole Building** approach which considers integrated energy solutions. It uses computer simulation, provides comparisons of various efficiency alternatives and quantifies the effect of improving the building's systems. Detailed energy use projections and life-cycle costs demonstrate that the estimated incremental costs associated with energy efficiency strategies can be recovered quickly through reduced operating expenses. Incentives up to \$150,000 are available for projects estimated to exceed a Title 24 or standard practice baseline by at least 10% on a whole building performance basis. Design teams are eligible for additional incentives up to \$50,000.

The **Systems** approach encourages owners to look at the systems of a building rather than individual equipment or fixtures. Each building system can be designed to achieve greater efficiency as a whole rather than as a collection of components. Systems that may qualify for incentives up to \$150,000 include: day lighting; interior lighting; HVAC; service hot water, and others.

Savings by Design also offers financial incentives to design teams. These incentives can provide a substantial value to the project. To qualify for design team incentives, the team

⁴⁴ Utility sponsors are Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Edison Company, Southern California Gas Company and the Sacramento Municipal Utility District.

uses the Whole Building Approach and a computer simulation model to optimize their design. The model calculates the energy savings of the building compared to the Title 24 baseline. The design team qualifies for incentives when the building design saves at least 15%, and the maximum incentive per project is \$50,000. Design team incentives are paid directly to the design team, and are in addition to the incentives the owner receives

Multifamily New Construction Energy Efficiency Program

Utility/Agency	Puget Sound Energy
Target Sector	New Construction Multi-Residential
Measures	Both gas (boilers, water heaters, windows, etc) and electric measures (clothes washers, lighting, heat pumps, etc.)
Key Attributes	<ul style="list-style-type: none"> • Geared toward LEED and Built Green certifications • Offers grants and technical information to developers

PSE's multifamily new construction energy-efficiency program offers grants and technical information to developers building new Multifamily residential and commercial buildings. The program aims to reduce utility costs, is geared to complement sustainable building certification programs such as LEED[®] and Built Green[®] and to integrate itself into developers' long-term strategic planning. Qualifying multifamily projects include apartments, townhomes, condominiums, assisted living residences and similar structures with five or more attached dwelling units.

Under this comprehensive program, all residential and commercial financial incentives for multifamily new construction projects are packaged under one grant for each customer. Specific incentives are offered on an equipment basis. The program includes gas incentives (dishwasher, showerhead, condensing boiler, condensing water heater, windows, fan coil 4-pipe system), electric incentives (such as clothes washer, dishwasher, refrigerator, CFL fixtures and lamps, thermal heat pump) and HVAC system incentives.

Projects must be in PSE's electric, natural gas or combined service territory. To participate in the program, development teams must submit a project application, then PSE will facilitate an Energy Efficiency Evaluation, generate an incentive proposal and then generate a grant. PSE conducts continued monitoring during construction, then after final measure and documentation, PSE closes the grant and executes payment.

Commercial Efficiency Programs: Prescriptive Approach to EE Building Design

Utility/Agency	Puget Sound Energy
Target Sector	New Construction for mid size Office, School or Retail (under 100,000 sq ft)
Measures	Grants for energy efficiency projects, provided under an off-the-shelf measures package approach including lighting, HVAC and building envelope installations
Key Attributes	<ul style="list-style-type: none"> • Funding up to 100% of installed cost • Whole-building prescriptive approach and grants per sq ft • Off-the-shelf set of solutions for each segment

Puget Sound Energy (PSE) in Washington State’s grant programs help fund new construction and expansions, efficiency retrofits, and contractor services. Its Commercial Efficiency Program offers incentives for new construction. Funding for up to 100 percent of the installed cost is provided for any energy-efficiency project resulting in increased efficiency of equipment fuelled by electricity or natural gas supplied by PSE to a non-residential business.

PSE’s Prescriptive Approach to New Building Design program targets mid to small sized clients (<100,000 sq ft) which are commercial and classified as an office, school or retail. It uses a whole-building prescriptive approach and offers grants on a per-square-foot basis, when certain benchmark energy reduction ratios are reached.⁴⁵ Project packages will result in buildings that exceed efficiency levels prescribed in applicable energy codes by at least 10 percent for electricity savings measures, and exceed code for natural gas measures.

Clients have a choice of standard, ready to implement measures in HVAC, building envelope and lighting design. *These off-the-shelf set of measures are designed to be easier to implement, flexible and simple.* Specific component technologies include: innovative HVAC systems or system components, control systems, ENERGY STAR® TP-1 Transformers, day lighting, energy-efficient lighting and building thermal improvements such as class 35 glazing.

PSE will pay for up to 100% of the incremental cost of the package of measures. Incentives range from 50 cents to \$2.60 per square foot for the basic package plus substantially more for optional enhanced measures.

