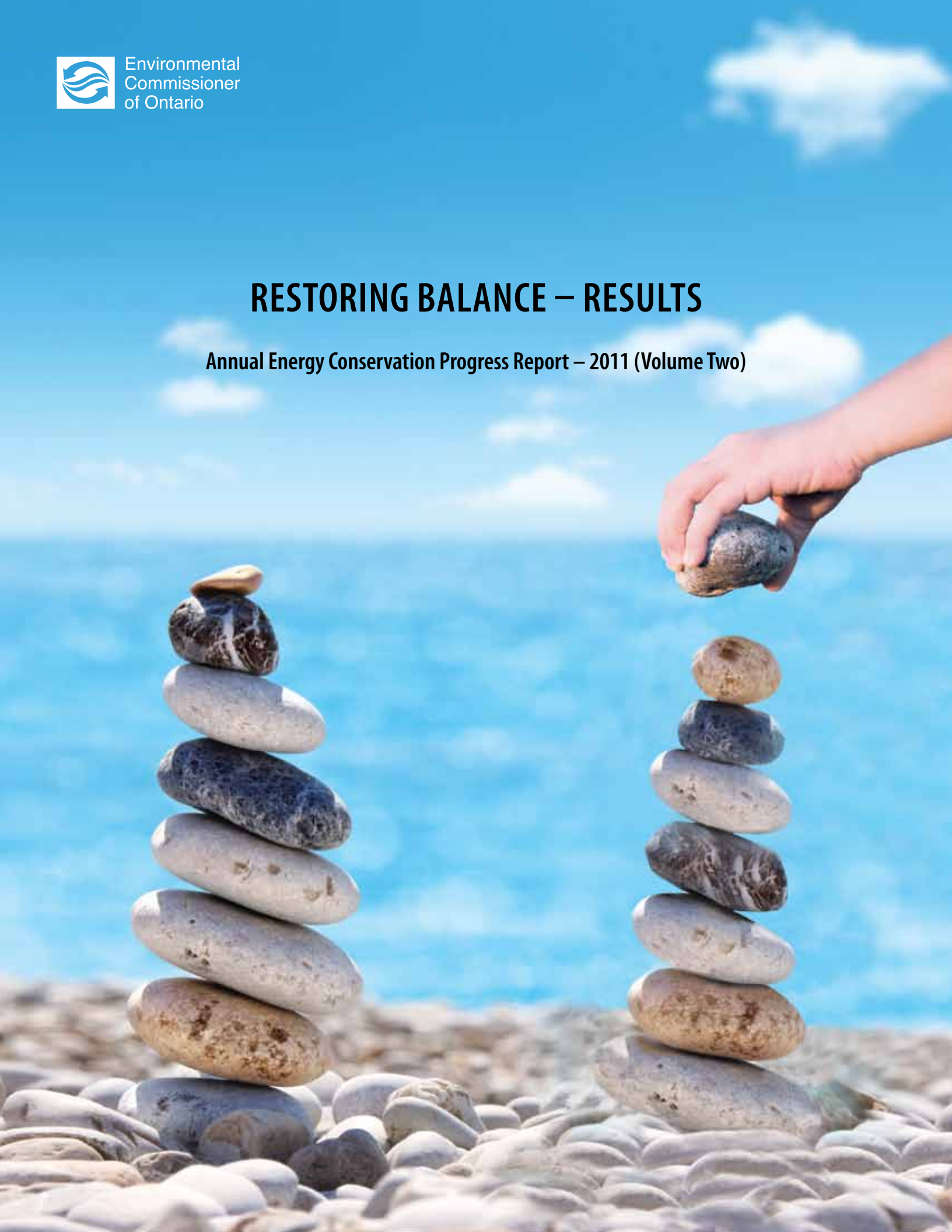
Environmental Commissioner of Ontario

RESTORING BALANCE – RESULTS

Annual Energy Conservation Progress Report – 2011 (Volume Two)



LIST OF ACRONYMS

BAP	Board-Approved Program
BPS	Broader Public Sector
CDM	Conservation and Demand Management
CESOP	Clean Energy Standard Offer Program
CHP	Combined Heat and Power
CIEEDAC	Canadian Industrial Energy End-Use Data and Analysis Centre
COF	Council of the Federation
DSM	Demand-Side Management
EBR	*Environmental Bill of Rights, 1993*
EBT	Electronic Business Transaction
ECO	Environmental Commissioner of Ontario
EDA	Electricity Distributors Association
EDU	Ministry of Education
ekWh/ft^2	Equivalent kilowatt-hour per square foot
ERSOP	Energy Recovery Standard Offer Program
EV	Electric Vehicle
FIT	Feed-in Tariff
GEGEA	*Green Energy and Green Economy Act, 2009*
GJ	Gigajoule
GJ/m^2	Gigajoule per square metre
IESO	Independent Electricity System Operator
IPSP	Integrated Power System Plan
km^2	Square kilometre
kWh	Kilowatt-hour
LCFS	Low Carbon Fuel Standard
LDC	Local Distribution Company
m^3	Cubic metre
MOI	Ministry of Infrastructure
MTO	Ministry of Transportation
MUSH	Municipalities, Universities/Colleges, Schools and Hospitals
MW	Megawatt
MWh	Megawatt-hour
OEB	Ontario Energy Board
OPA	Ontario Power Authority
PJ	Petajoule
PSUI	Process and Systems Upgrade Initiative
RbP	Results-based Plan
RESD	Report on Energy Supply and Demand in Canada
SCDSB	Simcoe County District School Board
SOP	Standard Offer Program
TOU	Time-of-Use
TWh	Terawatt-hour
UCD	Utility Consumption Database

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Commissioner
of Ontario

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l'environnement
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Commissioner

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Commissaire

January 8, 2013

The Honourable Dave Levac
Speaker of the Legislative Assembly of Ontario

Room 180, Legislative Building
Legislative Assembly
Province of Ontario
Queen's Park

Dear Speaker:

In accordance with Section 58.1 of the *Environmental Bill of Rights, 1993,* I am pleased to present to you Volume Two of the Annual Energy Conservation Progress Report – 2011 of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario.

The Annual Energy Conservation Progress Report – 2011 is my independent review of the Ontario government's progress in conserving energy and is issued in two separate documents. The first volume, *Restoring Balance: A Review of the First Three Years of the Green Energy Act,* was submitted June 5, 2012, and covered the broader policy framework affecting energy conservation in Ontario. This second volume describes conservation initiatives underway, assesses energy savings derived from these initiatives and measures progress on meeting targets.

Sincerely,

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Environmental Commissioner of Ontario

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COMMISSIONER'S MESSAGE

"It's like herding cats!" This colourful adage describes how government policy typically gets made. Too often, it's a chaotic and frustrating exercise. Images of factions heading off in all directions come to mind. Since success under these conditions is uncertain, policy makers attempt to reduce the risk of failure by practicing inclusiveness. So the policy process usually involves consultation, or stakeholdering as it's known, to incorporate different views on the best path to pursue. At the end of the day, what hopefully emerges is a rough consensus on the policy course to be followed. And this clutter of feline stakeholders can move forward together in the same direction – or at least not backwards, sideways or every which way.

Considering the current policy framework for electricity conservation, I think the province could easily provide the necessary direction with one simple gesture. Given that the framework expires in less than two years – at the end of 2014 – the government needs to confirm its long-term commitment to conservation. Fortunately, policy makers can move quickly because a consensus already exists. All the major stakeholders, who are vital to the success of conservation, have told me that the missing key is a public commitment by government to a long-term framework.

I recommended this in my report last year, but so far the government has pussyfooted around. What we're left with is a blank canvas where, as usual, critics fill the void with misleading images that hinder long-term policy. The most deceptive picture I've seen recently portrayed conservation as unnecessary because there is surplus power. Of course, this picture glosses over the historical record of past surpluses followed by the threat of shortages, which illustrates how expectations can be overtaken by changing events.

During this decade, nuclear units at Bruce and Darlington will be shut down for roughly three years to be refurbished. Based on past experience, it is quite possible that the units will be off-line longer than expected. There is further risk to reliability since operation of the Pickering nuclear station – itself aging and nearing the end of its working life – will be extended to make up for the generating capacity being refurbished.

Also missing from the picture are longer-term risks. The commitment to new nuclear in the government's Long-Term Energy Plan will require a tough decision on costs. The image that conservation critics paint omits the detail that the prices bid in a recent tender to add a new nuclear station were rejected by the government as far too costly. If the ultimate decision is ratepayers can't afford more nuclear, the alternatives are conservation, renewables, gas or buying power from other provinces.

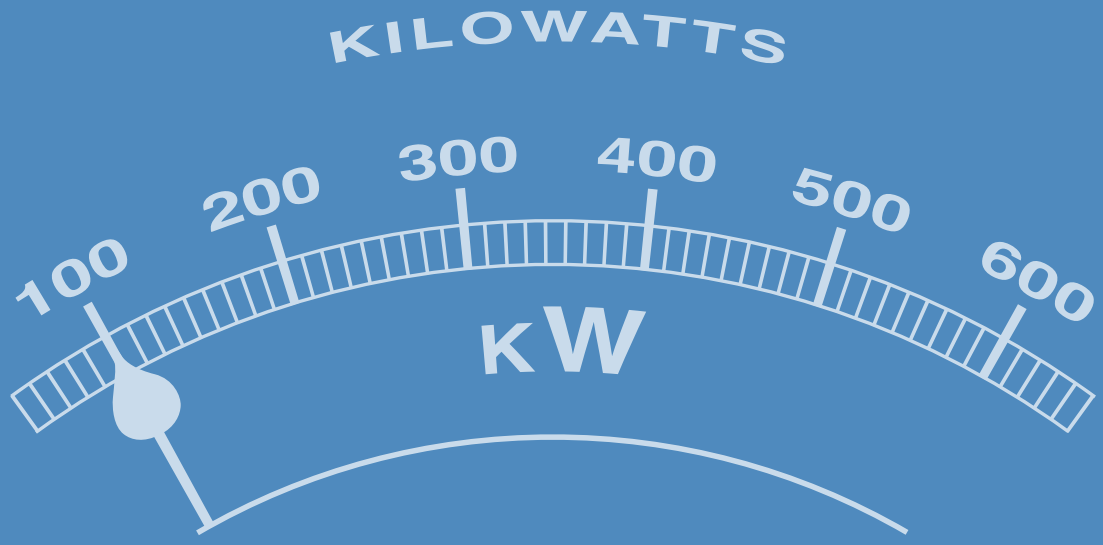
As this year's report shows, conservation is proving its ability to help balance supply and demand. As well, it plays a role in avoiding the greenhouse gas emissions that result from using natural gas generators as the balancing tool. Moreover, it's much cheaper than adding any type of new generation. Perhaps most importantly, it doesn't create NIMBYism – the "not-in-my-backyard" opposition to infrastructure development. Unlike power plants or transmission lines, residents don't worry about property values falling because you locate some conservation nearby.

As you delve into this report, I'd direct you to one observation. Almost half of the electricity savings booked in 2011 came from programs contracted before 2011, under the old conservation framework, but which were not completed until 2011. The province's energy regulator, the Ontario Energy Board, allowed distribution utilities to count pre-2011 savings towards their targets. The decision underscores the idea that you can't just flick a switch and turn programs on and off. The timeframe has to reflect how stakeholders get things done. It can't be determined in isolation of their needs.

The lesson this teaches us for the current framework is that a lack of commitment beyond 2014 will restrict participation, particularly for business programs that yield large savings. A hard stop in 2014 means programs will begin to wind down this year. For example, industries won't renew their participation in demand response programs, nor will there be any incentive for distributors to sign up customers for new construction and retrofit programs since they can't be completed in time.

This is a major impediment. The government should not squander its hard-earned efforts by sitting on a decision until the last moment. Ontario needs a long-term commitment to energy conservation now.

EXECUTIVE SUMMARY



Under the *Environmental Bill of Rights, 1993*, the Environmental Commissioner of Ontario (ECO) reports annually to the Legislative Assembly of Ontario on the province's progress in energy conservation.

In June 2012, the ECO released Volume One of the Annual Energy Conservation Progress Report – 2011 which reviewed the government's progress on the energy conservation commitments of the *Green Energy and Green Economy Act, 2009*. Building upon this analysis, Volume Two presents the quantitative results of the activities that support the Act's commitment to build a culture of conservation. The report includes highlights from conservation actions for all fuels (Section 1), followed by a summary of progress against established energy targets (Section 2), a detailed analysis of two selected conservation targets that encourage efficient electricity generation and delivery of programs by electricity distributors (Section 3), and finally a review of an energy benchmarking initiative by the Ministry of Education (Section 4). Volume Two also reports on trends in Ontario's energy consumption (Appendix A) and summarizes barriers to conservation that the ECO has identified (Appendix B).

Conservation results from 2011 are generally encouraging for both electricity and natural gas. However, the ECO concludes that the government needs to confirm a long-term commitment to conservation that extends beyond 2014, when funding for electricity conservation programs is currently scheduled to end.

Combined Heat and Power – A Desirable Path to Energy Conservation?

Combined Heat and Power (CHP) uses one fuel to produce both heat and electricity. By utilizing heat energy that would otherwise be wasted, in industrial processes or to heat nearby buildings, CHP can save energy. The Ministry of Energy has set a target of integrating 1,000 megawatts (MW) of CHP into Ontario's electricity system and has directed the Ontario Power Authority (OPA) to procure projects to achieve this target.

The OPA contracted for 462 MW of CHP between 2005 and 2009, and launched new procurements in 2011 for further progress towards the 1,000 MW target. While these procurements attracted project applications (all fuelled by natural gas) totaling approximately 600 MW, only two contracts for small projects representing 5.9 MW have been awarded to date (decisions are still pending on most smaller projects). All large-scale project proposals were rejected, primarily due to the OPA deeming the cost too high.

The future of CHP in Ontario looks cloudy, at least if the focus remains on using a planning model that is driven by the province-wide electricity system's needs at the expense of efficiently planning the overall need for all energy sources. Low-cost CHP projects appear to be in short supply and CHP procurement risks adding additional baseload capacity at a time when there is surplus generating capacity. The ECO believes that it is worthwhile to examine whether 1,000 MW of CHP remains a desirable goal.

The OPA believes that at the provincial level no additional CHP capacity is currently needed, and the Ministry of Energy is reviewing with the OPA whether to proceed with the existing CHP procurements. The OPA also believes that the need for CHP should be assessed at the local or regional level to ensure generation is developed where it is specifically needed, meets system needs, and maximizes value to ratepayers. The ECO finds this approach reasonable, especially given the local benefits that CHP systems can offer from both an electricity and district heating perspective. For example, Toronto is one location where CHP could offer benefits since it faces growing energy demand in the core as a result of new building development, while also facing transmission constraints that limit bringing energy into the downtown core.

The ECO recommends that the Minister of Energy re-examine the combined heat and power target and post a policy proposal for public comment on the Environmental Registry.

Ontario does not plan for its energy needs in an integrated manner, and doing so could improve the economic viability of CHP projects. The ECO believes that Ontario has the opportunity to improve its energy efficiency by capturing and using waste heat, rather than exhausting it to the natural environment. A key challenge in developing district heating systems is ensuring that there is a customer base that can use the waste heat. This requires stakeholders to co-operate on developing long-term community energy plans and infrastructure investments. One way to ensure that such infrastructure investments are considered during municipal planning processes would be to incorporate district energy into the Provincial Policy Statement.

The ECO cautions that Ontario's electricity grid is supplied by mostly carbon-free resources and so there is no guarantee that all natural gas-fired CHP projects will reduce carbon emissions. The ECO believes the OPA should explicitly consider potential emissions reductions in future procurements, giving preference to projects with the greatest emissions reduction potential.

The ECO recommends that the Ontario Power Authority consider avoided greenhouse gas emissions as a factor in future combined heat and power procurement decisions.

The 2014 LDC Electricity Conservation Targets, Year One

The 2011 results for electricity conservation targets, the first year under Ontario's new electricity framework for conservation and demand management (CDM), are reasonably encouraging despite a late start and significant issues with program operation. The new framework provides increased responsibilities and opportunities for Ontario's Local Distribution Companies (LDCs), while maintaining a province-wide design role for the OPA. Conservation programs continue to yield cost-effective results, with a cost to ratepayers of only 3 cents per kilowatt-hour saved.

The numbers show that Ontario LDCs achieved approximately 40 per cent of the 2014 energy target and 16 per cent of the 2014 peak demand target, based on conservation projects completed by the end of 2011. Although not a certainty, it appears LDCs are on track to meet the provincial aggregate energy target for 2014 but they are not on track to meet the peak demand target.

Current restrictions preventing LDCs from developing custom conservation programs have constrained innovation. Many of the successful existing CDM programs are approaching market saturation, and innovation is needed to develop the next generation of conservation programs. Disappointingly, the Ministry of Energy has taken no action to encourage custom LDC-led CDM programs.

The ECO recommends that the Minister of Energy direct the Ontario Energy Board to establish an expedited review process for proposed LDC custom conservation programs below a specified cost threshold.

The ECO believes immediate action is needed to resolve the uncertainty around incentive funding for long-term conservation projects that could be started now, but would not be completed until after 2014. Both the OPA and LDCs have identified this as a priority. Committed funding would assure potential project participants, in particular multi-year projects such as condominiums, that they will be eligible to receive incentives. This would increase participation in the programs.

The ECO recommends that the Minister of Energy immediately issue direction to the Ontario Power Authority authorizing incentive funding for conservation projects commenced prior to December 31, 2014 that are completed post-2014.

The ECO also maintains that the Minister of Energy must make a long-term commitment to conservation that includes guaranteed funding, beyond the expiry of the current framework at the end of 2014.

Energy Benchmarking in Schools

The Ministry of Education (EDU) has, commendably, developed the Utility Consumption Database (UCD) to track utility data for every electricity and natural gas account in all school boards. The energy benchmarking capabilities of the UCD provides EDU and school boards with the ability to identify high and low performing schools and boards, determine average provincial benchmarks for energy consumption, and set energy reduction targets. Data from the UCD shows that there is a wide variation in energy performance across schools and across school boards.

The database also positions school boards significantly ahead of the broader public sector (BPS) in meeting the energy consumption reporting and conservation plan requirements of the *Green Energy Act*. The ECO encourages EDU to continue to lead the BPS by developing an aggressive sector conservation target that aligns with the province's electricity conservation and greenhouse gas targets.

The ECO recommends that the Minister of Education establish an aggregate energy conservation target for the education sector to be achieved by the 2015 school year, and work with school boards to allocate this target.

The ECO encourages EDU to share the valuable knowledge it has built through the development of the UCD, as it may assist the BPS in preparing for or complying with the July 2013 reporting requirements under the *Green Energy Act*. The ECO also believes Ontarians should have the unrestricted ability to view the energy performance of publicly funded school boards or schools and that open access to energy data will further conservation in the province. Therefore, the ECO is concerned with the confidential and restricted nature of the UCD, which is currently only accessible to EDU and school boards.