⁴⁵ \$0.60 to \$1.80/sq. ft. for 10% to 30% energy-efficiency improvements compared to the energy code

Industrial Energy Monitoring and Targeting (M and T)

Utility/Agency	Enbridge Gas
Target Sector	Industrial
Measures	Provides monitoring and targeting assessment, subsidizes half of operational energy analysis, incentive payments, and training workshops.
Key Attributes	<ul style="list-style-type: none"> • Combines payments with subsidized energy analysis

Enbridge's Industrial Energy Monitoring and Targeting program provides a preliminary assessment of industrial facilities and then recommends an energy management company. It will then subsidize up to half the cost (up to \$10,000) of an operational energy analysis, which will determine the costs and benefits of an M and T system, and also provide payments of \$0.10 per m³ of estimated natural gas savings. Enbridge also offers training workshops on monitoring and targeting and specific technologies.

Wisconsin's Focus on Energy Industrial Program

Utility/Agency	Focus On Energy
Target Sector	Industrial
Measures	Lighting, HVAC, process, maintenance, motors, pumps, fans, etc.
Key Attributes	<ul style="list-style-type: none"> • Multi-pronged approach to best meet the needs of their customers • Combination of incentives and training/resources for customers

Focus on Energy's Industrial Program has been a leader in design and implementation of the most successful industrial energy efficiency program in the US. They have achieved current best practice status from a multi-pronged approach:

1. Provide best practice provides specialized best-practice support for the pulp and paper, metal casting, plastics, food/dairy and water/wastewater industries to improve the energy efficiency of manufacturing processes. Services include measure identification, technical review and financial support.
2. Provides best-practice information for lighting, compressed air systems, steam systems and motors/drives. Focus on Energy also provides specialized process best-practice information for the water/wastewater, pulp and paper, metal casting,

plastics and food/dairy industries. See our Info Library focusonenergy.com/industrial.

3. Sponsors industrial training for plant managers, engineers and facility operators in lighting, steam systems, compressed air systems and leak detection and refrigeration.
4. Provide co-fund assessments of energy efficiency project feasibility. The incentive will be up to 10 percent of the estimated energy savings and up to 50 percent of the cost of a study performed by an independent third party, not to exceed \$7,500.
5. Provide up to 30 percent of the cost for energy efficiency projects, based on first year energy savings, as follows:
 - a. Tier 1 Technologies (Lighting, premium efficiency motors, compressed air measure, insulation, etc.) - Electric efficiency: 4¢/kWh (annual) saved; \$125/kW reduced (peak summer hours)
 - b. Tier 2 Technologies (Refrigeration, heat recovery, VFDs on pumps and fans, air filtration, HVAC controls, energy efficient processes): Electric efficiency: 6¢/kWh (annual) saved; \$200/kW reduced
6. Buys down the cost of certain standard maintenance activities.
 - a. Chillers, Compressed Air, Steam Traps, boilers

Wisconsin Focus on Energy Compressed Air System Audit and Leak Survey Incentive

Utility/Agency	Wisconsin Focus on Energy
Target Sector	Industrial
Measures	Audits, trainings, incentives
Key Attributes	<ul style="list-style-type: none"> Facilitates installation of super-efficient and new technology.

Wisconsin Focus on Energy offers audits, leak surveys, and incentives for installing air compressors equipped with variable speed drives. The program offers workshops on the value of efficient compressed air systems. In terms of incentives, up to \$7,500 is offered for the audits, up to \$3,000 is offered for the Leak Surveys, and the incentive for qualifying efficient air compressor is \$70 per horsepower of the compressor.

DOE - Save Energy Now Industrial Audits Program

Utility/Agency	EERE - DOE
Target Sector	Industrial
Measures	Industrial Audits
Key Attributes	<ul style="list-style-type: none"> Energy assessments supported by software tools and

	<p>expert support</p> <ul style="list-style-type: none"> • Training integrated into approach. • Follow up designed to increase involvement and assess implementation rates.
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The Save Energy Now program is a new and highly cost-effective form of energy savings assessment. It relies on a suite of respected software tools, proven assessment protocols, training curricula, certified energy experts, and strong partnerships for deployment. The *Save Energy Now* assessments integrate a strong training component designed to teach industrial plant personnel how to use DOE's opportunity assessment software tools. This approach has the advantages of promoting strong buy-in of plant personnel for the assessment and its outcomes.

Another important element of the *Save Energy Now* assessment process is the follow-up process used to identify how many of the recommended savings opportunities from individual assessments have been implemented in the industrial plants. Plant contacts involved with the *Save Energy Now* assessments are contacted 6 months, 12 months, and 24 months after individual assessments have been completed so that assessment implementation results can be identified.

The program assesses several sorts of systems including process heating, steam, fan, compressed air and pumps. *Save Energy Now* assessments, in contrast to standard audits, have a training element. These assessments focus on hands-on demonstrations to industrial plant personnel specifically on how to use the DOE steam, process heating, pumping, compressed air, and fan software tools. On the last day of the assessment, a required Closeout Meeting is held to review and discuss the opportunities identified in the assessment. The positive effect of using this approach for conducting assessments is that: 1) plant personnel get hands-on experience of how to effectively use the DOE software tools and of the value of applying these tools to their operations; 2) plant personnel are willing to buy-in to the opportunities identified and evaluated during the assessment, which increases the likelihood that many of the identified opportunities will implemented ; and 3) opportunities are investigated that often can result in significant energy and cost savings for the host plant. The Decision Software Tools used include specialized programs for steam systems, process heating, pump systems, compressed air systems, and fan systems.

Focus on Energy : Agriculture Programs

Utility	Focus on Energy
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Target Sector	Agricultural
Measures	Audits, training, incentives
Key Attributes	<ul style="list-style-type: none"> • Free Energy Assessments • Incentives for energy efficient farming equipment

The Focus on Energy agriculture program provides a variety of services to help Wisconsin farmers improve energy efficiency. No cost energy assessments are available to identify areas of possible energy savings. The program provides technical assistance and information about best-practices and energy efficient equipment. Cash incentives are available for a wide variety of energy efficient solutions for dairy & livestock farms, commercial agri-businesses, green houses, grain facilities and aqua culture facilities. Some of the standard incentives are for lighting, HVAC, motors/variable frequency drives (VFDs), scroll compressors, heat-recovery tanks, milk pre-coolers, water heaters and greenhouse glazing. The keys to this programs success has been the cooperation and coordination of the various parties who are interested in modernizing Wisconsin's agricultural operations.

From 2001 to 2008 the focus on energy program has helped more than 2,000 farms save over 87 million kWh and over 22 MW of electricity and nearly 1.9 million therms of natural gas and propane, annually. The net benefit-cost ratio for this program was evaluated as 2.1 in 2007. Due to this program the number of distributors for certain energy efficient equipment has increased indicating program success.

EnSave/PG&E: California Dairy Energy Efficiency Program (DEEP)

Utility	Pacific Gas & Electric Company
Target Sector	Agricultural
Measures	Incentives
Key Attributes	<ul style="list-style-type: none"> • Cash incentives for up to 50% equipment cost

DEEP offers cash incentives on energy efficient farm equipment including variable speed drives (VSDs), plate coolers, compressor heat recover units, scroll compressors, lighting, time clocks, ventilation and premium efficiency motors. Incentives are for dairy customers of PG&E and can be collected for up to 50% of the equipment cost. During the first year of the program 51 dairy producers had installed VSDs resulting in 2.6 million kWh of savings and over \$390,000 of savings for participants.

Interstate Power and Light Company (IPL) : Agriculture Energy Efficiency Program

Utility	Interstate Power and Light Company
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Target Sector	Agricultural
Measures	Audits, training, incentives
Key Attributes	<ul style="list-style-type: none"> • Free farm energy audits • Rewards for purchase of EE equipment

IPL provides a variety of energy programs which are designed to increase the energy efficiency of all farming practices. Services include free farm energy audits to pinpoint energy waste, identify energy efficiency technologies which could be employed, recommend energy efficient equipment and informs farmers of the available rewards program. The rewards program provides returns for the purchase of energy efficient farm equipment up to 50% of the equipment cost. Incentives are for electric motors, grain dryers, heat re-claimers, irrigation systems, lighting equipment, milking equipment, scroll compressor and ventilation equipment. IPL also conducts site visits to discuss the applicability of distributed renewable power production to meet the farm site needs. The program has had a positive effect on the market for agricultural products. Some suppliers have changed their focus to make their products meet IPL standards.

The program has yielded \$1.99 in benefits for every dollar spent in Iowa and \$3.09 in benefits for every dollar spent in Minnesota. The innovative IPL energy audit process has been recognized by the USDA Rural Development Office for its effectiveness.

PG&E: Data Center

Utility	Pacific Gas & Electric Company
Target Sector	Business
Measures	Audits, Rebates
Key Attributes	<ul style="list-style-type: none"> • Free audits • Incentives for improving data center cooling operations

Data centers are often overcooled and operated inefficiently. PG&E offers no cost data center cooling operations assessments to identify opportunities for energy savings. There are 2 levels of data center airflow management services available. For small centers temporary metering and monitoring equipment is used to determine a baseline and after implementing best system practices businesses are paid based on their decreased cooling system energy use. For larger data centers the Data Center Cooling Control Program is available. It installs permanent measure controls and equipment to optimize airflow. Incentives are available for energy savings achieved through this program. PG&E has been successful with this program by recognizing the importance of cooperation IT and facility management professionals.

PG&E offers financial incentives for high-tech businesses that use energy efficient methods in their data centers. Customers participating in the set of services, including cooling system improvements, high-efficiency power conditioning equipment retrofits, airflow management tune-ups, virtualization, and replacement of computing and data storage equipment with the latest technologies, have reduced their energy consumption by one-third to one-half. In 2006-2007 the enrolment in PG&E's data center energy efficiency courses tripled. The program had annual savings of 18.2 GWh in 2007.

The program pays incentives based on the annual kilowatt-hour savings that will accrue from the project, at the rate of 8 cents per kilowatt-hour. Incentives are paid based on the energy savings directly related to removing the computing equipment. Based on typical power use of servers, incentives can range from \$150 to \$300 per server removed through a virtualization project. Incentives are capped at 50% of the total project cost.