The ECO recommends that the Minister of Education ensure that the Ontario public has unrestricted access to the Utility Consumption Database by July 1, 2013.

1 INTRODUCTION

1.1 THE ECO'S REPORTING MANDATE AND APPROACH

The Environmental Commissioner of Ontario (ECO) reports annually to the Speaker of the Legislative Assembly of Ontario on the province's progress in energy conservation. Our reporting mandate, under the *Environmental Bill of Rights, 1993* (*EBR*), is to: review efforts to reduce or make more efficient use of transportation fuels, oil, propane, natural gas and electricity; measure progress on energy conservation targets; and assess barriers to conservation and efficiency.[1] Reports are issued bi-annually in two volumes, each focused on specific aspects of the reporting mandate.

1.2 CONTEXT OF THE REPORT

Linking the 2011 Volume One and Two Reports

Volume One of the 2011 report, released in June 2012, reviewed the implementation of the *Green Energy and Green Economy Act, 2009* (*GEGEA*). It examined the Act's twin aims: to expand renewable energy and to build a culture of conservation. Our report concluded that the government needed to restore balance between the Act's dual purposes and work as forcefully on conservation provisions as it has in expanding renewable electricity generation. The ECO's assessment was that several of the conservation promises were unfulfilled and the government had neglected its stated objective to build a culture of conservation.[2]

Our Volume Two reports are primarily data reports that present quantitative results of conservation initiatives. For 2011, Volume Two builds upon the analysis in the first volume. The first volume examined those *GEGEA's* statutory provisions that provided the design of the conservation culture. Volume Two focuses on the programs used to build the culture, examining energy savings in 2011. In addition to the overall savings data, the report analyzes two selected conservation efforts: Ontario's effort to encourage efficient combined heat and power (CHP) generation; and provincial development of a database to assist benchmarking of energy consumption by Ontario school boards.

1.3 PROGRESS ON BUILDING THE CONSERVATION CULTURE

The commitment to building a conservation culture is now almost a decade old, having been announced in 2004[3] and restated with the introduction of the *GEGEA* in 2009.[4] The notion of laying the foundation for a conservation culture was also the theme of the OPA's 2006 annual report, released shortly after the government announced the commitment and created the OPA to be one of its architects.[5] Sufficient time has passed to put the government's efforts into perspective. The report begins with a summary of the almost decade-long commitment to culture building, and highlights issues associated with measurement of this objective.

Progress Since 2004

To continue the builder analogy, if creating a culture of conservation is like constructing a building, its resilience depends upon a strong foundation. Arguably, Ontario is still constructing the culture's foundation and, on the whole, progress has been slower than perhaps was expected. However, positive results for some fuels are apparent, particularly natural gas and more recently for electricity. Following the brief historical summary below, detailed results for 2011 are presented in Sections 2 and 3.

Transportation Fuels

For transportation fuels and refined petroleum products, there is no blueprint for building the culture. With the exception of transit funding, there is no substantive program activity by the provincial government. There has been limited progress towards targets established by the government related to the use of transportation fuels (e.g., rebates for electric vehicles, low carbon fuel standards, lowering fuel consumption of the Ontario government fleet). The transportation demand management, efficiency and alternate fuel programs offered by government during the past few years are now either: inactive; terminated prior to their original end date; reduced in scale; or undergoing a mid-program review. Overall, there has been a reduction of activity. Policy activity addressing transportation fuels is more robust than program implementation but still quite limited, consisting of transit guidelines, rebates for purchase of electric vehicles and a freight transportation strategy. A more detailed review of programs and policy tools to reduce transportation energy consumption is contained in the ECO's *Annual Greenhouse Gas Progress Report 2012: A Question of Commitment*.

Electricity

Since 2004, electricity conservation policy has tested several designs for a regulatory framework, and further modifications may arise from the report of the Ontario Distribution Sector Review Panel. Results of past years' policies and programs are reviewed in previous ECO reports.

Rebranded or redesigned electricity conservation programs were launched in 2011 for the 2011-2014 period. The 2011 results suggest that if a similar level of savings is extrapolated for coming years, the province will achieve a mixed performance of success and failure on, respectively, its 2014 energy savings and demand savings targets. The positive 2011 results potentially mask some associated risks. There remains uncertainty if the foundation being built can maintain the structure over the long-term. Local Distribution Companies (LDCs) are evenly split on whether they will meet their targets for reducing energy usage in kilowatt-hours or reducing peak demand in kilowatts, and they are urging changes to the regulatory framework.[6] Crucially, without a firm policy commitment beyond 2014, the savings rate may atrophy over the next few years since some types of conservation projects require long-term commitments to produce results. Also the base of programs generating the bulk of the results is still fairly narrow. Savings are not widely distributed among customers, particularly the residential sector, which is key to building a conserver culture. In 2011, one program (OPA's Demand Response 3, which provides incentives for large industries to reduce demand when called upon) delivered one-half of demand savings. A second program (the Equipment Replacement Incentive, which provides retrofits for businesses) delivered almost one-half of energy savings that were provided by programs that began in 2011.

As noted in our 2011 Volume One report, regulations, codes and standards are providing only moderate support. With the notable exception of Ontario's Building Code, the government has set only one new energy efficiency standard since 2007, and the province has acted like a "free rider" benefitting from the action of other jurisdictions that have led in this area.[7] As also noted in previous reports, electricity pricing policy has likely impeded progress on building a conservation culture by communicating a contradictory message. Various uncoordinated pricing decisions sometimes work at cross purposes, both enabling and hindering conservation; for example, time-of-use (TOU) rates encourage conservation but are offset by policies to reduce the length of the peak TOU period or to narrow the price differential between peak and off-peak times. Price rebates (like the Ontario Clean Energy Benefit) or incentive prices (like the Industrial Electricity Incentive Program) hinder conservation.[8]

Photo by: Rick Harris, www.flickr.com/rickharris

Natural Gas

Since 2007, both gas utilities have typically exceeded their demand-side management (DSM) targets. However, the trend line for the two companies has differed. The amount of gas saved by Enbridge's conservation programs has flat-lined in recent years, while Union Gas's savings have dramatically increased, likely as a result of the greater potential for conservation by Union's industrial customers compared to Enbridge's smaller base of industrial customers. The scope of performance targets was expanded in 2007 when market transformation targets were added to complement the DSM program targets that were already in effect. A further revised regulatory framework for natural gas conservation was implemented for the 2012-2014 period. While it remains to be seen whether this will advance conservation to a deeper level, change was overdue; some measures-based programs (e.g., low-flow showerheads to conserve hot water) had reached market saturation and new approaches were needed.

Oil and Propane

No government programs for the conservation of oil and propane currently exist, and no conservation targets for these fuels have been developed by government. However, government programs directed at residential, commercial and institutional energy use that operated from 2007-2012 did result in some savings of these energy sources.

1.4 METRICS ARE NEEDED TO ASSESS THE CONSERVATION CULTURE

Better metrics are needed to determine how Ontario is faring in its goal of building a conservation culture. To date, the objective has been employed more as an aspirational policy slogan adopted by ministries, agencies and energy companies to justify activities. The government has not set out a detailed description of its conservation culture goal, nor has it proposed indicators against which progress in achieving such a culture could be measured. If the stated goal is to serve as more than a catchphrase, metrics are needed to measure how ingrained the culture is among Ontarians. The indicators should be based on standard socio-economic measurements. With respect to economic factors, a key metric to consider is the energy productivity of the Ontario economy; that is, a conservation culture is one that strongly values economic outputs that use less energy and where the energy intensity of the economy shows continuous improvement. Some metrics currently exist and these could be built upon to provide a better profile of Ontario's culture of conservation.

The Ministry of Energy's Results-based Plan (RbP) states that the ministry's mandate includes the creation of an energy conservation culture and identifies the building of such a culture as an RbP result.[9] Metrics included in the RbP are: the electricity conservation targets; smart meters; TOU rates for electricity; the OPA's conservation programs; a regulatory framework for efficiency; and the empowerment of consumers through tools, information and incentives. The government's Long-Term Energy Plan repeats these as markers and itemizes others (e.g., the Building Code, school retrofits, reducing electricity used in government buildings). Although an impressive list, it is problematic. It implies the mere fact that government plans include these activities is proof that Ontario has built a conservation culture, regardless of verification of their effectiveness.

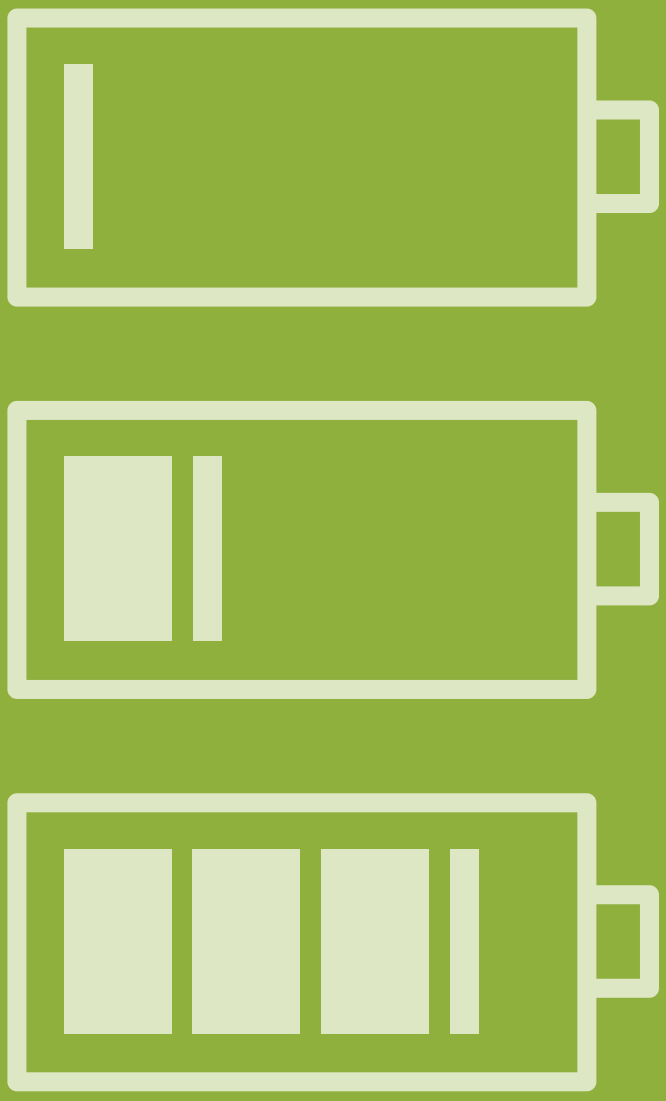
A second source of metrics is contained in the OPA's 2011 Revenue Requirement Submission (OEB case # EB-2010-0279). The OPA's approved operating budget includes funding to refine its "culture of conservation metric."[10] Development of the metric began in 2010, but the results are not yet distributed. It measures, on a quarterly basis, the direction and magnitude of attitudinal change towards conservation. It uses polling to track across seven themes considered demonstrable of a cultural value of wise energy use.

A third source is the recently adopted scorecard metric used by gas utilities for market transformation programs. It is a new approach required by the OEB to measure more than just the total amount of natural gas saved. It tracks other factors, like participation and equipment installation rates, in an attempt to measure a program's performance and to determine if the market is transforming to a point where efficiency becomes a normal commercial practice. If so, program assistance is no longer needed for these particular technology measures or practices, and incentive funding can be directed towards other emerging opportunities.

This is the extent of efforts to measure the culture of conservation. The Ministry of Energy's metric essentially boils down to the province-wide electricity reduction and smart meter targets. There is no effort to measure the link between the targets and market transformation to a new culture. This may be an important disconnect since targets treat conservation as a resource (a demand-based resource similar to contracting generation as a supply resource) that utilities procure. Conversely, culture building leans more towards measuring consumer behavior (as opposed to measuring kilowatt-hours of savings) that is reflected as typical products and services purchased in an altered market place. The OPA's survey research attempts to quantify the culture's development through changes in awareness and behavior, although it is focused primarily on electricity. More experience will determine if the gas utilities' scorecard is a useful metric, but it does attempt to advance beyond current practice by connecting program activity to the longer-term goal of a robust conserver culture where ratepayers need not fund conservation.

To enable better measurement of the conservation culture, an outcomes-based approach would be preferable to the current methods. Common sense would suggest that it use metrics derived from a description of the end state or conditions sought – the characteristics of the built environment and the social values. In other words, what Ontario would look like with such a culture (e.g., by 2020, one-half of commercial buildings will have a standardized energy rating, and the real property market will attach value to a building's energy performance). This allows the current environment to be compared against an end point to determine if market transformation milestones have been reached such that conservation has become a normal part of Ontarians' home and work life. As is done with electricity and natural gas conservation programs, third party verification of the metrics would be desirable.

2 SUMMARY OF PROGRESS ON ALL TARGETS



Government-Established Targets

The ECO's mandate includes reporting on Ontario's progress in meeting government-established targets to reduce or make more efficient use of energy. The ECO considers "government-established targets" to result from either a formal government policy or a minister directing activities that specify an amount of energy to be conserved.[11] To date, the ECO has completed a detailed analysis of progress towards most of these targets, and references have been provided in various summary tables to direct the reader to the location of the analysis.

Targets for Natural Gas

Ontario's two large natural gas utilities (Enbridge Gas Distribution and Union Gas) have annual performance targets for their conservation activities, and progress on these targets is summarized in Section 2.2. While these targets are not "government-established targets," the ECO also reports on them to provide a more complete understanding of the state of energy conservation in Ontario. Each utility has three targets: (1) a results target that measures the net benefits of its portfolio of conservation programs; (2) a market transformation target related to installing drain water heat recovery systems in new residential construction; and (3) a target for performing home audits and weatherization retrofits for low-income households.

2.1 UPDATE ON GOVERNMENT-ESTABLISHED ENERGY TARGETS

The tables in this Section provide an overview of progress towards government-established energy targets for the 2011 reporting year. Table 19 of Appendix C provides a list of the achieved targets as of December 31, 2011.

2.1.1 A GUIDE TO THE TABLES ON GOVERNMENT TARGETS

Table 1 outlines the energy targets that are specifically set for government ministries. It is each ministry's responsibility to meet its respective target. While all targets are important, some influence activities across the entire province, while others influence activities internal to government. As evident from the table, all current targets were set prior to 2010.

Table 2 summarizes the active electricity conservation targets in Ontario contained in directives issued to the Ontario Energy Board (OEB) and the Ontario Power Authority (OPA), which the OPA and Local Distribution Companies (LDCs) are responsible for achieving. These targets are based on the new conservation policies unveiled in 2010 and 2011. The OPA is tracking conservation and demand management savings from 2011 onwards made towards the directives laid out in this table. Since 2011 marks the first year of savings under these new targets, this report provides a first look at Ontario's progress towards meeting the new electricity conservation targets. Conservation programs that contribute towards these targets will be undertaken using the authority of various procurement directions[12] outlined in Table 3.

Table 3 summarizes the various procurement directions, four of which are required to meet the energy performance targets in Table 2. This table also includes the November 23, 2010 combined heat and power directive, which does not contribute to the conservation performance targets in Table 2, but it does promote more efficient use of energy through combined heat and power. In Section 3 of this report, a more detailed analysis of progress towards two targets is provided: procurement of combined heat and power (Section 3.1) and the LDC Conservation and Demand Management targets (Section 3.2).

Table 4 shows previous directions that were abandoned by the Ministry of Energy and OPA. Therefore, any savings that have already been procured from efforts under these directions will now contribute to the targets set out in Table 2.

Table 1: Summary of Government-Established Energy Targets for Ministries

ECO Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
Provincial Targets						
2009 (Volume Two, Section 3.1)	Premiers' agreement at the 2008 Council of the Federation (COF)	Ministry of Energy	2008	2020	20% energy efficiency improvement in Ontario by 2020.	▪ Progress on the target is undetermined as the ministry has not provided the methodology to measure progress against the 20% target. ▪ Progress has been made against elements of the five-point plan to which the COF committed in 2008. The following initiatives were taken to increase Ontario's energy efficiency: efficiency measures were added to the Ontario Building Code; O. Reg. 82/95 was amended in February 2012 to raise the efficiency standard for 75 and 100 watt light bulbs (effective January 1, 2014) and for 40 and 60 watt-equivalent bulbs (effective December 31, 2014); Leadership in Energy and Environmental Design (LEED) standard was adopted for construction of new Ontario government buildings; and regulatory amendments were passed in October 2012 to facilitate new innovative financing mechanisms for home retrofits.
2009 (Volume Two, Section 3.5)	Low Carbon Fuel Standard (LCFS)	Ministry of Energy	2007	2020	10% reduction in carbon intensity from transportation fuels by 2020.	▪ Little measurable and quantifiable progress towards this target has been made. ▪ Policy work through 2008-2009 was conducted to analyze the appropriateness of California's LCFS regulation; however, the ministry has identified several significant and potentially intractable issues related to this commitment, and no LCFS regulation has been developed for Ontario.[13] ▪ Some progress has been made in reducing the carbon intensity of transportation fuels and supporting the development of alternative fuels. Preliminary 2011 data indicates Ontario has increased the amount of ethanol blended into gasoline by over 50% compared with 2007 data.

ECO Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
2009 (Volume Two, Section 3.6)	Electric vehicle (EV) purchases	Ministries of Transportation (MTO), Economic Development and Innovation, Infrastructure, and Energy	2009	2020	1 in 20 vehicles driven in Ontario by 2020 to be an EV.	▪ As of July 2012, 405 purchase incentive grants and 542 green licence plates have been issued for EVs. ▪ In addition to the $84 million EV purchase incentive earmarked for the July 1, 2010 to March 31, 2015 period, an $80 million fund was announced in 2011 to spur development and investment in EV charging stations. In the 2012 Ontario Budget, these initiatives were combined and the total budget was reduced by $43.1 million. Following tabling of the Budget, in response to an ECO inquiry, MTO indicated that due to slow uptake and fiscal pressures the total budget for the combined initiative has been reduced by $101 million. ▪ In 2012, a Request for Information was issued to support development of a strategy for supporting EV infrastructure. In December 2012, the government announced details for the EV charging station rebates. Starting January 1, 2013, EV rebate recipients will be eligible for an additional rebate of up to $1,000 or 50% (whichever is lower) for the purchase and installation costs of a home charging station. ▪ Preliminary EV charging infrastructure has been installed at four GO transit stations and incorporated into the design of new parking at five GO stations. Metrolinx has issued a Request for Information for the installation and operation of EV chargers at the nine stations. The procurement process is anticipated to be underway by the end of 2012.