Austin Energy Power Saver Commercial: Thermal Energy Storage Programs

Utility	Austin Energy
Target Sector	Commercial
Measures	Rebates for purchase of thermal energy storage system
Key Attributes	<ul style="list-style-type: none"> • \$50-\$300 / kW rebate for thermal energy storage system

AE's Thermal Energy Storage program offers rebates to commercial AE customers who install a TES unit. They also provide a 50% rebate on a feasibility study, up to \$7000 provided the anticipated demand shift is greater than 100 kW. TES is a proven technology using conventional refrigeration equipment and specialized storage tanks to shift all or part of a facilities cooling load from on-peak to off-peak. TES rebates levels were adjusted in an attempt to increase participation. The former \$250/kW incentive has been changed to a declining block structure from \$300 to \$50/kW. This effort recognizes that the economy of scale is not available with smaller systems.

APPENDIX D: ILLUSTRATIVE PROGRAMS

a) Strategic Approach for MUSH sector for HONI:

Background:

The MUSH sector offers an opportunity to leverage a limited number of customer contacts to capture a significant number of facilities using a common approach. The potential for efficiency in this sector lies primarily in two areas: Municipalities and School Boards. Where hospitals or universities and colleges are served by HONI they should also be approached, but it appears that they represent a relatively small area of potential.

Municipalities:

- There are 444 municipalities in the Province of Ontario.
- Many of the larger municipalities are served by Ontario's 81 Local Distribution Companies (LDC's).
- Those located in HONI territory tend to be smaller municipalities which may have more limited resources and require greater support in order to effectively participate in initiatives.
- In addition, some upper-tier municipalities may have headquarters based in territory served by an LDC but also have facilities located in HONI territory

School Boards:

- There are over 120 School Boards in Ontario, each with multiple facilities.
- Some of these Boards serve areas such as Toronto or Waterloo Region which are served entirely by LDC's. Most, however, while based in municipalities served by other LDC's will have some facilities served by HONI.

The MUSH sector represents a relatively small share of HONI's load; however, it is a concentrated opportunity. The identified proportion of 2014 potential represented by the MUSH sector is shown in the table below.

Sector	Energy (GWh)	Peak (MW)
Universities/Colleges	0.1%	0.3%
Hospitals	0.8%	1.1%
Schools	4.0%	2.9%
Municipal Facilities	Not separated – included in offices and other commercial.	

Note that municipal facilities were not specifically identified in the analysis. Municipal facilities are expected to represent a similar or higher level of potential as schools. Municipalities tend to have a greater number and diversity of facilities though they may not be as large as those of the school boards. Some municipal facilities also tend to be more energy intensive (i.e. Water and sewer treatment).

The following strategy assumes that Hydro One can identify facilities associated with municipalities within its Customer Relationship Management (CRM) system. This information should then be used to identify priorities in terms of the key accounts which control the greatest number of facilities and associated energy use.

Feedback from stakeholders identified several key areas where improvements or additional support was desired:

- Desire for initiatives tailored to specific sectors.
- One stop shopping – need for single source of information on programs/initiatives.
- Unbiased, independent source of information re savings opportunities, technologies, and for energy audits.
- Forum to share ideas or lessons learned from pilot programs

Strategies and Services:

Much of the reduction potential in this sector lies in space cooling and lighting. While the analysis of technical potential necessarily focuses largely on technology changes, experience in school programs indicates that significant reductions can also be achieved through behavioural/operational changes. Best practice programs engage the entire school community to achieve these savings. A number of municipalities and school boards already have established energy management programs in place. One element of preparing to implement this strategy will be to identify which of the priority organizations identified from CRM information already have programs in place. This information can help to further focus client contact efforts.

The following initiatives, which build on the identified areas of technical potential and feedback from stakeholders, are recommended as part of this strategy:

1. One stop shopping:
 - Establish HONI as the one-stop source for energy management information.
 - Use HONI web site to provide information and links to sites with information on best practices and technical information. HONI site now provides information for *myHome* and *myBusiness*, with specific links for farming community. Similar links could be added for municipalities and schools.

- Information provided on the HONI site should be easy to navigate and specific enough to allow user to identify the links appropriate to their needs.
 - Provide both management and technical information (i.e. How to establish a multi-facility energy management program as well as measure specific information and how to calculate savings). The Hydro One Brampton site contains this type of information for workplace lighting, industrial equipment, etc..
 - Encourage establishment of holistic energy management system approach within which specific projects can be considered (i.e. Lighting project using ERIP).
 - In most instances, the information required to provide guidance to these clients is already available and could be readily compiled or linked to HONI's site.
- i.e. for schools – Office of Energy Efficiency - Best Practices for Schools,
- Ontario eco schools program.

2. Advice and Audits:

- One of the areas identified by stakeholders was the need for unbiased advice on energy management opportunities, technologies and energy audits.
- It is recommended that HONI selectively contact Municipalities and School Boards in order to discuss the status of their energy management efforts and to offer assistance in furthering these efforts.
- The support required will vary depending on the initial conditions with each client organization; either providing guidance to the client on how to establish an energy management system, improve the system or provide support to existing efforts. Materials and information available to the client from HONI's website, as discussed above, will be used to support and provide collateral for the client contact.
- The level of support will also vary depending on organizational capabilities. Larger Municipalities/School Boards may have the technical capacity to audit their own facilities, while smaller organizations need additional assistance. HONI staff could assist with simple "walk-through" level audits and provide technical advice.
- Incentives are available from the Province of Ontario and the federal government to help homeowners and industries identify and quantify energy efficiency opportunities. To our knowledge, such incentives are not currently available for the institutional sector. If it is found that many organizations do not have the capacity to identify their own opportunities or HONI does not have the capacity to provide such services, then HONI could

consider a program of financial incentives to help fund third party audit services for facilities within its territory. This service should be provided by a firm not involved in provision of subsequent products or services.

3. Sharing Success:

- Municipalities in particular noted that they would like to be able to share experiences and learn from pilot initiatives undertaken by others.
- Use web site to link users to appropriate sites which show case studies or best practice results. There are a number of such sites available across Canada and the U.S., some Ontario-specific examples are shown below.

Ontario Examples:

- Municipalities - Ontario Municipal Knowledge Network - <http://www.omkn.ca/AM/Template.cfm?Section=Home6>
- Case studies/audit examples: <http://www.amo.on.ca/Content/las/EnergyServices/Audit/AuditBinder/default.htm>

b) Low Income Audit and Direct Install Program

This program is aimed at delivering energy advice and direct assistance to low-income households with electric space and water heating. The energy audit would provide customers with information on potential efficiency measures (i.e. insulation and weatherization) including approximate costs, savings, contractor names, and 'how-to' information. During the site visit, the auditor(s) could install a number of simple measures, including: efficient showerheads, aerators, hot water tank and pipe insulation, and some CFL lamps⁴⁶.

Program availability could be communicated through subsidized housing agencies and low income support agencies as well as from customer contacts and call center. Billing inserts could be used

HONI could deliver such a program by using permanent or summer student staff, and/or by partnering with organizations currently involved in delivering ecoENERGY audits within HONI's service territory.

As discussed in section 5, the federal government is offering support to homeowners through its ecoENERGY program. In order to qualify for incentives, homeowners must

⁴⁶ It is assumed that a small number of CFL's would be provided for the fixtures with the highest hours of use.

have a pre- and post- retrofit energy audit. A number of non-government and some private organizations across Ontario are involved in providing these home energy audits.

Hydro One could leverage the efforts already underway through this program by working with NGO's serving HONI territory. One approach could be to offer a discount for audits to low income households with electric space and water heating; either by providing a direct per audit incentive or by offering in-kind support to the NGO's offering the service.

Analysis of this illustrative program indicates that the lifetime benefit associated with the bundle of direct install measures described above would greatly exceed the incremental material cost; leaving substantial 'headroom' to deliver the program. All of the measures have a positive TRC. A program that delivered these measures to 2,000 low income homes would result in energy savings of 1.6 GWh and would have a positive PAC if program costs were less than \$300 per home. These savings would be further increased to the extent that homeowners took further actions to reduce space heating requirements.

Some NGO's delivering ecoENERGY audits have experimented with "electricity specific" audits and information delivery⁴⁷. While these initiatives were found not to achieve sufficient reductions when delivered on a stand-alone basis, they could be cost-effective when bundled with audits targeted at all-electric low income homes.

Information on HONI initiatives could also be delivered as part of the audit. Collateral on ECM's and HPWH incentives could be delivered to all HONI customers receiving an audit. Communicating this information as part of the audit process allows delivery to only those homes where the application is appropriate, and to homeowners who have demonstrated an interest in conserving energy. Audit staff can also provide much more specific and detailed information than would be possible through other communication methods. Further savings could be added to the program by combining the delivery of the audit with direct installation of CFL's, efficient shower heads, or services such as a "water heater tune-up"

c) Industry Hand Holding

The Electricity Retrofit Incentive Program offers incentives for a broad range of CDM measures across the commercial, institutional, industrial and agricultural sectors. Incentives are available for a number of specific technologies (prescriptive incentives) or for custom projects. Experience indicates that the level of participation in incentive

⁴⁷ For example the REEP program in Waterloo Region and the Elora Center for Environmental Excellence.

programs such as ERIP can be significantly enhanced through an active program of communication and support by utilities such as HONI. An active program of “hand holding” has been incorporated in the programs modeled in this report.

Feedback from stakeholders, described earlier, indicates that potential participants lack awareness of both the programs and the available technologies. A program of increased customer contact would help build awareness and customer confidence in energy efficiency measures. Properly trained HONI staff could assist customers across all business sectors identify opportunities and assist them through the process of applying for applicable incentives. Strategically, these efforts would focus on the sub-sectors with the greatest electricity use in each sector (i.e. offices in commercial; transportation and machinery, fabricated metals, and food and beverage industrial sectors. Within these sectors, the largest consumers and those with significant multiple locations would be targeted for contact and support.

One key to the success of such a program is to ensure that staff involved in supporting different market segments have an understanding of the needs and interests of that segment. In many cases, the justification for or barriers faced by potential projects may have more to do with these needs and interests than economic considerations. In the commercial sector, for example, improvements that increase the rental appeal of the space will yield far greater interest than those which simply reduce energy costs. On the other hand projects which fail to address the risk of production downtime in manufacturing or are perceived as detrimental to bio-security in the food or poultry industry are unlikely to proceed.