ECO Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
Internal Government Targets						
2011 (Volume Two, Section 4.0)	Education sector energy consumption reduction	School boards assisted by the Ministry of Education	2008	Not applicable	Establishment of a database to gather energy consumption data and set benchmarks.	▪ The Utility Consumption Database (UCD) was launched in August 2009. The UCD has collected electricity and natural gas consumption data for the 2009/10 school year, September to August, (the baseline year) and the 2010/11 school year. ▪ The provincial average energy intensity for the sector was 0.67 GJ/m^2 in the 2009/10 school year and 0.74 GJ/m^2 in 2010/11 school year.
2009 (Volume Two, Section 4.7)	Ontario Public Service energy consumption reduction	Ministry of Government Services	2009	March 2014	Annual reduction of 5% for the period 2009-2014 in each of vehicle fuel consumption, air travel, and energy used in government buildings.	▪ Exceeded annual reduction target for vehicle fuel consumption in 2009/10, but not 2010/11 or 2011/12. ▪ Exceeded annual reduction targets for air travel in the first three years (2009/10, 2010/11, 2011/12). ▪ Insufficient data to confirm annual reduction targets for energy used in government buildings target in 2009. Target achieved for calendar year 2010 and 2011.[1]
2010 (Volume Two, Section 2.3.2)	Electricity conservation in Ontario government operations	Ministry of Infrastructure with assistance from Infrastructure Ontario	2004 and 2007	2007 and 2012	A two-step target measured against a baseline of 2002/03 electricity use: a 10% reduction in the government's own electricity use by 2007, and an additional 10% by 2012.	▪ Government achieved 80% of its 2007 target. ▪ 2011 electricity consumption was 16% lower than 2002/03 baseline consumption (372 GWh in 2011 vs. 445 GWh in 2002/03).

Note:

1.

Vehicle Fuel Consumption	**Air Travel**	**Energy in Facilities**
(fiscal year values)	(fiscal year values)	(calendar year values)
Baseline in 2006: 41,365,508 L	Baseline in 2006: 29,197,253 mi	Baseline in 2006: 925,874 eMWh
2009/10: 37,638,885 L	2009/10: 23,732,087 mi	2009: to be confirmed
2010/11: 37,897,815 L	2010/11: 24,579,468 mi	2010: 899,764 eMWh
2011/12: 36,858,804 L	2011/12: 23,377,226 mi	2011: 865,597 eMWh

Table 2: Summary of Government-Established Provincial Electricity Conservation Targets for the OPA and LDCs

Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
2010 (Volume Two, Section 2.4.2)	Province-wide electricity conservation targets contained in the Long-Term Energy Plan and the February 2011 Supply Mix Directive	Ontario Power Authority	November 2010 February 2011	2015, 2020, 2025 and 2030	▪ 2015 target: 4,550 MW of peak demand savings and 13 TWh of energy savings (baseline year 2005). ▪ 2020 target: Additional 1,290 MW of peak demand savings and 8 TWh of energy savings (annual targets of 5,840 MW and 21 TWh). ▪ 2025 target: Additional 860 MW of peak demand savings and 4 TWh of energy savings (annual targets of 6,700 MW and 25 TWh). ▪ 2030 target: Additional 400 MW peak demand savings and 3 TWh of energy savings (annual targets of 7,100 MW and 28 TWh).	▪ 2,069 MW of peak demand savings as of year-end 2011 (45% of 2015 peak demand target). ▪ 6.545 TWh of energy savings as of year-end 2011 (50% of 2015 energy target).
2011 (Volume Two, Section 3.2 and Appendix D); 2010 (Volume Two, Section 2.4.1 and Appendix B)	Conservation and Demand Management Directive for electricity distributors for the period 2011-2014	Local Distribution Companies, with oversight by the Ontario Energy Board	March 2010	2014	▪ 1,330 MW of provincial peak demand reduction persisting at the end of the four-year period, and 6,000 GWh of reduced electricity consumption accumulated over the four-year period. ▪ Distributors were allocated a share of the province-wide target and are required to submit annual reports on progress to the Ontario Energy Board. ▪ Achievements contribute to, but are measured separately from, Long-Term Energy Plan targets (which also include savings from codes & standards, pricing policy, and non-OPA/LDC programs).	▪ 208.0 MW expected to persist until 2014, as of year-end 2011 (16% of 2014 peak demand target).[14] ▪ 2,388 GWh of cumulative energy savings achieved as of year-end 2011 (40% of 2011-2014 energy target).

Table 3: Summary of Active Procurement Directions to the OPA for Provincial Electricity Conservation

Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
2011 (Volume Two, Section 3.2)	Industrial Transmission Connected Electrical Efficiency Program	Ontario Power Authority	March 2010	Not provided.	▪ 300 MW of demand savings. ▪ Program encourages industrial consumers to make capital expenditures for energy efficiency and conservation. The program will provide a five-year period within which industrial consumers may agree to participate. The OPA shall perform ongoing evaluation of the program to ensure it is achieving its objectives.	OPA launched the Industrial Accelerator program in June 2010. Net annual peak demand savings for 2011 were 0.5 MW.
2011 (Volume Two, Section 3.1)	Combined Heat and Power (CHP)	Ontario Power Authority	November 2010 (June 2005, June 2007, April 2008 directions are superseded)	Not provided.	Procure a total of 1,000 MW using individually negotiated contracts for projects over 20 MW and a standard offer program for projects under 20 MW. The 1,000 MW target includes CHP that was procured under the three earlier directives.	462 MW has been procured. Of this, 414 MW was procured in 2005/06, and this accounts for 90% of all CHP procured under this initiative.

Report Section	Initiative	Responsibility to Address	Date Announced	Completion Date	Description	Progress on Target
2009 (Volume One, Section 5.1)	Demand Management, Demand Response and High Efficiency Combined Heat and Power Supply	Ontario Power Authority	June 2005 and amended February 2006	Procurement to be launched no later than fall 2005. Some project contracting to conclude by early 2006.	▪ Up to 500 MW through demand-side management and/or demand response. ▪ June 2005 direction was for 250 MW or more of demand-side management and/or demand response, with a focus on the cities of Toronto, Mississauga, Brampton, and Oakville. ▪ February 2006 Addendum was issued to clarify that the intent of the directive was for up to a maximum of 500 MW.	
2010 (Volume One, Section 5.2)	Conservation and Demand Management under the GEA Conservation Framework	Ontario Power Authority	April 2010	Not provided in directive, although programs must start in January 2011 and conclude in December 2014.	▪ Consult with LDCs and provide advice to the OEB on appropriate allocation of CDM Targets amongst LDCs. ▪ Provide advice to the OEB on the administration of LDC CDM activities. ▪ Design, deliver and fund OPA-Contracted Province-Wide CDM Programs. ▪ Design and co-ordinate energy efficiency and DR programs for First Nation and Métis communities. ▪ Provide support and funding of CDM research and innovation to assist LDCs in their conservation efforts through the Conservation Fund.	The Ministry of Energy indicated that results from these procurement directions are currently counted against provincial targets contained in Table 2.
2010 (Volume One, Section 5.2)	Conservation and Demand Management Program under the GEA Conservation Framework: Low-Income Conservation Initiative	Ontario Power Authority	July 2010	To be implemented by early 2011.	Design, implement and fund an electricity CDM program for low-income residential consumers for 2011-2014.	

Table 4: Abandoned Directions

(Procurement Authority[1] Transferred to Directions Shown in Table 3)

Report Section	Initiative	Date Announced	Description	Progress on Target
2009 (Volume One, Section 5.1)	Conservation and Demand-Side Management Initiatives (Residents of Low-Income and Social Housing)	October 2005	▪ Up to 100 MW in reduced overall electrical energy consumption and demand. ▪ Expected results for longer-term reductions in electricity peak demand by reducing the use of inefficient appliances, and the program to include a comprehensive package of energy measures that are designed to address these goals.	3 MW (3%) [2,3]
2009 (Volume One, Section 5.1)	Efficient Lighting and Appliances	October 2005	▪ Up to 100 MW in reduced overall electrical energy consumption and demand by residential, commercial and industrial customers.	24 MW (24%) [2,4]
2009 (Volume One, Section 5.1	Toronto Reliability Supply and Conservation Initiative	February 2006 Set completion date: 2010	▪ Up to 300 MW through demand-side management and/or demand response. ▪ In recognition of existing and planned conservation initiatives funded through Sept. 2007, OPA to work co-operatively with Toronto Hydro and the community in Toronto to avoid duplication of initiatives prior to that date.	188 MW (63%)
2009 (Volume One, Section 5.1)	Residential Sector	March 2006	▪ Up to 150 MW through demand-side management and/or demand response. ▪ Two key initiatives: (1) energy efficiency improvements in existing electrically heated homes; and (2) energy efficiency improvements to residential properties and equipment or appliances, with one element being an education and incentive program.	88 MW (58%)
2009 (Volume One, Section 5.1)	Commercial Buildings and MUSH (Municipalities, Universities / Colleges, Schools and Hospitals) Sector	March 2006	▪ Up to 150 MW through demand-side management and/or demand response. ▪ Expected that this would build upon any Conservation and Demand Management initiatives being undertaken through the Toronto Reliability Supply and Conservation Directive, issued February 10, 2006.	23 MW (16%) [2,5]

Notes:

1. "Procurement Authority" refers to a ministerial instruction that gives the OPA authority to spend money and contract with suppliers for conservation initiatives. The OPA will still be spending funds in the sectors listed in the above directions in Table 4, but under new authority shown in Table 3.
2. Although OPA programs may target a particular sector, peak demand savings are allocated only to the initiative under which they were procured to avoid double counting (see notes 3, 4 and 5).
3. Although 0 MW were procured under the Low Income/Social Housing Directive from 2008-2010, initiatives for low income customers were available through the Toronto programs and Multifamily Energy Efficiency Rebates.
4. The Great Refrigerator Roundup (now called Fridge & Freezer Pickup) was targeted specifically to appliances and the Power Savings Blitz (now called Direct Install Lighting) program was targeted mainly to lighting. However, these programs are funded through the Local Distribution Company (LDC) Conservation and Demand Management (CDM) Directive.
5. Four conservation programs targeted the commercial/MUSH sector; however, these initiatives were procured under either the Toronto Directive or the LDC CDM Directive.

ECO Comment

Although the ECO is encouraged by the government's continuing effort to conserve energy, there are still concerns. The Ministry of Energy's lack of a methodology for measuring progress towards completing the Council of the Federation (COF) target, as shown in Table 1, is a serious problem, particularly as the ministry appears to be purposely ignoring this aspect of measuring the COF commitment and is content to focus its action on elements of the five-point plan that accompanied the 20 per cent improvement objective (see Section 2.1.2). The ECO strongly believes that the ministry is obliged to develop a methodology to measure progress on this target.

2.1.2 WANTED: A METHODOLOGY TO MEASURE PROGRESS ON THE COUNCIL OF THE FEDERATION TARGET

As discussed in the ECO's Annual Energy Conservation Progress Report – 2009 (Volume Two), provincial officials did not agree on methodological issues to measure progress on this target, which calls for a 20 per cent improvement in energy efficiency for Ontario (see Table 1). Unresolved issues include: the target's baseline year; whether it is an absolute or intensity-based target; and sectors to which the target would apply. The ministry has also been unable to provide the ECO with an established methodology to measure energy efficiency improvements. Instead, the ministry continues to highlight some initiatives that fulfil the Council's commitment to a five-point plan to achieve the target (i.e., enhancing the Model National Code for Buildings, adding energy efficiency to the National Building Code, increasing the number of products covered by energy efficiency standards, adopting green building policies for newly constructed government facilities, and implementing a mechanism to provide homeowners with access and assistance for home efficiency audits and retrofits). These initiatives are important but do not address the issue of measuring progress towards this target; such metrics would be useful in identifying gaps where more stringent standards might be needed to meet the 20 per cent target (e.g., boilers). The ECO strongly encourages the ministry to develop a clearly defined methodology to measure energy efficiency improvements.

The ECO is further troubled by the different treatment of "performance targets" (Table 2) and "procurement directions" (Table 3) because both result from ministerial direction.

Procurement directions often include an amount of electricity savings, suggesting that they should be viewed as targets. However, the Ministry of Energy advised the ECO that these were procurement directions only and were intended to act as authorization for the OPA to procure conservation resources; as a result, the ministry suggests that they were not formal targets.[15] The ECO believes that all of the outlined goals should be considered firm, government-established targets.

To ensure the government's conservation efforts remain credible, a consistent approach must be taken towards achieving government-established targets. The ECO also believes that this differentiation between target directives and procurement directions is problematic and an example of weak accountability in the electricity regulatory framework that risks trivializing some conservation efforts. The government has given the OPA the best of all possible worlds, where it has authority to contract with organizations to deliver savings and assign results as it sees fit without any formally defined obligation to achieve even a minimum amount of its procurement threshold. This is illustrated in Table 4 which provides a list of directions that were issued to the OPA and remain incomplete and are now presumably cancelled or abandoned. The ECO believes that these directions were originally intended to be at least approximate targets, where each supported the overall goal to reduce energy. Similarly, the Ministry of Energy noted that the 300 MW of demand savings associated with the Industrial Transmission Connected Electricity Efficiency Program Directive (Table 3) represented "a reasonable outcome of the program."[16] Ontario Power Authority programs are an important component of the province's energy strategy and contribute significantly to targets established through the Supply Mix Directive. However, they lack the sort of compliance and accountability for targets that are attached to LDC licences.

2.2 UPDATE ON NATURAL GAS UTILITY CONSERVATION TARGETS

The conservation programs offered by natural gas utilities (Enbridge Gas Distribution and Union Gas) in 2011 remained similar to those of previous years. Each utility has developed new conservation plans that will come into effect in 2012, reflecting changes to the Ontario Energy Board's Demand Side Management Guidelines that govern the utilities' conservation actions.

Both utilities easily exceeded their overall 2011 results targets, which are based on the net monetary savings that will be realized through conservation measures. The physical amount of natural gas saved by Enbridge's conservation measures has remained relatively flat over the past five years (approximately 77.3 million cubic metres [m^3] in 2011). In contrast, Union Gas has been able to take advantage of the opportunities for large savings among its industrial customers, and its gas savings have tripled between 2007 (55.9 million m^3) and 2011 (163.7 million m^3). Overall utility spending on gas conservation was approximately $55 million in 2011, a slight increase over recent years, but quite small in comparison to spending on electricity conservation ($270 million in 2011).

Both utilities also have conservation targets related to their market transformation program of installing drain water heat recovery systems in new residential construction. The percentage of new homes built with drain water heat recovery systems was much lower in Enbridge's service territory than in Union's in 2011 (9 per cent versus 21 per cent). Union Gas ended its incentives for drain water heat recovery at the end of 2011, noting that the energy savings from drain water heat recovery systems are lower than originally predicted. However, Enbridge will continue to offer an incentive for drain water heat recovery in 2012.

Finally, both utilities have a target specific to a low-income weatherization program that offers home audits and retrofits at no cost to low-income residents in selected geographic areas. The Ontario Energy Board's decision to allow utilities to access additional funding earmarked for low-income conservation permitted both utilities to more than double participation in the low-income weatherization program in 2011 relative to 2010.

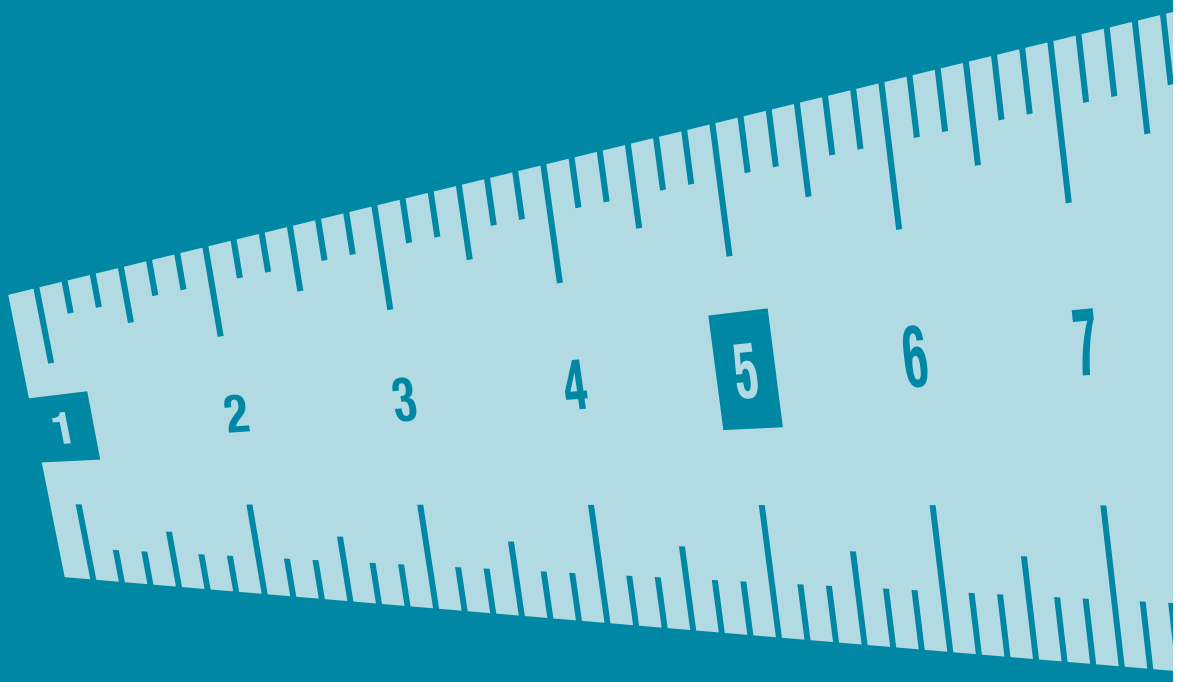
Table 5: Summary of Natural Gas Utility 2011 Conservation Targets

ECO Report Section	Initiative	Responsibility to Address	Description	Progress on Target
2009 (Volume Two, Section 4.2)	Demand-side management results target	Union Gas	$252.7 million in net benefits from utility conservation programs in 2011.	$379.4 million in net benefits (150% of target), from 163.7 million m^3 in annual natural gas savings.[17]
		Enbridge Gas Distribution	$139.5 million in net benefits from utility conservation programs in 2011.	$171.8 million in net benefits (123% of target), from 77.3 million m^3 in annual natural gas savings.
2009 (Volume Two, Section 4.2)	Market transformation targets – drain water heat recovery	Union Gas	17.7% of new housing starts to include drain water heat recovery systems.	21.0% of new housing starts (2,691 units) included drain water heat recovery systems – exceeded target.
			128 total builders participating in drain water heat recovery program.	137 participating builders – exceeded target.
		Enbridge Gas Distribution	22% of new housing starts to include drain water heat recovery systems.	9.0% of new housing starts (2,168 units) included drain water heat recovery systems – less than 50% of target.
			25 new builders participating in drain water heat recovery program.	60 new builders participating – more than 200% of target achieved.
2009 (Volume Two, Section 4.2)	Low-income weatherization program targets	Union Gas	400 households participating in low-income weatherization program.	450 participating households – exceeded target.
			488,000 m^3 first year gas savings from low-income weatherization program.	514,499 m^3 in first year gas savings – exceeded target.
		Enbridge Gas Distribution	500 households participating in low-income weatherization program.	599 participating households – exceeded target.
			773,650 m^3 first year gas savings from low-income weatherization program.	824,773 m^3 in first year gas savings – exceeded target.