It is expected that different industrial sectors will dominate in different zones of HONI's service territory. It may therefore be appropriate to build different industry specialization in program support staff in different regions of the province.

As part of this process, technical expertise and support materials should be developed to address common end uses that represent significant CDM potential within and across markets. Some examples would include lighting, compressed air systems, fans and blowers, etc.. Some support materials on these areas are already available in the “Energy Efficiency Guides” available on HONI's website⁴⁸ and in the sector specific “Energy Wise Tips” for different agricultural sectors. A number of other support materials, including evaluation tools and calculators that could be used to support customers in each sector are

⁴⁸ Energy Efficiency Guides are available on Electro-technologies, Compressed Air, Electric Motors, Lighting, and Heat Pumps, as well as on Power Quality.

<http://www.hydroone.com/MyBusiness/SaveEnergy/Pages/EnergyEfficiencyGuides.aspx>

available on-line from various Canadian and US agencies. HONI could leverage and link to this information to enhance the information currently provided through HONI website to address targeted end-uses and sectors.

d) Water Heater Load Control

To enhance customer load shifting in response to TOU rates, Navigant Consulting explored a water heater load control program under which electric water heaters were controlled “off” during on-peak periods. With such controls, the water heaters would recover during the subsequent lower cost time period.

Assuming a 14 year life for this measure implemented in 2010, the present value savings of such shifting were estimated to be \$383 assuming 75% of the on-peak consumption was shifted to the following period. Peak demand reduction per controlled water heater would be approximately 0.25 kW in the summer and 0.6 kW in the winter, with 95% of the present value of savings accruing from avoided capacity costs. While Navigant Consulting did not explore available technologies, it expects that control technologies to enable such shifting would be economic, particularly if deployed in conjunction with some form of home management network or with other in-home CDM installation work.

APPENDIX E – STAKEHOLDER INTERVIEW DISCUSSION GUIDE

Market Player Interview Guide Discussion Points

Note: The questions listed below are only discussion points used during the interview of the market player. Discussions will vary significantly based on the knowledge/insight of the interviewee and their desire/availability to participate in the interview.

HVAC / Lighting Contractors / Engineering Firms

1. Current involvement with energy efficiency in the area
 - a. Types of programs involved with
 - b. Types of customers you deal with
2. Current participation in conservation programs
 - a. What do you find most beneficial about the program(s)?
 - b. How familiar are your customers with regards to the program(s)?
 - c. What works good / bad about the program(s)?
 - d. Current barriers that are hindering your ability to enrol more customers?
 - e. How could the programs be improved?
 - f. Paperwork / resource requirements?
 - g. Prescriptive vs. custom measures?
3. Are there any large end-uses / segments which are not being covered by current programs?
 - a. Technologies / measures, customer types?
4. What are the general characteristics of an “ideal” program for you?
5. What needs to be done to increase the effectiveness of current and future CDM programs?
6. Skill level / training of your staff? Resource requirements to participate in CDM?
7. Manufacturers – ability to provide services and products
8. What are the current market trends vis-a-vis:

- a. CAC – size, SEER level, rebates, proper sizing, maintenance, etc...
 - b. GSHP installations?
 - c. Water heaters?
 - d. Electric heating sources?
 - e. Home lighting – trends, penetration, customer perceptions
 - f. Commercial lighting – Day-lighting, EMS, sensors, T8s, HIDs, LEDs...
 - g. Commercial HVAC – VFDs, demand control ventilation, economizers, sub-metering, etc..
9. Customer desire for home / building audits?
- a. Willingness to pay?
 - b. Pros/cons of auditing
 - c. How much of recommended audit gets completed
10. Current relationship with LDCs? With OPA? Association?
- a. How could they help them promote more of the CDM programs?

Additional Home Builder Questions

- b. What are you currently installing above code vs. code?
- c. Differences between Energy Star and conventional home?
- d. Thoughts on a “smart home”? Likelihood? Desire?
- e. Motivations of customers for more energy efficient homes
 - i. Willingness to pay
 - ii. Level of importance in overall decision
- f. Technologies that customers are asking for / they would like to see in future homes
- g. Trends in current construction practices vis-a-vis energy efficiency
- h. Training requirements/skill level of construction industry

Consumer Council of Canada (CCC) INTERROGATORY #4 List 1

Interrogatory

Ex. B/T1/S2/p. 3

HON has indicated its programs achieved annualized savings of 284 GWh and 67 MW in peak demand over the period to March 2008. Please provide a schedule setting out how those savings were derived. Were these results audited by an independent third party? If not, why not?

Response

The schedules below provide a summary of how the total savings of 67 MW and 284 GWh up to March 2008 were achieved through Market Adjusted Rate of Return (MARR). For additional information, please refer to the HONI's CDM Annual Report for 2008 (filed as an attachment to Exhibit I, Tab 9, Schedule 7, part a).