Note: At the time of writing this report, Enbridge Gas Distribution had not confirmed their final 2011 results and indicated that some results would likely change (by less than 10 per cent) from the draft results presented here.

Sources: Union Gas, *Final Audited Demand Side Management 2011 Annual Report* (2012); Energy & Resource Solutions, *Independent Audit of Enbridge Gas Distribution 2011 DSM Program Results* (2012); Ontario Energy Board, *Natural Gas Demand Side Management Summary Report – 2011 Results* (2012).

3 PROGRESS ON SELECTED TARGETS



3.1 COMBINED HEAT AND POWER – A DESIRABLE PATH TO ENERGY CONSERVATION?

3.1.1 INTRODUCTION

In 2005, the Minister of Energy directed the Ontario Power Authority (OPA) to integrate 1,000 MW of combined heat and power (CHP) into Ontario's electricity system. This section reviews progress made towards this 1,000 MW goal.

The Technology

Cogeneration, also known as CHP, uses one fuel to produce both heat and electricity. System designs must include a power generator and a heat recovery system, and the heat recovered is used in industrial processes or to heat nearby buildings. By utilizing heat energy that would otherwise have been wasted, CHP offers improved efficiency over conventional electricity generation (see Figure 1). This improved efficiency results in less fuel used and, theoretically, fewer emissions.

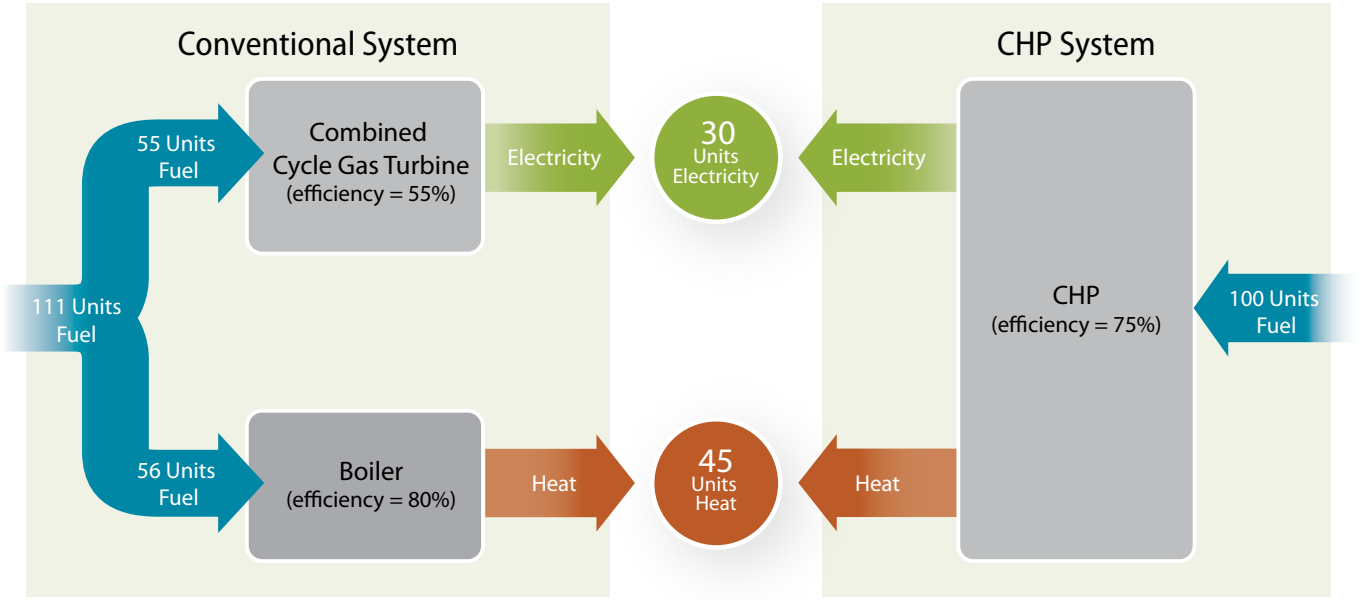


Figure 1: Energy Flow Diagram Showing a Conventional Electricity and Heat Generation System Compared to a CHP System

Note: This example shows how fuel is saved when generating electricity and heat using a CHP system. A conventional system is shown on the left-hand side. This system uses a natural gas-fired combined cycle gas turbine to produce electricity and a natural gas-fired boiler to produce thermal energy. Overall, 111 units of energy are required to power these systems and generate 75 units of thermal and electrical energy. In other words, this system has an overall efficiency of 68 per cent. To produce a comparable amount of energy using a CHP system, only 100 units of fuel are needed if we assume a CHP efficiency of 75 percent. Efficiencies for CHP systems can even exceed 80 per cent, which would result in a greater amount of energy savings when compared to combined cycle gas turbines and boilers.

The technology can also be distributed across a wide geographic area, allowing electricity generation to exist close to demand while reducing line losses and enhancing electrical grid stability.

Although the benefits of CHP are often considered from a perspective that focuses simply on electricity, this focus is too narrow. Combined heat and power systems are designed to capture excess heat energy, and thermal energy accounts for over 70 per cent of community energy needs in Canada.[18] Therefore, CHP offers an excellent opportunity for providing distributed thermal energy and avoiding the use of individual furnaces and boilers.

3.1.1.1 RELIABLE TECHNOLOGY FROM THE 1800s

Cogeneration is a mature design that has existed since the late 1800s. Before there was a fully developed electrical grid with centralized power production, steam produced through on-site combustion was the primary source of energy at industrial locations. In fact, the typical industrial design used cogeneration due to the overall efficiency benefits, as the generated exhaust steam was used for industrial heating purposes.

As a result of low fuel prices, an increase in regulations and policies surrounding electricity generation, and technology advancements resulting in pre-packaged industrial equipment (such as boilers), the use of combined heat and power (CHP) declined.[19] This trend began to change in the mid-1970s, when interest in CHP revived as attention turned towards improved efficiency and the use of alternative energy sources to enhance energy security and reliability.

Approximately 11 per cent of Europe's heat and electricity needs are met by CHP, with higher penetration rates in certain countries.[20] For example, Denmark uses CHP for over 40 per cent of its national electricity generation. In Canada, the amount of installed CHP is tracked by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). CIEEDAC has been gathering information directly from CHP operators since 2000 and has determined that cogeneration comprises approximately 7 per cent of Canada's total electricity generation. In Ontario, the total installed industrial CHP capacity is estimated to be 6 per cent of installed generation capacity (2,000 MW).[21] Based on CIEEDAC's database, Alberta and Ontario account for two-thirds of Canada's total installed CHP capacity. Alberta is estimated to have slightly more installed CHP than Ontario.

3.1.2 ONTARIO'S HISTORY PROCURING CHP THROUGH THE OPA

Directions

The first of four directions by the Minister of Energy to the OPA for CHP procurement were issued in 2005. The OPA was formally instructed by the Minister of Energy to procure up to 1,000 MW of high efficiency CHP projects across Ontario, and projects could include district energy systems (see Section 3.1.2.1). The initial procurement process for this, called "CHP I," took less than one year to complete and resulted in 414 MW of CHP projects (results for OPA CHP procurement are shown in Table 6). With a balance of over 500 MW remaining towards the 1,000 MW target, the OPA issued a Request for Expressions of Interest in June 2007 to determine if interest in additional potential projects existed, and the OPA subsequently developed CHP II. At the time, the OPA believed that CHP II would result in the remainder of procurement required under the 2005 direction; however, this was not the case. No contracts were awarded under CHP II primarily because of an unfavourable economic climate for large-scale CHP projects.[22]

A CHP plant in Helsinki, Finland

3.1.2.1 DISTRICT HEATING AS ONE APPLICATION FOR CHP

Combined heat and power (CHP) has the potential to provide district heating services where thermal energy is distributed. This is typically done by circulating water or low pressure steam using an underground piping network.[23] At the interface between the piping network and the building, a heat exchanger is situated, allowing heat transfer to take place between the piping and the building's radiator and tap water systems. District heating systems have the potential to be more efficient than conventional supply systems because CHP relies on using energy that would have otherwise been unused. Before installing a district heating system, certain factors must be considered. These factors include the fuel source for the CHP system, the timing and nature of the thermal energy demand, and a review of other potential uses for the electricity generated.

It is ideal if the consumers of the thermal energy are located relatively close together, since efficiency is eroded if the steam or hot water must be piped over a significant distance. However, larger regions have been able to implement such a system. For example, Finland's capital city, Helsinki, has successfully incorporated district heating into its long-term infrastructure plans. Since the 1950s, Helsinki has promoted a distributed heat network for buildings within the city limits and the CHP system provides over 92 per cent of the city's heating demand.[24] Helsinki currently has more than 1,230 km of underground piping, and requires approximately 20 km of new piping each year to accommodate new buildings.

Efforts in Ontario are not as mature. In 2010, the Ontario Power Authority (OPA) commissioned a study to update its information and data on district energy systems. The study was meant to further OPA's understanding of the value of district energy for use in electricity planning and to assist procurement efforts and district energy programs.[25] There are a number of district energy operations already under contract with the OPA, including:

- Durham College District Energy (2.3 MW);
- Sudbury District Energy Cogeneration Plant (5 MW) and Sudbury District Energy Hospital Cogeneration (6.7 MW); and
- Markham District Energy (which includes the Warden Energy Centre [5 MW], Birchmount Energy Centre [2.6 MW], and Bur Oak Energy Centre [3.3 MW]).

Infrastructure Ontario explores district energy opportunities for government owned and funded buildings, including campuses. The Ontario government also meets and consults with advocates of CHP and district energy systems, such as the Canadian District Energy Association and the Quality Urban Energy Systems of Tomorrow.

In June 2007, the ministry issued its second CHP direction to the OPA and instructed the agency to launch a clean energy supply Standard Offer Program (SOP), which would include small CHP.[26] Similar to Ontario's standard offer programs for renewables, the intent of an SOP for CHP was to offer a fixed price and a simplified contract process, which would make it easier for small projects to participate. The SOP was to be in place by fall 2007. Multiple stakeholder sessions were held, but the focus changed in 2009 with the introduction of the Feed-in Tariff (FIT) and no SOP was developed.[27]

Meanwhile, in April 2008, the Minister of Energy directed the OPA to procure approximately 100 MW of high-efficiency CHP from projects greater than 10 MW and powered by renewable fuels (e.g., biomass).[28] The resulting procurement process, referred to as CHP III, was undertaken and awarded 78 MW of contracts for CHP projects fuelled by biomass (although 30 MW were terminated, as shown in Table 6).

3.1.3 CURRENT EFFORTS TO PROCURE CHP – THE NOVEMBER 2010 DIRECTION

On November 23, 2010, the Minister of Energy issued the fourth CHP direction to the OPA. This direction maintains the goal of procuring 1,000 MW of CHP and replaces the previous CHP directions that were issued in June 2005, June 2007 and April 2008.[29] The 1,000 MW goal is to be met through three project streams:

- projects already procured through CHP I, II, or III;
- new individually negotiated contracts for projects larger than 20 MW; and
- a new standard offer program for projects smaller than 20 MW.

The contents of the November 2010 direction are somewhat different than the earlier directions, and it also included a list of seven factors for the OPA to consider when procuring CHP projects. In response to an information request, the ministry outlined the policy

rationale for each of the seven factors that the OPA shall consider and the full details are summarized in the endnotes of this report.[30] The ministry indicated that the policy rationale behind some of the factors was based on earlier CHP procurement efforts. Technical factors, such as designing facilities to follow heat loads, were also introduced with the rationale that such requirements would encourage more fuel efficient CHP projects. However, CHP operations typically do not generate in a pattern that follows system demand, especially if they are properly following heat loads. As a result, the OPA was also allowed to consider projects that could adapt to electricity system needs (e.g., using heat storage technologies that allow CHP operators to adjust power generation).

In addition to these factors, the November 2010 direction also differed from the earlier directions in that it lacked any associated deadline for procurement, and there was also no mention of renewable fuel. The ministry indicated that no deadline was provided because the earlier procurement processes had difficulty meeting assigned deadlines.[31] The ministry also indicated that renewable energy fuelled CHP is still eligible but was not explicitly mentioned, because it was not expected to be competitive with natural gas and energy recovery based CHP. Renewable energy fuelled CHP is also eligible under the FIT program.

3.1.4 RESULTS

CHP I, II and III – Prior to November 2010 Direction

The CHP procurement results made under CHP I, II, and III are shown in Table 6. As previously mentioned, the directions behind these procurement processes have been superseded by the November 2010 direction.

Table 6: Results of CHP Procurement Under Ministerial Directions Prior to November 2010

Energy Source (Fuel)	CHP I, II, or III	Contract Facility (Name)	Location (Municipality)	Contract Capacity (MW)	Commercial Operation Date
Natural Gas	CHP I	Durham College CHP	Oshawa	2.3	March 2008
Natural Gas	CHP I	Warden Energy Centre	Markham	5.0	June 2008
Natural Gas	CHP I	Great Northern Tri-Gen Facility	Kingsville	11.3	October 2008
Natural Gas	CHP I	London Cogeneration Facility	London	12.0	December 2008
Natural Gas	CHP I	Essar By-Product Fuel Cogeneration Facility	Sault Ste. Marie	63.0	June 2009
Natural Gas	CHP I	East Windsor Cogeneration Centre	Windsor	84.0	November 2009
Natural Gas	CHP I	Thorold Cogeneration Project	Thorold	236.4	March 2010
Biomass	CHP III	Becker Cogeneration Plant	Hornepayne	8.0	Under Construction
Biomass	CHP III	Thunder Bay Condensing Turbine Project	Thunder Bay	40.0	Under Construction
Biomass	CHP III	St. Marys' Renewable Energy Centre	Sault Ste. Marie	(30.0)	Contract Terminated due to St. Marys' Receivership
			Total (MW)	**462**	

Note: The table shows the results of procurement programs that specifically focused on CHP and resulted from ministerial direction to the OPA. In total, the OPA manages 972 MW of CHP projects, which includes some cogeneration facilities that were already in operation or under construction before the OPA was formed in January 2005. A complete list of CHP projects managed by the OPA is available at: http://www.powerauthority.on.ca/electricity-contracts/combined-heat-power

Source: Ontario Power Authority.

The majority of CHP generation contracted through the OPA resulted from the CHP I procurement process, conducted between 2005 and 2006. At the time of the original CHP directive and the first procurement efforts, Ontario's electricity supply-demand balance was much more precarious than today.[32]

November 2010 Direction

CHP IV

The procurement process for large CHP that the OPA developed in response to the November 2010 direction, CHP IV, began in June 2011 and was limited to four different regions: the Greater Toronto Area; the Kitchener, Waterloo, Cambridge and Guelph area; Hamilton; and Kingston. It received a total of three proposals for projects located in Toronto, Oshawa and Scarborough.[33] These proposals represented 280 MW of contract capacity and each project planned to use natural gas as a fuel source. The OPA had targeted 300 MW of CHP under CHP IV, so the submissions fell only slightly short of this target. However, none of the projects were offered contracts by the OPA under CHP IV. One project proposal was incomplete, while the other two proposals were rejected due to their high cost per unit of electricity produced. The OPA indicated that the required project price per unit of electricity was higher than the equivalent price offered to smaller projects through the Clean Energy Standard Offer Program (CESOP, see next subsection).

Through the November direction, the ministry gave the OPA the responsibility to determine a reasonable cost for CHP facilities.[34] The ministry indicated that earlier CHP procurements had resulted in contracts being offered at prices higher than other forms of generation, with the exception of solar power, so the impact of CHP IV procurement on ratepayers was a prime concern.[35]

The original project timeline indicated a determination of subsequent procurements under the CHP IV procurement tender would take place in the fourth quarter of 2011.[36] As of November 2012, the next steps for CHP procurement are under evaluation by the OPA and the Ministry of Energy.

Clean Energy Standard Offer Program (CESOP)

Under the November 2010 directive, the OPA was also to procure CHP projects that are 20 MW or less through an SOP. Draft rules for the CESOP were posted online in January 2011.[37] Under CESOP, the OPA divided 200 MW of capacity into two streams: 150 MW for a CHPSOP that would purchase electricity from new gas-fired CHP projects, and 50 MW for an Energy Recovery Standard Offer Program (ERSOP), which would purchase electricity generated through recovery from an existing thermal energy stream that is currently being wasted (e.g., the heat from a flare stack). The first application period (called the Launch Period) ran from May 6, 2011 until June 30, 2011, and excluded certain areas of the province due to economic and technical constraints. From July 1, 2011 to August 31, 2011, the program opened up to the entire province and applications could be submitted for these projects (called the Second Tranche).

Results of procurement under the CESOP are shown in Table 7. Only two projects with a total capacity of 5.9 MW have been procured to date, both in Markham.

Table 7: Procurement Results Under the CESOP Program

	Contracted Applications		Rejected Applications		Applications Awaiting a Decision		Total	
	# of Projects	Capacity (MW)	# of Projects	Capacity (MW)	# of Projects	Capacity (MW)	# of Projects	Capacity (MW)
CHPSOP[1]	2	5.9	4	20.4	47	271.3	53	297.6
ERSOP	0	0	2	0.2	1	20.0	3	20.2
Total	**2**	**5.9**	**6**	**20.6**	**48**	**291.3**	**56**	**317.8**

Note:

1. Of the CHPSOP projects: 14 (56.5 MW) were for district energy systems; 34 (215.1 MW) were for greenhouses; and 2 (10.2 MW) were for industrial systems.

Source: Ontario Power Authority.

According to the program rules, once projects were submitted and reviewed by the OPA under the respective SOP, the OPA would consult with other agencies and determine whether the applicable distribution and transmission systems would accommodate a

particular project. If a project could not be accommodated by the distribution and transmission system, the OPA would reject the application. If the distribution and transmission system could connect the project, the OPA would (presumably) accept the application and offer a contract. Contract offers were expected in the third quarter of 2011.[38] As of September 2012, only 2 of the 56 projects have received contracts and the majority of projects are still awaiting a decision.

The Ministry of Energy, in conjunction with the OPA, is reviewing whether proceeding with these procurements is in the best interests of ratepayers given Ontario's current supply and demand outlook (there is currently adequate generation capacity to meet electricity demand).[39] This has put the CESOP program on hold. The processing of applications (and offering contracts or rejecting applications) will not be completed until the review is concluded.