Energy Savings - Year	MWh
Contribution of annualized energy savings for 2005	8,169
Contribution of annualized energy savings for 2006	90,949
Contribution of annualized energy savings for 2007	172,759
Contribution of annualized energy savings for 2008	12,697
Cumulative annualized energy savings	284,574

Peak Demand Reduction - Year	MW
Contribution of peak demand reduction for 2005	0.7
Contribution of peak demand reduction for 2006	9.9
Contribution of peak demand reduction for 2007	53.1
Contribution of peak demand reduction for 2008	2.6
Total peak demand reduction	67

These results were not audited by an independent third-party as there was no requirement under MARR funding.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #5 List 1**

3
4 **Interrogatory**

5
6 Ex. B/T1/S2/p. 3

7
8 Please provide a list, by year, for the period 2005-2010 of all CDM program undertaken
9 by HON, the cost of those programs and the results achieved.

10
11
12 **Response**

13
14 Please refer to Exhibit I, Tab 9, Schedule 7 part a, for a copy of the HONI's CDM
15 Annual Report for 2005 to 2009

16
17 The 2010 actual costs and results are yet to be finalized.

Consumer Council of Canada (CCC) INTERROGATORY #6 List 1

Interrogatory

Ex. B/T1/S2/pp. 4-5

HON indicates that all current Board-approved programs in the Application have the flexibility built in to allow uptake by distributors and other agencies. Please elaborate on what is intended. How would HON facilitate that uptake? Would HON be compensated by these other distributors or agencies in any way? If not, why not? If so what arrangements are contemplated?

Response

Cooperation with other distributors and other agencies may include, but not be limited to joint marketing efforts, collaboration in program delivery, and joint EM&V.

To the extent that other LDCs decide to implement our CDM programs, Hydro One expects LDCs to pay for the costs associated with developing and implementing the respective programs in their service areas.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #7 List 1**

3
4 **Interrogatory**

5
6 Ex. B/T1/S2/p. 4

7
8 The evidence states that HON considered opportunities to maximize administrative
9 efficiencies and synergies - e.g. working with gas distributors, electricity distributors,
10 social service agencies etc. Please explain how HON intends to work with the gas
11 distributors over the 4- year period. What types of arrangements are contemplated?

12
13
14 **Response**

15
16 Please refer to Exhibit I, Tab 6, Schedule 6, for opportunities to maximize administrative
17 efficiencies and synergies with other distributors or agencies. The details of the potential
18 arrangements will be determined in 2011 in the course of program deployment for the
19 proposed initiatives. This information is not currently available.

Consumer Council of Canada (CCC) INTERROGATORY #8 List 1

Interrogatory

Ex. B/T1/S2/p. 6

HON has developed an ongoing tracking and review process in order to provide early detection of differences between program plans and actual experience. What are the costs of developing that process? What will be the annual costs of tracking results? How are those cost to be recovered?

Response

The costs of developing and operating a tracking system vary by initiative. Hydro One has already developed initiative tracking systems that can be modified and updated for the proposed programs. The cost of tracking is included in the overall program management cost estimates and Hydro One expects to minimize this cost by leveraging the existing systems, where possible.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #9 List 1**

3
4 **Interrogatory**

5
6 Ex. B/T1/S2/p. 6

7
8 Please explain the statement, "Hydro One will implement design adjustment plans,
9 leveraging existing tools, to promptly address any differences between program plans and
10 actual experience."

11
12
13 **Response**

14
15 In designing the proposed initiatives, Hydro One has relied on relevant experience
16 associated with programs such as Double Return in order to minimize the gap between
17 projections and actual results. As mentioned in Exhibit I, Tab 6, Schedule 8, the
18 initiative results will be tracked and where there is a gap between plan and actual,
19 appropriate adjustments will be made as required to minimize the gap.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #10 List 1**

3
4 **Interrogatory**

5
6 Ex. B/T1/S2/p. 6

7
8 The evidence indicates that HON is developing other potential Board -approved CDM
9 programs that can be implemented if required. Please provide an estimate of the costs
10 incurred to develop these additional programs. How are those costs to be recovered? If
11 the programs never materialize how will the costs be recovered?
12

13
14 **Response**

15
16 The development of these additional programs is currently under consideration. Cost
17 information is not available at this time.
18

19 Hydro One may file a Board-Approved CDM Program application for these and other
20 potential Board-Approved Programs at a future date, if required.

Consumer Council of Canada (CCC) INTERROGATORY #11 List 1

Interrogatory

Ex. B/T1/S2/pp. 8-9

Please provide a breakdown of the \$18.2 million for the OPA- Contracted residential programs.

Response

The breakdown of the Consumers program budget by initiative has not been finalized.

Consumer Council of Canada (CCC) INTERROGATORY #12 List 1

Interrogatory

Ex. B/T1/S2/p. 11

What was the overall cost incurred by HON in developing its Board-Approved program portfolio? Please provide all cost details including the cost of outside consultants. Please explain how those costs have been, or are expected to be recovered.

Response

Hydro One incurred consulting costs associated with the preparation of the Navigant Study of approximately \$150,000. This cost and any incremental internal costs were recovered through the funding approved as part of the Distribution Rate filing EB-2009-0096.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #13 List 1**

3
4 **Interrogatory**

5
6 Ex. B/T1/S2/p. 11

7
8 For each of the Board- approved programs please explain, in detail how the budget was
9 developed. Please explain how each of the savings targets was calculated. Please provide
10 all of the TRC and PAC calculations. Please include all assumptions

11
12
13 **Response**

14
15 Please refer to Exhibit I, Tab 6, Schedule 2 for detail about how the budget was
16 developed. Please refer to Exhibit I, Tab 1, Schedule 7, part b, Schedule 18 part b,
17 Schedule 25, part b, Schedule 33, part b, Schedule 39 part b and Schedule 48 part b for
18 details on how each of the initiative savings were derived, as well as TRC and PAC
19 calculations.

Consumer Council of Canada (CCC) INTERROGATORY #14 List 1

Interrogatory

Ex. B/T2/S1/p. 1

HON indicates that it intends to implement a fully-allocated costing methodology in accordance with Appendix A of the CDM Code for all of its CDM programs. Please file any internal memos, documents, and manuals etc. that describe HON's proposed fully allocated costing methodology.

Response

Hydro One's standard methodology is in accordance with the requirements of the CDM Code and has been filed with the Board and references include:

EB-2009-0096 Prefiled Evidence Exhibit C1, Tab 4, Schedule 1, "Costing of Works" (methodology for fully-burdened salaries)

EB-2009-0096 Prefiled Evidence Exhibit C1, Tab 5, Schedule 2, (methodology for overhead costs)

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #15 List 1**

3
4 **Interrogatory**

5
6 Ex. C/T1/S2

7
8 Please explain the process HON intends to use regarding program specific assumptions.
9 Will they be updated annually? If not, why not? How will HON develop assumptions for
10 measures which are not part of the OPA measure inventory?

11
12
13 **Response**

14
15 Hydro One will ensure that all initiatives will be evaluated in accordance with the OPA's
16 EM&V Protocols and that best available information will be used for updating
17 assumptions on an annual basis.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #16 List 1**

3
4 **Interrogatory**

5
6 Ex. C/T1/S2

7
8 Please explain why all of the proposed individual program budgets are redacted.

9
10
11 **Response**

12
13 Individual program budgets are redacted for commercial reasons to ensure the integrity of
14 the upcoming competitive RFP process.

Consumer Council of Canada (CCC) INTERROGATORY #17 List 1

Interrogatory

Ex. C/T1/S2

For each of the proposed programs please identify the free-ridership rates used. Please provide all studies used to develop those free-ridership rates.

Response

The free-ridership rates and assumptions are identified in Hydro One's responses to the following interrogatories from the Board:

- Community Events: Exhibit I, Tab 1, Schedule 7, part b.
- Neighbourhood Benchmarking: Exhibit I, Tab 1, Schedule 18, part b.
- Monitoring and Targeting: Exhibit I, Tab 1, Schedule 25, part b
- Small Commercial Energy Management and Load Control: Exhibit I, Tab 1, Schedule 33, part b
- Municipal and Hospital Efficiency Performance: Exhibit I, Tab 1, Schedule 39, part b
- Double Return Plus: Exhibit I, Tab 1, Schedule 48, part b.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #18 List 1**

3
4 **Interrogatory**

5
6 Ex. C/T1/S2

7
8 For all of the proposed programs please indicate how EM&V costs will be accounted for.
9 What is the total annual projected cost for EM&V?

10
11
12 **Response**

13
14 As shown in the submission, EM&V costs are accounted for in each proposed initiative
15 and will be tracked as a separate cost. Projected costs for EM&V were filed in
16 confidence to ensure competitive RFP integrity.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #19 List 1**

3
4 **Interrogatory**

5
6 Ex. C/T1/S2

7
8 Please provide a description of the process HON undertook to determine which
9 residential programs it would adopt. Please provide a list of the programs that were
10 considered and then rejected. Please explain why those programs were rejected.

11
12
13 **Response**

14
15 Please refer to Exhibit I, Tab 9, Schedule 12.

Consumer Council of Canada (CCC) INTERROGATORY #20 List 1

Interrogatory

Ex. C/T1/S2/p. 6

With respect to the Community Education Program how does HON intend to measure results? How does HON intend to count participants? How were the savings targets set for this program?

Response

HONI will collect a set of indicators to track the performance of this initiative. The following is the initial list of the performance indicators:

To support program implementation, HONI plans to track the following program details:

- list of planned Community Events (including dates & times)
- total anticipated attendance per event
- total planned promotional products distributed per event
- list of cancelled Community Events (including reasons such as “rained out event”)
- actual promotional products distributed per event
- follow-up surveys

The complete list of data variables for this program will be defined by the selected third party EM&V expert.

The above list indicates how HONI will account for participants.

The savings targets are based on the anticipated number of promotional products expected to be distributed at these events.

1
2 **Consumer Council of Canada (CCC) INTERROGATORY #21 List 1**

3
4 **Interrogatory**

5
6 Ex. C/T1/S2/p. 14

7
8 Please provide a list of the 20 US utilities that have undertaken a similar program. To the
9 extent possible please a summary of the program results.

10
11
12 **Response**

13
14 Please refer to Exhibit I, Tab 1, Schedule 12.