Generally, procurement via an SOP can take time. Prior to the program being placed on hold, most applications required numerous rounds of clarification requests before they were deemed to be complete.[40] The two successful projects submitted their applications during the Launch Period and did not require numerous rounds of clarification requests, so their projects were evaluated prior to the program being placed on hold.

Defining the New Path Forward Through Regional Planning

The OPA indicated to the ECO that it does not believe it is necessary at this time to contract additional CHP capacity under the November 2010 directive.[41] The OPA feels that not pursing contracts under CHP IV would deliver relief to Ontario's electricity ratepayers, while continuing to support the government's efforts to maintain a clean, reliable and cost-effective electricity system. The organization also indicated that if a need for additional generation develops, new gas capacity can be procured within a relatively short lead time. In fact, the OPA believes that the need for this type of generation should be assessed at the local level to ensure generation is developed where it is specifically needed, meets system needs and maximizes value to ratepayers. The ECO was advised by OPA that this could be accomplished through an integrated regional planning process, rather than through a provincial procurement initiative.[42]

ECO Comment

The future of CHP in Ontario looks cloudy, at least if the focus remains on a planning model that is driven by the electricity system's needs at the provincial level. Ontario does not plan for its energy needs in an integrated manner.

The recent CHP IV procurement has demonstrated that low-cost cogeneration projects appear to be in short supply, and Ontario's strong electricity supply position has left the OPA questioning the value of procuring additional CHP at this time. As most CHP projects have a limited ability to ramp up or down their electricity production, due to their need to supply heat, CHP procurement runs the risk of adding additional baseload capacity at a time when the province is in surplus. The Ministry of Energy appears to be undecided as to where to go next. It is worthwhile to examine whether 1,000 MW of CHP remains a desirable goal.

Environmental Considerations

From an environmental and energy conservation perspective, the case for cogeneration has always been that it is a more efficient use of fuel. If the alternative to CHP is generating heat by burning natural gas directly, while obtaining electricity from a centralized grid dominated by fossil-fueled power plants, then CHP is the obvious choice, reducing both energy consumption and carbon emissions. However, this situation does not describe Ontario very well. Since Ontario's electricity grid is supplied by mostly carbon-free resources, there is no guarantee that the use of gas-fired CHP will reduce carbon emissions.

In the ECO's opinion, any OPA CHP procurement should consider potential emissions reductions and account for this factor when making decisions on contract offers and prices. Maximizing the use of heat generated by CHP systems must be mandatory, and preference should be given to projects with the greatest emissions reduction potential. A project's avoided emissions would likely depend on its hours of operation. CHP projects that include an energy storage or load-following component would therefore receive credit for their ability to offset more carbon-intensive peaking generation. The ECO also notes that explicit consideration of avoided greenhouse gas emissions would inherently favour energy recovery projects (e.g., ERSOP stream) over new CHP projects. Such projects would in theory recover energy that is being lost in a system that is already installed in Ontario (e.g., a flare stack).

The ECO recommends that the Ontario Power Authority consider avoided greenhouse gas emissions as a factor in future combined heat and power procurement decisions.

The ECO believes that Ontario has the opportunity to improve its energy efficiency by capturing and using waste heat, rather than exhausting it to the natural environment. This waste heat – from any process, such as thermal power generation or industrial processing – can be fed into nearby complementary systems or used in district heating systems. A key challenge in developing district heating systems is ensuring that there is a customer base that can make use of the waste heat. This requires key stakeholders to work together and co-operate while developing long-term community energy plans and infrastructure investments. One way to ensure that such infrastructure investments are considered during municipal planning processes would be to incorporate district energy into the Provincial Policy Statement. Municipalities use this to develop official plans and it includes policies on key issues that affect communities, including energy conservation and efficiency.

3.1.4.1 COGENERATION FUNDING THROUGH CONSERVATION PROGRAMS

Smaller generation and cogeneration projects (less than 10 MW for distribution-connected customers or 20 MW for transmission-connected customers) are also eligible for capital incentive funding through two OPA conservation programs: the Industrial Accelerator; and the Process and Systems Upgrade Initiative (PSUI). As opposed to the larger CHP procurements, these projects would be used solely to reduce the customer's need for grid electricity, not to sell electricity to the grid.

Several LDCs reported (in their Conservation and Demand Management annual reports) that there was interest from their customers in using the PSUI program to fund natural gas-fired generation or cogeneration projects, but it was unclear whether these projects would be approved by the OPA. The OPA notes that it has provided the eligibility guidelines to LDCs and large industrial customers for both the Industrial Accelerator and PSUI programs. These guidelines state that OPA approval is required, and the impact on ratepayers will be considered. Preference will be given to projects that: provide a net efficiency benefit to the participant; are driven by a primary energy source of process waste heat, waste power, waste by-product or waste gas; and are cost effective from both the customer's and OPA's perspective. It appears that there will be no approval of natural gas-fired CHP projects through the PSUI program, at least in the short term. OPA officials advised attendees of an OPA Management Teleconference on November 2, 2012, that the agency has put a pause on natural gas-fired CHP projects in order to consider their impact on conservation and the PSUI program.

While the ECO believes that clarity must be provided to LDCs where possible, the ECO's general cautions about gas-fired cogeneration also apply here, especially if the OPA removes the pause placed on natural gas-fired CHP projects. The ECO supports the OPA's choice to retain final decision-making authority. Specifically, the ECO suggests that the OPA consider avoided greenhouse gas emissions when determining whether to fund proposed generation projects through the Industrial Accelerator and PSUI programs, as is done in California.[43] The ECO notes that the OPA's stated preference for projects that provide a net efficiency benefit and/or are fuelled by waste energy is an (imperfect) proxy for this type of calculation, and the OPA should favour projects that reduce energy consumption and greenhouse gas emissions.

A Localized Approach

If there is not a province-wide environmental rationale for supporting gas-fired CHP everywhere, then each CHP project will need to stand on its own merits. The OPA has indicated that the province as a whole does not need additional CHP capacity at this time and, if future procurement of CHP were to take place, the projects should be assessed at the local level via an integrated regional planning process, rather than through provincial procurement. This seems reasonable, especially given the local benefits that CHP systems can offer from both an electricity and district heating perspective.

The ECO recommends that the Minister of Energy re-examine the combined heat and power target and post a policy proposal for public comment on the Environmental Registry.

By re-examining the target using the Environmental Registry, the government is required to solicit public comments and publicly report the rationale for its decision.

Photo: Markham District Energy Inc.

To date, it appears that evaluation of proposed CHP systems has been focused on the electricity system benefits, instead of placing a high value on the energy conservation potential offered through heat recovery systems. To receive the most benefits from CHP installations, local energy supply options should be fully reviewed because results are site-specific. Priority should be given to those projects that can benefit the most from CHP installations and district heating systems. For example, one area that could benefit from CHP procurement on a local or regional basis is the City of Toronto. Toronto faces growing energy demand in the core as a result of new building development, while at the same time it faces transmission constraints for bringing energy into the downtown core. Distributed energy solutions, including CHP and district energy, can provide the added capacity to meet peak demand, provide additional energy supply, and reduce transmission congestion; they could, therefore, be an attractive energy resource for the city.[44] District heating systems and distributed generation can expand the capacity of the existing electrical grid and address specific regional issues. These benefits support using a localized approach for CHP procurement.

The ECO also hopes that the review of the existing applications submitted under CESOP will be completed promptly, since the large majority of applicants have been left waiting for the OPA to make a decision on their proposals.

3.2 THE 2014 LDC ELECTRICITY CONSERVATION TARGETS, YEAR ONE

3.2.1 INTRODUCTION

The year 2011 was the first year of operation of Ontario's new framework for the design and delivery of electricity conservation programs. The new framework provides increased responsibilities and opportunities for Ontario's Local Distribution Companies (LDCs), while maintaining a province-wide role for the Ontario Power Authority (OPA). The rules of this framework were established through directives from the then-Minister of Energy and Infrastructure to the Ontario Energy Board (OEB) and the OPA in spring 2010, and further codified through the OEB's *Conservation and Demand Management Code For Electricity Distributors* (2010), and the supplemental *Guidelines for Electricity Distributor Conservation and Demand Management* (2012).

Each of Ontario's then 80 (now 76)[45] LDCs was assigned two electricity conservation targets measuring the performance of the LDC's conservation programs: a cumulative energy savings target measured against the total amount of electricity saved between 2011 and 2014, and a peak demand target measured against the reduction in the LDC's contribution to provincial peak demand in 2014. The provincial aggregate of the individual LDC targets is 6,000 gigawatt-hours (GWh) of cumulative energy savings between 2011 and 2014 (roughly 1 per cent of the total electricity expected to be consumed in Ontario over these four years), and 1,330 megawatts (MW) of peak demand reduction in 2014 (roughly 5 per cent of the expected Ontario peak demand in that year). LDCs could meet their targets by delivering conservation programs designed by the OPA (also known as Tier 1 or "OPA-Contracted Province-Wide" programs, listed in Table 8), LDC-designed programs ("Board-Approved CDM Programs" or "BAPs", also known as Tier 2/3 programs), or a combination of both types of programs.

LDCs failing to meet their targets will be in violation of their license conditions, and subject to (as yet undefined) disciplinary action from the OEB, while distributors reaching at least 80 per cent of both of their targets will be eligible for performance incentive payments from the OEB. These performance incentives increase with the level of LDC achievement (up to an LDC achieving 150 per cent of its targets, at which point incentives are capped). LDCs are also eligible for a cost-effectiveness incentive from the OPA, if they do not spend their full program administration budget.

All funding for conservation programming will come from Ontario ratepayers, through the Global Adjustment charge on customer bills. Funding flows from the OPA to LDCs and to customers (in the case of incentives paid to customers to encourage their participation in the program).

For more detailed reviews of the Conservation and Demand Management Code and the establishment of LDC conservation targets, see previous ECO reports.[46]

3.2.2 PROGRAM OFFERINGS

Despite the original intent of the new conservation framework to provide opportunities for LDC-designed programs, LDCs began and finished 2011 with no BAPs in operation.[47]

In late 2010, LDCs were required to file conservation and demand management (CDM) strategies with the OEB, which were intended to set out a road map for how each LDC proposed to meet its conservation target. For the province as a whole, the OPA estimated that Province-Wide programs could deliver savings accounting for 78 per cent of the aggregate peak demand target and 91 per cent of the aggregate energy target.[48] BAPs would presumably be needed to make up the remainder of savings. The role that LDCs expected BAPs to play varied widely. In some cases, LDCs were expecting that as much as one-third of their targets might be met through BAPs, while other LDCs expected to meet their targets entirely through Province-Wide programs. The CDM strategies had proposed a wide variety of BAPs, although many of these programs were still in the conceptual stage. Some examples of proposed programs included municipal energy efficiency leadership, water heater load shifting, and incentives for ENERGY STAR® dishwashers and washing machines.

Applications for BAPs must be approved by the OEB. The first applications for BAPs were made by Toronto Hydro and Hydro One/Hydro One Brampton, but following unfavourable rulings by the OEB in early 2011, these utilities chose not to proceed with the proposed BAPs.[49] As of December 2012, there have still been no additional applications for BAPs since the Toronto Hydro and Hydro One/Hydro One Brampton filings. As the ECO had predicted, the overly restrictive provisions on "duplication" of Province-Wide programs have proven a barrier to BAPs.[50]

Table 8: Description of saveONenergy Province-Wide (Tier 1) Conservation Programs and Initiatives

Initiative	Description
Consumer Program	
Appliance Retirement (Fridge & Freezer Pickup)	Free door-to-door pickup and disposal of old, inefficient fridges and freezers, window air conditioners and dehumidifiers.
Appliance Exchange	In-store trade-in of old, inefficient window air conditioners and dehumidifiers for coupons towards purchase of newer, more efficient models.
HVAC Incentives (Heating & Cooling Incentive)	Incentives for purchasing high-efficiency central air conditioning or furnaces with high-efficiency motors.
Conservation Instant Coupon Booklet; Bi-Annual Retailer Event; Retailer Co-op	Incentive coupons, in-store discounts and retailer promotions reducing purchase price of small energy efficient products, such as lighting and programmable thermostats.
Residential New Construction	Incentives for builders that exceed the Ontario Building Code in energy efficiency of new home construction.
Residential Demand Response (*peaksaver* Extension; *peaksaver* PLUS)	Demand response program that centrally reduces consumption of air conditioners, electric water heaters and pool pumps during periods of high system demand. *peaksaver* PLUS (not launched until 2012) also provides participants with an in-home energy display to track their energy consumption.
Business Program	
Equipment Replacement Incentive (Retrofit)	Incentives for energy-saving measures in existing buildings. Fixed incentives for specific measures; variable incentives (based on projected energy or demand savings) for engineered or custom projects.
Direct Install Lighting	Free, turnkey, energy-efficient lighting upgrades for small business customers.
Energy Audit; Existing Building Commissioning	Incentives for energy audits or commissioning of chillers, in order to identify energy-saving opportunities.
New Construction and Major Renovation (High Performance New Construction)	Incentives for energy efficiency measures in new buildings or major renovations that exceed Ontario Building Code. Fixed incentives for specific measures; variable incentives (based on projected energy or demand savings) for engineered or custom projects.
Industrial Program	
Process and Systems Upgrade	Incentives for large industrial energy efficiency projects that can deliver large savings (100 MWh or more annually), including funding for initial engineering studies to identify and quantify opportunities.
Monitoring and Targeting	Funding for installation of monitoring and targeting equipment in order to understand energy consumption patterns and identify energy saving opportunities.
Energy Manager	Funding for a dedicated energy manager (which can be shared by firms) to identify and act on energy saving opportunities.
Key Account Manager	Funding for LDCs to employ a specialized account manager to work with customers on industrial conservation initiatives.
Demand Response 3	Incentives to large electricity customers in return for reducing electricity consumption at times of high system demand.
Home Assistance Program	
Low Income Initiative (Home Assistance)	Free audit and installation of energy efficiency measures for qualified low-income customers. Co-ordinated in some areas with gas utilities.

Note: In some cases, official initiative names differ from the names under which the initiatives are marketed to customers. In these cases, the official name is given first, followed by the common name in brackets.

There are four OPA-Contracted Province-Wide "programs" – the Consumer Program, the Business Program, the Industrial Program, and the Home Assistance Program, each of which is composed of one or more "initiatives." There is a close, but not exact, match between the program name and the sector targeted. The Consumer Program is designed primarily for the residential sector, but also includes small commercial participants in the Residential Demand Response initiative. The Business Program is primarily for the commercial and institutional sector, but also includes industrial and multi-residential participants in the Retrofit initiative. The Industrial Program includes commercial and institutional participants in the Demand Response 3 initiative. The Home Assistance Program benefits residential customers.

With no BAPs in operation, LDC program offerings in 2011 were limited to the suite of Province-Wide CDM Programs, which LDCs enter into a contract with the OPA to deliver. These "programs" and "initiatives" are designed by the OPA and promoted using the saveONenergy mark, and are described in Table 8. Some, but not all, were variations on programs that had been offered in previous years. The relative roles of the LDC and the OPA vary with the initiative – some initiatives are managed centrally by the OPA, with the LDC's role limited to promotion (e.g., Demand Response 3). Other initiatives are managed directly by the LDC or subcontracted (e.g., Direct Install Lighting).

Some initiatives that were intended to form part of the suite of Province-Wide CDM programs have not been launched, including a residential initiative for high-efficiency televisions and set-top boxes and a direct install initiative of efficient space cooling equipment for small businesses (similar to the current direct install lighting initiative). The OPA reports that these initiatives have not been launched as they require a relatively high level of administrative effort in proportion to the savings produced (programs not in market were expected to account for only approximately 4 per cent of peak demand savings and 7 per cent of energy savings of all Province-Wide programs).[51]

The full suite of Province-Wide conservation programs shown in Table 8 was not ready to go on January 1, 2011. Final program schedules[52] for most residential and business initiatives were available from the OPA by January or February 2011, but schedules for industrial initiatives, the Home Assistance Program, and two key residential and business initiatives were not available until May 2011 (August 2011 in the case of *peaksaver* PLUS, although LDCs were allowed to offer an older version of the *peaksaver* program while the updated program was in development). The date by which individual LDCs were actively offering programs was often several months later than the date program schedules were finalized, particularly for LDCs that subcontracted delivery of conservation programs. No utilities launched *peaksaver* PLUS in 2011. For these reasons, overall aggregate results for all programs in 2011 will not be based on a full year of LDC activity.

3.2.3 2011 PROGRAM RESULTS

In aggregate, the conservation programs of all Ontario LDCs achieved 2011 net annual energy savings of 605.5 GWh and a 2011 net annual peak demand reduction of 215.7 MW. This represents a reduction of about 0.4 per cent of Ontario's total 2011 electricity consumption (141.5 terawatt-hours [TWh]), and a peak demand reduction of just less than 1 per cent of the actual 2011 peak of 25,450 MW.

Results throughout this section are presented as net savings, because the official targets are measured against net savings. Gross savings in 2011 were 946.1 GWh (156 per cent of net energy savings) and 307.6 MW (143 per cent of net peak demand reduction). The major difference between gross savings and net savings is that savings from "free-riders" (program participants who would have undertaken conservation measures even in the absence of program assistance) are removed from the results and do not count towards net savings. Conversion of gross savings to net savings is based on information derived from the OPA's program evaluations. As final evaluation reports for 2011 were not available at the time of publication, the ECO has not had a chance to review the assumptions behind these conversion factors.

Figure 2 shows progress towards 2014 targets, as of the end of 2011. Most energy-saving measures installed in 2011 will still be operating in 2014 and will deliver energy savings in each year from 2011 to 2014. Therefore, the cumulative energy savings achieved to date for 2011 to 2014 (2,388 GWh) is approximately four times the 2011 savings.

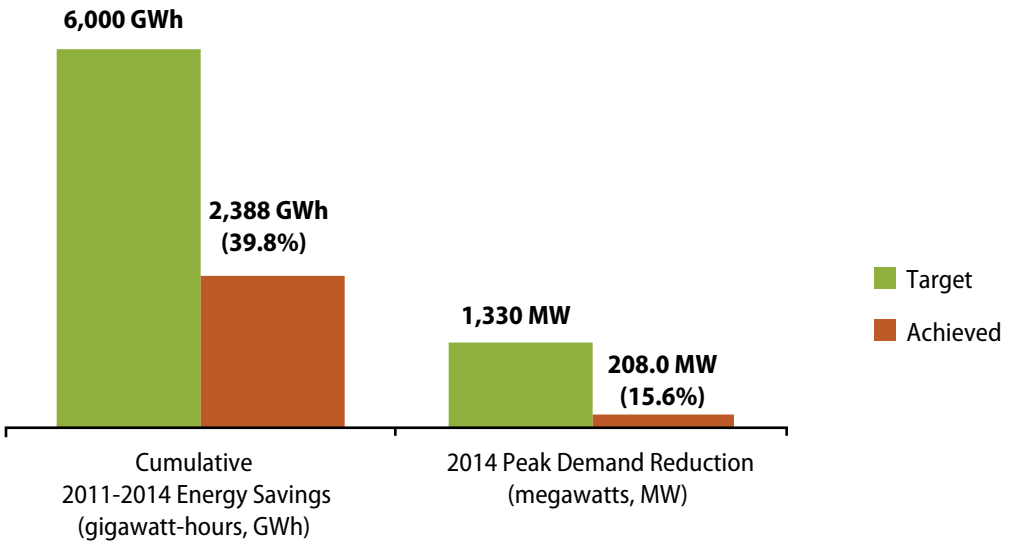


Figure 2: Ontario-Wide Progress Towards 2014 LDC Conservation Targets, as of December 31, 2011

Note: In some cases, demand response contracts need to be re-procured before 2014, meaning that not all peak demand savings are guaranteed to persist in 2014. One approach in estimating 2014 peak demand savings is to assume that none of the existing demand response customers (Demand Response 3 and Residential Demand Response) remain in place until 2014. This produces an estimated 2014 peak demand reduction of 128.9 MW (9.7 per cent of target). An alternative approach is to assume that all existing demand response customers remain in place in 2014. This produces an estimated 2014 peak demand reduction of 208.0 MW (15.6 per cent of target). The ECO believes that the second method is the most accurate method of estimating progress towards the 2014 target; most customers that have already committed to demand response are likely to remain participants, at least until the end of 2014 (after which time funding is uncertain). Results shown throughout this section use the second method of estimating 2014 peak demand reduction.

Source: Ontario Power Authority.

The numbers show that Ontario LDCs had achieved approximately 40 per cent of the energy target and 16 per cent of the peak demand target based on conservation projects completed by the end of 2011.

One way to estimate the likelihood that the aggregate 2014 provincial targets will be met is to assume that programs achieve the same level of success in attracting new participants (i.e., who will be able to save the same amount of incremental conservation savings) in each of the following three years as was achieved in 2011. Cumulative energy savings from 2011 to 2014 would then be approximately 6,055 GWh (101 per cent of the target) and peak demand savings in 2014 would be 863 MW (66 per cent of the target).[53]

However, this may be a conservative assumption. Results in 2011 were dampened by the start-up process of conservation delivery for LDCs and the late launch dates of key programs. In future years, LDCs will also be credited with some additional savings towards the peak demand target due to time-of-use (TOU) pricing, as the OEB has clarified (in its CDM guidelines) that these savings are eligible to count towards LDC targets. The OPA has not yet completed an analysis of the peak demand savings from TOU pricing, although the ECO expects savings to be rather minor, in part, due to the lower than expected price differential between peak and off-peak electricity prices. The current price ratio between peak and off-peak prices is less than 2:1, whereas it was around 3:1 from mid-2006 to mid-2008.

On the other hand (as discussed further below), the 2011 annual results were boosted by the inclusion of 2011 results from pre-2011 programs. Results in future years will not be able to take advantage of this one-time effect. There is also a possibility that some popular programs are approaching market saturation and will deliver lower savings in future years.

Therefore, it remains to be seen whether incremental results in coming years will be higher or lower than in 2011. If the opposing factors cancel out and future results are similar to 2011, then, at a provincial level, Ontario's LDCs will just meet the aggregate 2014 energy target, while falling one-third short of the peak demand target.

Results By Initiative

Moving from the general to the specific, Table 9 breaks down 2011 results by conservation initiative.

Table 9: Savings from 2011 Province-Wide (Tier 1) Programs by Initiative

Initiative[1,2]	2011 Net Annual Energy Savings (GWh)	2011 Net Annual Peak Demand Savings (MW)	Participation
Consumer Program			
Appliance Retirement (Fridge & Freezer Pickup)	23.0	3.3	56,110 appliances
Appliance Exchange	0.5	0.4	3,688 appliances
HVAC Incentives (Heating & Cooling Incentive)	59.4	32.0	111,587 installations
Conservation Instant Coupon Booklet	21.2	1.3	559,462 products
Bi-Annual Retailer Event	29.4	1.7	870,332 products
Retailer Co-op	0.0	0.0	152 products
Residential New Construction	0.0	0.0	7 projects
Residential Demand Response (*peaksaver* Extension)	0.0	10.4	19,682 devices
Consumer Program – All Initiatives	**133.6**	**49.2**	
Business Program			
Equipment Replacement Incentive (Retrofit)	164.9	29.1	2,949 projects
Direct Install Lighting	61.1	23.7	20,297 projects
Energy Audit	0.0	0.0	103 audits
New Construction and Major Renovation (High Performance New Construction)	0.4	0.1	10 projects
Pre-2011 Programs[3]	241.9	44.8	2,863 projects
Business Program – All Initiatives	**468.2**	**97.8**	
Industrial Program			
Demand Response 3	3.7	68.7	269 facilities
Industrial Program – All Initiatives	**3.7**	**68.7**	
Home Assistance Program			
Low Income Initiative (Home Assistance)	0.0	0.0	46 projects
All Province-Wide (Tier 1) Programs	**605.5**	**215.7**	

Notes:

1. No results were recorded in 2011 for initiatives not listed.
2. No results were recorded in 2011 for Board-Approved CDM Programs (Tier 2/Tier 3 Programs).
3. "Pre-2011 programs" include Data Centre Incentive Program, Electricity Retrofit Incentive Program, EnWin Green Suites, High Performance New Construction, Multifamily Energy Efficiency Rebate, and Toronto Comprehensive.

Source: Ontario Power Authority.

Results from the Business Program dominate the 2011 results, accounting for 45 per cent of peak demand savings and a whopping 77 per cent of energy savings. Key 2011 initiatives of the Province-Wide programs that made major contributions towards the peak demand target were the Demand Response 3 initiative, the Retrofit initiative, and the HVAC Incentives initiative. Key contributors to the energy target were the Retrofit initiative, the Direct Install Lighting initiative, and the HVAC Incentives initiative.

Of interest is the large contribution of pre-2011 programs to 2011 results (40 per cent of 2011 energy savings and 21 per cent of 2011 peak demand reduction). These are results for projects that were initiated under previous conservation programs (primarily retrofit programs for the commercial sector) prior to 2011, but were not completed (and thus, eligible for incentives) until after January 1, 2011.[54] Following clarification in the OEB's CDM guidelines, LDCs have been permitted to count the savings arising from these pre-2011 initiatives against their 2014 CDM targets. Unfortunately, this clarification was made in April 2012, not when the CDM code was released in September 2010. The delay may have reduced LDC effort in promoting these programs in the last months of 2010.

The delayed results from pre-2011 programs show that many complex conservation projects require more than a year from initiation to completion, and only then begin to deliver energy savings. This can also be seen by the negligible results in 2011 of the High Performance New Construction initiative and the Process and Systems Upgrade initiative which had no completed projects in 2011. Both of these programs target complex, large-dollar conservation investments and may yield results in future years. The lack of 2011 results means that it is too early to tell whether these initiatives will contribute significantly to the 2014 targets.

3.2.3.1 RESULTS OF OPA-ONLY PROGRAMS

Not all conservation programs funded by electricity ratepayers count towards LDC targets.[55] The Ontario Power Authority also directly operates conservation programs for large electricity customers connected directly to the transmission system, with no LDC involvement. These programs are Industrial Accelerator (a program very similar to the Process and Systems Upgrade Initiative offered to LDC customers), Demand Response 2, and Demand Response 3 (identical to the program of the same name offered to LDC customers). The OPA also has the capability to reduce the electricity consumption of customers who enrolled in the *peaksaver* program prior to 2011 that have not converted to the new *peaksaver* PLUS program offered by LDCs.

The performance of these programs in 2011 is shown below. OPA-Only programs deliver a significant amount of peak demand reduction (almost double the reduction from LDC programs), but a small amount of energy savings (roughly one-tenth of the savings from LDC programs). Total spending on OPA-Only programs in 2011 was $60.8 million.

Table 10: Results from 2011 OPA-Only Programs

Program	2011 Net Annual Energy Savings (GWh)	2011 Net Annual Peak Demand Reduction (MW)
Demand Response 2	54.3	66.8
Demand Response 3	10.1	230.4
Residential Demand Response (*peaksaver*)	0.2	96.4
Industrial Accelerator	1.2	0.5
All OPA-Only Programs	**65.8**	**394.1**

Source: Ontario Power Authority.

Individual LDC Performance

The decision to assign conservation targets to each individual LDC makes LDCs more accountable for conservation results and gives them a stake in promoting conservation. Figure 3 shows the variation in 2011 conservation results among LDCs, measured by the progress each LDC has achieved to date against its energy and peak demand targets (each point represents one LDC). See Appendix D for complete numerical results for each LDC.

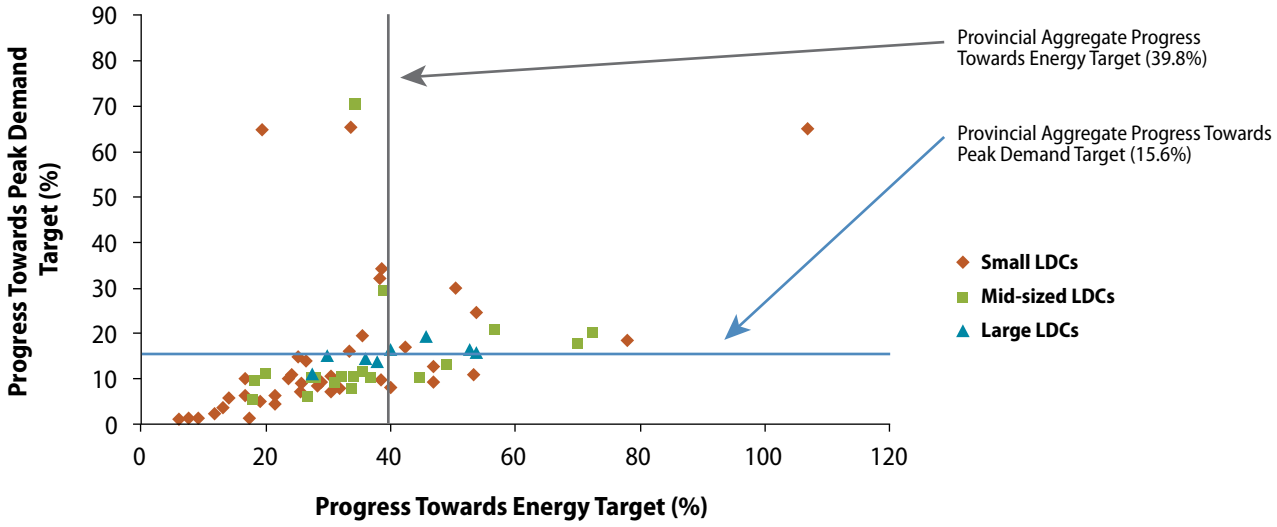


Figure 3: LDC Progress Towards 2014 Conservation Targets, as of December 31, 2011

Note: Progress towards peak demand target assumes that savings from demand response programs persist until 2014 (method 2). "LDC size" is based on the size of each LDC's energy target (which in turn was based on the LDC's share of provincial energy consumption). Small LDCs have an energy target accounting for less than 0.5% of the aggregate 2014 LDC energy target, mid-size LDCs have an energy target accounting for between 0.5% and 2% of the aggregate target, and large LDCs have an energy target accounting for more than 2% of the aggregate energy target.

Source: Ontario Power Authority.

There is a wide variation among LDCs with regard to progress on both the peak demand and energy targets. This variation may be due to several factors, including: the level of effort LDCs put into promoting conservation programs in 2011; the date at which LDCs were able to bring 2011 conservation programs to market; an LDC's conservation efforts in previous years; and the composition of the LDC's customer base (for example, LDCs without large industrial customers will find it more difficult to attract participants to the Demand Response 3 program).

As Figure 3 shows, results for smaller LDCs are much more variable than for larger LDCs. The performance of smaller LDCs will vary greatly depending on whether or not their largest customers participate in conservation programs. On the average, however, LDC size is not a strong predictor of results achieved to date, particularly for peak demand reduction. This is shown in Table 11.

Table 11: Progress of Ontario LDCs Towards 2014 Conservation Targets, by LDC Size

LDC Size	Weighted Mean Progress towards Energy Target (%)	Weighted Mean Progress towards Peak Demand Target (%)
Small (47 LDCs)	34.2	17.5
Mid-size (21 LDCs)	38.5	14.2
Large (8 LDCs)	40.8	15.9
All LDCs (76)	**39.8**	**15.6**

In their CDM strategies (prepared in fall 2010), LDCs were required to estimate their expected energy and peak demand savings in each year from 2011 to 2014, as milestones towards their 2014 targets. However, these estimates were based on the assumption that all Tier 1 programs would be in market at the beginning of 2011. In addition, many LDCs did not correctly interpret the cumulative nature of the energy target, or the way that the persistence of savings from demand response programs would be calculated. As the ECO predicted in a previous report, the mixture of cumulative and annual metrics for targets appears to have created confusion and added complexity to the task of communicating conservation policy.

For these reasons, the ECO believes that the original forecasts in the CDM strategies are of little value, and does not find it worthwhile to compare the actual 2011 results of each LDC against these forecasts. In the ECO's view, comparison of results achieved to date against the final targets is of more value.

Program Cost and Cost Effectiveness

Total electricity conservation spending in 2011 was $269.8 million dollars, including spending for OPA programs without LDC involvement.[56] This spending is recovered from all electricity ratepayers, through the Global Adjustment charge. With total Ontario electricity consumption of 141.5 TWh in 2011, this represents a charge of 0.19 cents (one-fifth of a penny) per kilowatt-hour on average. This represents about 2.5 per cent of the "electricity" charge on customer bills, and an even lower percentage if other charges such as delivery, regulatory charges and the Debt Retirement Charge are included.

A breakdown of spending for Tier 1 conservation programs by program and by type of cost is shown in Table 12. Approximately 80 per cent of funding went towards participant incentives.

Table 12: 2011 Province-Wide (Tier 1) Conservation Program Spending

Program	Central Program Services[1] ($)	Customer Incentives, Participant Based Funding, and Capability Building ($)	LDC Administration Costs ($)	Total Actual Charges ($)
Consumer Program	17,837,841	40,879,372	9,013,772	67,730,984
Business Program	5,693,241	115,269,033	12,046,822	133,009,095
Industrial Program	833,952	4,954,272	1,961,333	7,749,557
Home Assistance Program	13,165	0	457,911	471,076
Total – All Province-Wide (Tier 1) Programs	**24,378,199**	**161,102,677**	**23,479,837**	**208,960,712**

Note:

1. Central Program Services include: program delivery services, evaluation, measurement, verification, marketing, awareness campaigns, IT support, call centre, technical review services, and settlement services.

Source: Ontario Power Authority.

The cost effectiveness of 2011 conservation programs is shown in Table 13, using several different tests.[57] The Total Resource Cost test compares the lifetime program benefits (primarily due to avoided electricity, transmission, and distribution costs) with the program costs (e.g., administration and program delivery costs, along with any incremental cost of energy-efficient equipment) to all parties, including the program administrator and program participant.

The Program Administrator Cost test compares the benefits and costs only from the perspective of the program administrator (i.e., the OPA). For both tests, a benefit:cost ratio greater than 1 means that the program benefits exceed the costs; the higher the ratio, the more desirable a program is. An ideal program scores highly on both tests. The OPA is required to ensure that its overall portfolio of Province-Wide programs is cost effective, although individual measures, initiatives and programs do not need to be cost effective. It should be noted that the OPA's cost-effectiveness tests currently assign no value to the environmental benefits of conservation, including the reduction in greenhouse gas emissions, thus undervaluing conservation from the ECO's point of view. By the ECO's calculation, the benefit of avoided greenhouse gas emissions from 2011 conservation program activities was at least $22 million dollars, assuming a value of $30 per tonne of avoided CO_2 emissions.[58]

Table 13: Cost Effectiveness of 2011 Province-Wide (Tier 1) Conservation Programs

Program	Total Resource Cost Test (benefit:cost ratio)	Program Administrator Cost Test (benefit:cost ratio)	Levelized Delivery Cost	
			Energy Efficiency (cents/kWh)	Demand Response (dollars/MW-month)
Consumer	1.46	2.34	3.85	9,653.86
Business	1.14	2.73	2.83	
Industrial (Demand Response 3 only)	2.98	0.93		11,103.09
Total – All Province-Wide (Tier 1) Programs	**1.23**	**2.52**	**3.07**	**10,179.00**

Note: Consumer program results also include commercial participants in Residential Demand Response initiative; Business program results also include industrial participants in Retrofit initiative.

Source: Ontario Power Authority.

As Table 13 shows, the portfolio of OPA programs was indeed cost effective in 2011 from the perspective of both tests. However, within this portfolio, not all initiatives have been cost effective (results at the initiative level are not shown in Table 13, with the exception of Demand Response 3). In particular, the *peaksaver* initiative (not *peaksaver* PLUS, which was not rolled out in 2011) has not been cost effective using either test. The Demand Response 3 initiative for larger industrial and commercial customers had a Program Administrator Cost test ratio less than 1, although this initiative is very effective from the perspective of the Total Resource Cost test.

The levelized delivery cost (also shown in Table 13) can be used to compare the cost of conservation with the cost of electricity supply, by calculating the average cost per unit of electricity saved (or produced). Each unit of electricity saved by the portfolio of 2011 energy efficiency programs cost ratepayers approximately 3 cents per kilowatt-hour, far less than the cost of any new source of supply. The levelized delivery cost for demand response programs is provided as the monthly cost per MW. The average of $10,179/MW-month for demand response programs compares favourably with an average of $13,187 for gas-fired generation.[59]

3.2.4 PROGRAM ISSUES

Operational Improvements

The OPA has attempted to work with LDCs to improve the effectiveness of Province-Wide programs. The primary vehicle for making improvements to conservation programs is the Change Management process. The OPA notes that substantial program improvements suggested by LDCs, based on their program delivery experiences, have been made through this process. In addition, an Expedited Change Management process has been developed, which will allow minor changes to programs to be made faster (reducing estimated time from 3-6 months down to 3-8 weeks). The Expedited Change Management process is expected to be available in fall 2012.

The OPA has also attempted to be flexible in incorporating LDC ideas for completely new initiatives into the Province-Wide program suite, likely in response to the reluctance LDCs now have in submitting applications for BAPs to the OEB. Several LDC ideas originally considered for BAPs (e.g., commercial monitoring and targeting, non-capital-intensive energy audits) have been added to the Province-Wide program suite, and several more additions are expected for 2013. The OPA can also fund pilot programs through its Conservation Fund, and is intending to fund an LDC-led residential neighbourhood benchmarking pilot program in the near future.

One issue that appears to have been successfully resolved by the OPA and LDCs is the administrative hassles experienced by companies that wish to undertake conservation efforts and have stores located in multiple LDC service territories (e.g., chain stores). Previously, these organizations needed to submit multiple applications (one per LDC). However, there is now a "Head Office" model in place that allows companies to work with only one LDC in processing their applications, a change that greatly simplifies the process. In its 2011 CDM annual report, Hydro One noted that it had great success using the Head Office model to attract applications from some major chains to the Retrofit initiative.[60]

LDC Concerns

Despite the positive steps noted in the previous section, LDCs continue to have concerns about the framework for conservation program delivery in Ontario, particularly emphasizing that the framework can tend to engender monolithic programs not well tailored to individual LDCs' customer characteristics and load profiles. Many of these concerns are described in the 2011 LDC CDM annual reports and in a publication of the Electricity Distributors Association, *Innovation From the Ground Up: Locally Driven Conservation*.

Not surprisingly, one dominant issue has been the failure of the current framework to enable distributors to offer a mix of programs that is best suited to their service territory. LDCs have stated that the reach of Province-Wide CDM programs is not ideal and they have limited opportunities to deliver unique programs that target specific markets. There are relatively few initiatives currently available for small businesses and residential customers. The OPA's decision not to bring to market some of the proposed Tier 1 initiatives (e.g., pool pumps, high-efficiency televisions, direct service space cooling for small businesses) may make sense on a provincial level, but it may hurt utilities with a larger proportion of residential and small business customers. In particular, several LDCs noted that they had expected the direct service space cooling initiative to deliver savings, given the success of the similar direct install lighting initiative. Several LDCs also noted the need for specialized programs to support retrofits for the public sector.

Meanwhile, the OEB's onerous regulatory process and treatment of the initial BAP applications means that there will likely be few, if any, future applications for BAPs. Only one of the 2011 LDC CDM reports filed in September 2012 (Guelph Hydro) states a definite intention to seek approval for a BAP in the future, although a few other LDCs indicate that they are still considering the possibility. LDCs who want to offer customized or unique programs for their service territory have no other option but to seek approval from the OPA.

Other LDC concerns deal with operational issues and the relationship between the OPA and LDCs:

- LDCs have limited influence in the design and improvement of Province-Wide programs. While the Change Management process provides a vehicle to propose program improvements, it moves slowly and final decision-making authority rests with the OPA.
- The application process, contracts and supporting tools (such as the iCon system) for Province-Wide programs are overly complex and burdensome for program applicants. For example, the Residential New Home Construction initiative has required a separate application for each dwelling, making the initiative not worth the effort for tract home builders.
- LDCs have had difficulty bringing certain initiatives to market due to overly prescriptive requirements. For example, many LDCs have struggled to bring the *peaksaver* PLUS initiative to market because it has proven difficult to find an in-home display product that meets the OPA's requirements and works with the LDC's metering technology.
- The OPA's requirement for program participants to waive their rights to environmental attributes arising from conservation projects partially funded through incentives remains a barrier to participation for larger customers.[61] For example, London Hydro reports that its largest electricity customer is unwilling to participate in conservation programs for this reason. Again, there may be common ground for resolution as both the OPA and LDCs recognize the potential monetary value of carbon offsets is likely small and energy bill reductions from participating in Province-Wide programs are comparatively much larger.
- It is unclear whether the OPA will approve funding applications for projects that would reduce electricity consumption by installing "behind the meter" generation or co-generation. This issue is discussed further in Section 3.1.4.1 of this report.

Some of the concerns raised by LDCs go beyond the OPA-LDC relationship, and deal with the overall conservation framework established by ministerial directives, including the role of the OEB. These concerns cannot readily be addressed without the action of the Ministry of Energy or the OEB.

The largest concern of this nature is the lack of a formal commitment to conservation beyond 2014. This hard stop date means that LDCs will be reluctant to invest resources in developing new programs or hiring staff. It also means that customers (particularly for large projects, such as condominiums that would qualify for the High Performance New Construction initiative) are reluctant to participate in existing programs, not knowing if their projects will be completed by 2014, and whether incentives will be available after that date. A similar concern exists about new demand response contracts – potential participants may not be willing to make the necessary investments to participate in programs without a clear commitment to post-2014 funding.

The OPA agrees with LDC concerns that a guarantee of funding is needed for projects that are not completed by December 31, 2014, noting that this risk "may jeopardize reaching target if not addressed sooner rather than later."[62] However, the OPA does not have the authority on its own to guarantee funding beyond 2014. The Ministry of Energy was non-committal when asked by the ECO about the issue of carry-over funding, stating only that "we expect to be working closely with LDCs and the OPA to develop a transition plan and continuous delivery of programs post 2014."[63] More generally, the ministry indicated that the Long-Term Energy Plan's long-term conservation targets (which reach out as far as 2030) are a sign that the government will continue to invest in conservation beyond 2014.

LDCs have identified additional concerns with the CDM framework:

- Province-Wide CDM programs are driven by the target of reducing Ontario summer peak demand, instead of meeting customer needs. Distributors believe that a more customer-centric approach designed to reduce customer bills would yield improved results.
- The balance between risk and reward is not properly aligned under the current framework. LDCs note that the existing incentives for successful performance may be too low to make conservation a priority for senior management.
- The TOU pricing spread between peak and off-peak prices has been much lower than expected (currently a ratio of less than 2:1, down from 3:1 from mid-2006 to mid-2008). This will reduce the peak demand savings from TOU pricing, and will also dampen customer interest in potential conservation programs that could shift load from peak to off-peak (e.g., timing controls for electric water heaters).

3.2.4.1 LOCALLY DRIVEN CONSERVATION? – THE ELECTRICITY DISTRIBUTORS ASSOCIATION'S VIEWPOINT

In summer 2012, the Electricity Distributors Association (EDA, the trade association representing Ontario Local Distribution Companies) released a white paper titled *Innovation From the Ground Up: Locally Driven Conservation*. This paper summarized many of the concerns that LDCs have expressed with the current conservation framework, and proposed yet another new framework that would address these concerns, and (in the EDA's opinion) be more effective in delivering conservation results. The EDA also presented this framework in its submission[64] to the Ontario Distribution Sector Review Panel, a panel established by the Ministry of Energy to provide advice on issues related to Ontario's electricity distribution sector and distribution models, including opportunities for consolidating LDCs.

The proposed new approach of the EDA would return all responsibility for designing and delivering conservation programs to LDCs (working individually or in partnership). The role of the OPA would be limited to evaluation of results, market research and provincial branding. LDCs would not be assigned top-down conservation targets, but would instead make their own decision as to how much to invest in conservation programs. This model bears some resemblance to the current conservation framework for natural gas utilities. One key difference is that the EDA is proposing that conservation funding would need to initially come from LDC corporate funds. The province would only pay LDCs for results, at a fixed price (to be determined) per unit of energy or demand savings, which would be lower than the price paid for new generation. The LDC would thus bear full risk (and could reap the full reward) for the success of its programs. Accordingly, the OEB could play a smaller regulatory role (at least at the stage of program review) and the type and amount of conservation programs might be quite different. By contrast, the base funding for natural gas conservation programs is guaranteed to be recoverable from gas ratepayers and the OEB is involved, although there are also incentives for the gas utilities that are tied to performance.

As a possible transition approach, the EDA suggests that the government could implement the new model immediately for custom LDC programs, while the current suite of Province-Wide programs would continue to be offered.

ECO Comment

Despite a late start and significant issues regarding program operation, the 2011 results of LDC conservation programs are reasonably encouraging. Conservation programs continue to yield cost-effective results, with a cost to ratepayers of only 3 cents per kilowatt-hour saved. Every unit of electricity saved through a conservation measure is an environmental and economic benefit to the people of Ontario.

It appears likely that the provincial aggregate energy target for 2014 will be met, although this not a certainty. Achievement of the peak demand target is less certain. This is important because the electricity system is built to meet peak demand, and higher than expected peak demand will increase costs and environmental degradation.

The concerns expressed by LDCs reflect both the growing pains associated with the transition to a new delivery model and some inherent problems with the CDM framework. It is difficult to determine the relative importance of these factors. There needs to be a focus on delivering strong results for the remaining years of the current CDM framework, as well as immediate attention by the Ministry of Energy as to what will happen beyond 2014.

For the current framework, the ECO makes the following suggestions.

- *Restrictions on custom LDC conservation programs should be loosened*. The ECO is very disappointed that the Ministry of Energy has taken no action in the previous year to encourage custom LDC-led CDM programs. While it is encouraging that some LDC ideas have been incorporated by the OPA into Province-Wide programs, in the ECO's view this is not an adequate replacement for LDC-led programs. It introduces another gatekeeper which may simply mean more hurdles to overcome in LDCs receiving approval. In the ECO's view, the OPA's job is to identify programs that can work across the province, not to vet programs that may be suitable for specific LDCs. With many of the more successful existing CDM initiatives approaching saturation (e.g., Fridge & Freezer Pickup, Direct Install Lighting), it is critical to encourage innovation and help identify from where the next generation of conservation savings will come.

The ECO recommends that the Minister of Energy direct the Ontario Energy Board to establish an expedited review process for proposed LDC custom conservation programs below a specified cost threshold.

- *LDC incentives need to ensure a continued focus on conservation*. The ECO is concerned that some LDCs, particularly those that are not performing well and are unlikely to receive the OEB's performance incentives, may limit their conservation spending efforts in order to financially benefit from the OPA's cost-effectiveness incentives (which are tied only to program spending, regardless of level of performance, except for the qualifier that LDCs use "commercially reasonable" efforts to meet their targets). The OPA should work with the OEB and LDCs to resolve this issue, and ensure that these initiatives do not work at cross purposes. This will ensure that LDCs continue to make best efforts for the remaining years of the current conservation framework.
- *Further improvements are needed to the Change Management process*. As discussed earlier, the Change Management process is the primary avenue for improving Province-Wide programs based on real-world experience. It is critical that necessary improvements move through this process rapidly. The ECO notes LDC concerns that, while there are regular working group meetings between the OPA and LDCs to resolve issues around conservation programs, these often result in frustration and delays because final changes are made by the OPA behind closed doors and do not always reflect working group input. The ECO suggests that this is could be improved by ensuring that more senior decision makers represent the OPA on working groups. As much as possible, decisions should be made collaboratively at the table, instead of the current process by which the groups function like an advisory body to the OPA.

Beyond 2014

For the period beyond 2014, the ECO believes immediate action is needed to resolve the uncertainty around ongoing incentive funding.

The ECO recommends that the Minister of Energy immediately issue direction to the Ontario Power Authority authorizing incentive funding for conservation projects commenced prior to December 31, 2014 that are completed post-2014.

Both the OPA and LDCs have identified this as a priority. This authorization would reassure potential conservation participants that they will be eligible to receive incentives, even for longer, multi-year projects such as condominiums, and would likely increase participation in programs such as the High Performance New Construction Program and the Process and Systems Upgrade Initiative. The large contribution that projects from pre-2011 programs have made to 2011 results in the current transition year suggests the importance of a similar rollover period post-2014. The ECO also believes that post-2014 results of this nature should be counted towards LDC targets, to encourage LDCs to promote programs for long-term projects. This change would also likely require explicit direction from the Minister of Energy.

The ECO has also previously recommended[65] that the Ministry of Energy should formally commit to the continuation of conservation programs beyond 2014 and initiate the next CDM framework, which would include guaranteed funding, by January 1, 2014. This remains the ECO's view, and the time for the Ministry of Energy to begin developing a new framework is now. The slow start in 2011 shows the negative impact on conservation that an uncertain transition can have.

The ECO takes no position as to the specifics of the new framework. It seems to be the case that the overly risk-averse nature of the OPA and the legalistic process of the OEB have restricted LDCs from working to their full potential. Consideration should be given to giving LDCs a freer hand in program design and delivery, particularly if the next framework continues to hold LDCs accountable for achieving targets. At the same time, any new framework will need to ensure respect for ratepayer spending (which includes a robust evaluation of program results), and be able to predict and account for conservation's contribution to electricity system planning. This still implies the need for some centralized role and suggests that the best path forward post-2014 will be evolutionary in nature.

4 PROGRESS ON SELECTED INITIATIVES – ENERGY BENCHMARKING IN SCHOOLS

The ECO has chosen to concentrate its review on one conservation initiative, energy benchmarking in public schools – specifically, the Ministry of Education's (EDU) development of a Utility Consumption Database (UCD).

4.1 INTRODUCTION

Given the size of the education sector, the potential for energy conservation in Ontario's public schools is considerable. Ontario has over 5,000 publicly funded elementary and secondary school buildings, occupying over 26 million square metres.[66] Within the current context of fiscal constraint, all school boards face increasingly strained budgets, of which energy costs are just one of many operating expenses. Ontario spent over $339 million and consumed over 20,000,000 gigajoules (GJ) of energy powering and heating its public schools in the 2010/11 school year (September 1 to August 31), which is equivalent to the amount of energy used by the City of Guelph in one year.[67] Reducing energy consumption can provide multiple economic and environmental benefits (see Section 4.1.1). Energy conservation also provides a significant opportunity to redirect much needed funds from energy costs towards facility improvements or education in the classroom. Under conditions of rising energy prices, conservation will help contain energy costs.

4.1.1 BENEFITS OF ENERGY EFFICIENCY IN SCHOOLS

Along with achieving energy cost savings, investing in energy efficiency can produce multiple environmental, economic and educational benefits, including:

- Reducing greenhouse gas emissions by decreasing energy consumption. Emissions from energy use represent one of the largest impacts schools have on the environment.[68]
- Stimulating the local economy through job creation and encourage the development of markets for energy efficiency products and services.
- Creating a more conducive learning environment. Research has shown certain energy efficiency measures, such as daylighting and ventilation improvements, have a positive effect on student learning.[69]
- Providing an opportunity to adapt academic curricula to promote awareness of energy issues and support the building of a culture of conservation.

The Ministry of Education and Ontario School Boards: Partners in Energy Conservation

The Ministry of Education, in partnership with school boards, plays a critical role in managing the energy efficiency of Ontario's schools. The ministry administers the system of publicly funded elementary and secondary schools. This includes responsibility for: developing the curriculum; setting policies and guidelines for school board officials; providing funding; and determining the overall allocation each school board receives based on a per pupil funding formula.[70] The provincial government, through EDU, funds nearly 98 per cent of education sector spending.[71]

School boards are responsible for the operation of the province's schools, including their energy performance.[72] This includes: determining the number, size and location of schools; building, equipping and furnishing schools; preparing an annual budget; and supervising the operation of schools. Ontario has 72 publicly funded autonomous school boards with a diverse range of buildings and operating characteristics. School

Photo: Ontario EcoSchools

buildings vary by type, year of construction, budget and utilization factor, which will affect their decisions on how to direct conservation efforts. For example, the Toronto District School Board is Ontario's largest board with over 237,000 students registered in 599 elementary and secondary schools across a geographic area that covers 634 square kilometres (km^2). On the other hand, Superior North Catholic District School Board is Ontario's smallest school board with 636 students in 9 elementary schools in an area that covers almost 19,000 km^2.[73]

Photo: Ontario EcoSchools

As the ECO has previously noted, the Ministry of Education has commendably undertaken several initiatives to minimize the environmental footprint of Ontario's schools through its Energy Management and Conservation Initiative, which is a long-term strategy to support renewable energy procurement, reduce energy consumption and promote conservation in schools.[74] When the initiative was launched in 2009, it included a goal to reduce the sector's energy consumption by 10 per cent in 5 years.[75] As work to support the initiative began, the ministry realized no school boards had the energy consumption data necessary for measuring reductions in energy use. As a result, the ministry abandoned this specific goal and expedited the launch of the Utility Consumption Database.[76] Although the database now provides the ministry with the resources to set a meaningful and measurable sector target, there is currently no province-wide energy conservation target for the sector. Instead, EDU has encouraged school boards to use the UCD to set individual school board conservation targets.

4.1.2 FUNDING ENERGY EFFICIENCY AND RENEWABLE ENERGY IN SCHOOLS

In addition to the Utility Consumption Database, the Ministry of Education has provided significant capital funding in recent years to improve energy efficiency and incorporate renewable energy projects through three programs: the Green Schools Pilot Initiative; Energy Efficient Schools Funding; and Renewable Energy Funding for Schools. At the time of writing this report, some projects had not yet been completed. The ECO will review these programs in a future report.

4.2 THE UTILITY CONSUMPTION DATABASE

Benchmarking is the critical first step in finding and eliminating energy waste. Energy consumption data help school boards understand how energy is used in their buildings, and enables boards to benchmark their performance against other boards with similar facilities and operations (e.g., between schools of similar construction or between school boards with similar operations or geographic size and location). This aids in identifying energy saving opportunities. To provide school boards with an energy management tool, EDU developed the UCD, a database that electronically collects and tracks historical consumption data for every electricity and natural gas account from all 72 school boards.[77] Collectively, the database tracks over 5,000 natural gas accounts and 7,500 electricity accounts measuring energy use in more than 5,000 school and administrative buildings.[78] The UCD only tracks utility data that are available electronically, which currently limits the data collection to electricity and natural gas accounts.[79]

A key metric provided by the Utility Consumption Database is energy intensity, a measure of a board's or building's performance based on its energy use per unit area (e.g., energy used per square metre). This allows boards or specific schools to be compared on a common basis (e.g., by the amount of energy required to operate a building relative to the building's size).

Also, when using energy intensity as a metric, the data are typically normalized (i.e., adjusted to exclude the impact of weather or other factors that can significantly affect the amount of energy used in any given year). This provides a twofold benefit: it enables monitoring successive years of annual energy consumption to identify trends; and it allows comparison between school boards independently of the impact of weather or location (e.g., northern versus southern Ontario). Using a metric of energy intensity also allows conservation targets to be set as a percentage improvement in intensity regardless of the different intensity ratings of school boards. Ultimately, it could lead to setting operational standards per square metre of space occupied.

Through the data provided by the UCD, EDU has indicated that the ministry and school boards will be able to:[80]

- Allow boards to analyse year over year consumption, following weather correction, against key indicators such as number of students, total building area and other factors.
- Determine average provincial benchmarks for energy consumption based on common facility indicators.
- Identify the most energy efficient schools and boards.
- Identify schools and boards that need technical advice and support to reduce their energy consumption.
- Set annual energy reduction targets for the sector, boards and individual schools.

The UCD will also assist school boards in meeting the regulatory requirements of O. Reg. 397/11 made under the *Green Energy Act, 2009*, which requires institutions in the broader public sector (BPS, which includes municipalities, universities and colleges, schools and hospitals) to report on energy consumption and create energy conservation plans.[81]

When initially launched, the UCD was expected to be rolled out in phases over a two-year period, based on school boards' geographic locations.[82] During the roll out, the ministry encountered several unanticipated issues that delayed data collection for some accounts.[83] At the time of writing this report, the UCD contained electricity and natural gas consumption data for the 2009/2010 school year (which EDU has established as the baseline year) and the 2010/2011 school year. Although the UCD still contains a small percentage of incomplete data, the integrity of the information is very high and the ministry has made continuous efforts to rectify outstanding database issues (see Section 4.2.1).[84]

4.2.1 A NOTE ON DATA PRESENTED

The ECO notes the energy intensities shown in Figure 4 should be considered a preliminary estimate due to the current limitations of the Utility Consumption Database (UCD).

The energy intensities shown in Figure 4 have not been corrected for weather effects. Currently, the UCD only shows weather-normalized data for customized school board reports and only against the baseline year.[85] This means that the database cannot yet be used by school boards to make a completely accurate comparison of their buildings with similar buildings across the province or to analyze trends in their energy performance year-over-year.[86]

The UCD contains some data gaps that can make energy intensity averages appear better than they actually are. In particular, not all electricity and natural gas data is included in the UCD due to such data collection issues as missing accounts, missing days or parts of days of consumption, changes resulting from newly acquired or sold facilities, and inconsistencies with the format of data sent by local distribution companies (e.g., whether or not electricity consumption is adjusted to include line losses). The accuracy of the UCD relies heavily on the co-operation of utility companies and the continued vigilance of school boards to verify data. A recent example of the type of administrative challenge to data integrity was a decision by Toronto Hydro to change its billing systems software. As a result, many customers' school meters were assigned new account numbers and the UCD was unable to process the receipt of electronic data. Although current gaps in the database affect some school boards more than others, the integrity of the database as a whole is very high and, thus, unlikely to significantly impact energy intensity at a sector level.

Since the UCD automatically downloads electronic data from gas and electric utilities, it does not currently include the consumption of other fuels, such as heating oil, propane, steam or wood. Some school buildings, mostly in rural or remote northern areas, use fuels other than electricity and natural gas. Consequently, the average energy intensity for these school boards will be artificially lower than actual performance. However, given the minimal contribution of other fuels to total energy expenditures, these amounts are likely a relatively insignificant component of the sector's total energy use.[87]

The ECO also notes the energy intensity of schools can vary considerably within each school board (see Section 4.2.2). A school's energy profile is influenced by specific construction and operating characteristics, such as building age, building size, number of students, and the presence of such facility variables as swimming pools or cafeterias. The ECO was not provided with consumption data of schools and cannot report on energy performance at a school level.

The ECO acknowledges that the current limitations of the UCD can affect the accuracy of reported energy performance. Nonetheless, the ECO believes that the ministry has constructed a robust dataset, the UCD provides valuable information, and illustrates the significant opportunities for efficiencies available in the sector.

A general overview of the education sector's energy use, derived from the UCD, is shown in Table 14. In the 2009/2010 school year, the provincial average energy intensity was 0.67 gigajoules per square metre (GJ/m^2). In the following school year, the provincial average energy intensity increased by 10 per cent to 0.74 GJ/m^2, likely due in part to a colder winter that year.

Table 14: Overview of the Education Sector's Energy Use

	School Year 2009/2010 (baseline)	School Year 2010/2011
Total Building Area (includes portables)	26.6 million m^2	26.7 million m^2
Total Electricity Consumed	1,826.8 GWh	1,852.0 GWh
Total Natural Gas Consumed	333.8 million m^3	358.4 million m^3
Provincial Average Energy Intensity	0.67 GJ/m^2	0.74 GJ/m^2

Note: All energy consumption numbers presented in the table are estimates. Due to gaps in the database, totals do not represent the total energy consumption for all school boards. Energy intensity is calculated using electricity and natural gas consumption data only and converted to a common unit of energy – gigajoules per square meter (GJ/m^2). 1 gigajoule (GJ) is equal to 277.8 kilowatt-hours (kWh) of electricity and approximately 26.8 cubic metres (m^3) of natural gas. The conversion factor is approximate as the energy content of natural gas varies slightly depending on the composition of the gas.

Source: Ministry of Education.

At the school board level, there appears to be a wide variation in energy intensity across the province. In the 2009/2010 school year, the energy intensity of the worst performing board (with the highest energy intensity, thus using the most energy per square metre) was three times that of the best performing board (with the lowest energy intensity). According to one source, an estimated 10 to 20 per cent overall energy savings for Ontario schools can be achieved just by adopting existing good practices in the worst performing buildings.[88]

To demonstrate the range in energy performance across the sector, the ECO compared the energy intensity of a representative sample of school boards. These are shown in Figure 4. The sample included boards of varying size and geographic locations from both the public and Catholic school systems, as well as French- and English-language boards.

Figure 4 suggests there are significant opportunities for improvement in the sector. For example, for the 2010/2011 school year, improving the efficiency of those boards in Figure 4 with energy intensities above the current provincial average would result in annual savings of over 420,000 GJ. Extrapolating to the province as a whole, if all school boards whose energy intensity is currently worse than the 2010/2011 provincial average were to perform at the provincial average energy intensity, the sector could achieve over 1.8 million GJ in annual energy savings, a reduction of approximately 9 per cent.[89]

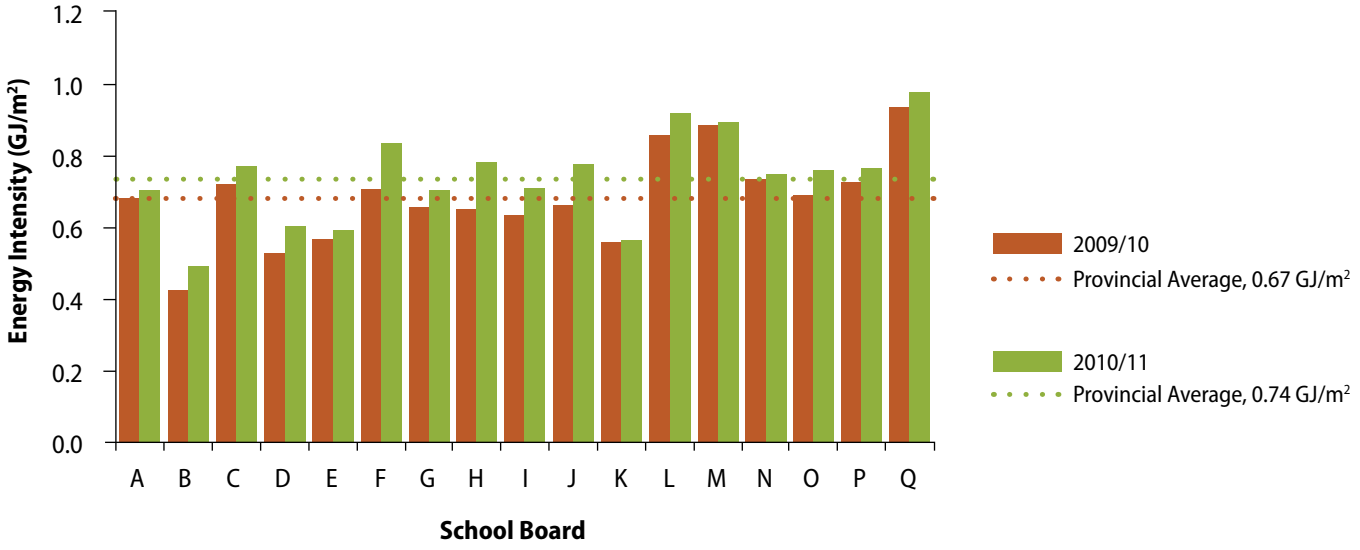


Figure 4: The Energy Intensities of a Sample of Ontario School Boards, 2009/2010 and 2010/2011

Note: The graph represents the energy intensities from a representative selection of school boards of varying building sizes, student enrolment and geographic locations. School boards include both public and Catholic boards and French- and English-langauge boards. Energy intensity figures only reflect electricity and natural gas consumption, and do not include use of alternative energy sources, such as heating oil, propane, steam or wood. Data has not been normalized to account for geographical, climatic and other variables.

Source: Ministry of Education.

There are several ways to improve the energy performance of individual buildings and provide school boards with significant energy cost savings. The U.S. Environmental Protection Agency has reported that behavioral and operational measures alone can reduce energy costs in schools by up to 25 per cent, while retro-commissioning of a typical 100,000 ft^2 school can uncover an average of $10,000 to $16,000 in annual energy savings.[90] Some Ontario school boards have already committed to improving the energy performance of their schools and have the data to prove there are real cost savings available (see Section 4.2.2).

4.2.2 CASE STUDY: SIMCOE COUNTY DISTRICT SCHOOL BOARD

The Simcoe County District School Board (SCDSB), located in south-central Ontario, is one of the province's largest public education systems. The Board oversees over 100 elementary and secondary schools, with approximately 50,000 students and over 6,000 employees.[91]

In 2008, the board participated in the Canada Green Building Council's benchmarking pilot project, which tracked the energy use of 250 participating elementary and secondary schools from across Canada. The results of the pilot showed a wide range of energy intensity across the sector, with SCDSB positioned slightly above the national median. The data also revealed a wide spread between individual school performance within the school board, with energy intensity ranging from around 10 to 30 equivalent kilowatt-hours per square foot (ekWh/ft^2, approximately 0.39 to 1.16 GJ/m^2). Despite the range in building type, age, equipment and other variables that affect energy consumption, SCDSB determined there were significant energy and cost savings opportunities available in all schools.

Since then, the board has been working to improve energy efficiency across its portfolio of properties. To guide energy efficiency improvements, SCDSB took a data-driven approach through benchmarking its schools, systems testing, developing targets, and monitoring monthly energy consumption. Examples of measures undertaken in some schools included replacement of windows and boilers, lighting retrofits, enhancements to heating, ventilation and air conditioning equipment, and improvements to the building automation systems.

Based on proven energy efficiency measures tested within its schools, SCDSB developed operational management and retrofit standards for lighting and mechanical systems, and has applied these standards to almost one-third of its portfolio. As a result, SCDSB reduced its average energy intensity by 16 per cent between 2008 and 2011. As shown in Table 15, during the three-year period the board achieved a reduction in energy consumption of 62,778 GJ at a reduced operating cost of over $500,000 annually.

Table 15: Simcoe County District School Board, Energy and Cost Savings – 2011 versus 2008

	Energy Savings	Net Cost Savings
Electricity	2,928,045 kWh	$244,000
Natural Gas	1,399,965 m^3	$307,500
Total	**62,778 GJ**	**$551,500**

Note: Net cost savings takes into account the total energy costs, including increased energy prices and increased consumption in schools that may not have had energy efficiency measures implemented. Total energy consumption used the following conversion factors: 1 gigajoule (GJ) is equal to 277.8 kilowatt-hours (kWh) of electricity and approximately 26.8 cubic metres (m^3) of natural gas. The conversion factor is approximate as the energy content of natural gas varies slightly depending on the composition of the gas.

Source: Simcoe County District School Board.

The board's long-term plan is to apply these standards to its entire portfolio of schools with the goal of all schools operating at an energy intensity of less than 15 ekWh/ft^2 (0.58 GJ/m^2). To ensure new schools are efficient from the beginning, SCDSB has adopted the same standards into the design of its new schools, which are expected to operate under 10 ekWh/ft^2 (0.39 GJ/m^2). The SCDSB's experience proves that a commitment to energy conservation can deliver real, achievable and ongoing energy and cost savings to school boards.

ECO Comment

The ECO commends the Ministry of Education for developing the UCD. The database is an excellent and necessary first step in helping school boards understand and manage their energy use. The benchmarking capabilities of the UCD provide a valuable resource for school boards, and will help them to set realistic conservation targets. The ECO also commends the ministry for its on-going efforts to ensure data integrity and improve the efficacy of the database.

The ECO encourages EDU to continue updating the database to include other fuels (e.g., oil and propane) and improve the current methodology for weather-normalization to allow for year-over-year comparison or comparison between sites. To allow for more accurate comparisons, the UCD's energy performance data should be normalized for occupancy factors (e.g., operating characteristics

and features like cafeterias, portables and athletic facilities). Furthermore, although the UCD reports the weighted average energy intensity at the school board level, it only reports the provincial average energy intensity at the sector level. The provincial average energy intensity, although a helpful point of comparison, can be dramatically affected by boards with significantly high or low energy use. The median energy intensity would be less affected by these outliers and, thus, provide an additional metric more representative of the typical energy intensity of the sector. The ECO urges EDU to report the median energy intensity and evaluate energy consumption data normalized for operating characteristics.

Leading Conservation in the Public Sector

The database positions school boards significantly ahead of most of the BPS to meet the energy consumption reporting and conservation plan requirements of O. Reg. 397/11. The ECO reminds EDU that the ability to set energy reduction targets was one of its stated reasons for developing the UCD. When the 10 per cent reduction goal was prematurely announced in 2008, the sector did not have baseline data from which to measure the reduction. Now that the UCD is operational, although the ministry lacks regulatory authority to compel school boards to undertake specific operational actions, the ECO encourages EDU to once again lead the public sector. EDU should establish an aggressive aggregate conservation target for the sector and work in partnership with boards to allocate the target among boards.

The ECO suggests that the target dates be aligned with other targets established by the province: for example, the Long-Term Energy Plan and Go Green: Ontario's Action Plan on Climate Change, which together contain targets for the years 2014, 2015 and other milestone years to 2050. The sector's target should initially be set for 2015 and then updated to align with the milestone dates of the electricity planning and greenhouse gas reduction policies. To encourage the sector to meet its targets, EDU could develop an incentive program that awards boards when targets have been met and reinvests energy savings in the sector. For example, Seattle Public School District, the largest K-12 school system in Washington State, collects and publicly publishes monthly and annual data for energy consumption, water usage, waste generation and diversion in its schools. In addition, the district provides monetary awards for schools that meet conservation goals or reduce utility use from the previous year.[92]

The ECO recommends that the Minister of Education establish an aggregate energy conservation target for the education sector to be achieved by the 2015 school year, and work with school boards to allocate this target.

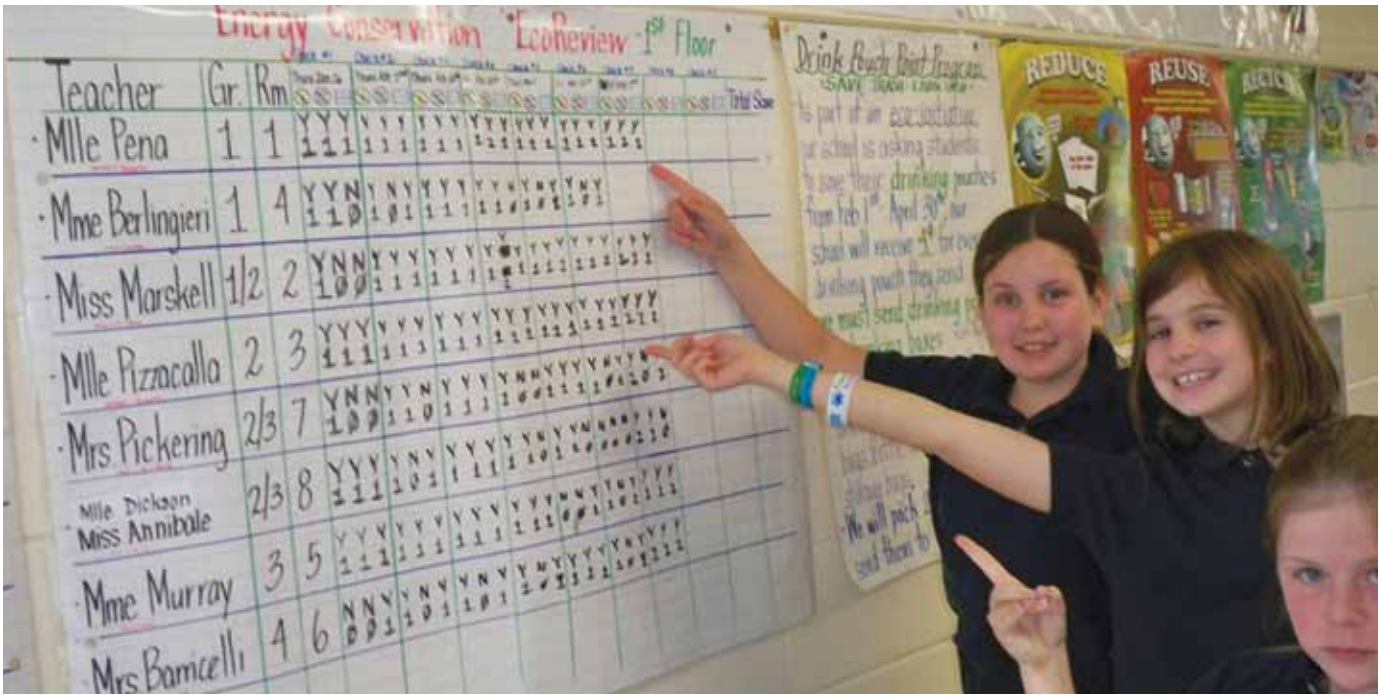


Photo: Ontario EcoSchools

Building Best Practices in Conservation

The ECO believes the centralized electronic transmission of consumption data is an innovative approach, which demonstrates to other sectors that the gathering of energy data need not be a continuously onerous task once procedures are established. In fact, other sectors may wish to develop a similar database and, as the ECO has previously suggested, best practices and lessons learned should be shared across the BPS.[93] Many of the challenges EDU encountered in the development of the UCD were similar to those faced by the Ministry of Infrastructure (MOI) in its efforts to verify energy consumption data for government buildings, and are likely to also affect the BPS.[94] Had the two ministries consulted one another during the development of the UCD, some delays may have been averted.

For example, one of the challenges EDU experienced with the UCD was related to inconsistencies in how LDCs electronically report electricity consumption data. Of the 68 LDCs from which EDU receives data, 55 were reporting electricity consumption as adjusted usage (amount of electricity consumed after adjustments to include losses that occur in the delivery of electricity), while the remainder reported metered usage (actual amount of electricity consumed on-site not including delivery losses). As a result, the consumption data were not comparable between boards or schools served by LDCs that do not report data in the same way. EDU has since converted all data to metered usage. Sharing such experiences would assist the public sector to comply with O. Reg. 397/11. The ECO encourages EDU and MOI to share their experiences with the BPS in advance of the first energy consumption and greenhouse gas emissions reporting required by July 2013 under O. Reg. 397/11.

Conflicting requirements between OEB reporting protocols and provisions of the *Green Energy Act, 2009* exacerbate the problem of data consistency. The OEB's Electronic Business Transactions (EBT) Standards Document, which specifies protocols for communication of electronic transactions, requires energy consumption to be presented as adjusted usage.[95] However, the Act requires the BPS to report metered usage.[96] In 2011, staff of the ministries of Education and Energy requested a single common approach in rules for LDCs' reporting of data. To date, the OEB has not addressed this issue.[97] The ECO urges the OEB to prioritize the creation of a consistent approach to reporting energy consumption data by LDCs based on the requirements of the *Green Energy Act, 2009*.

Driving Conservation through Open Access

In addition to annual energy consumption data that school boards will use to comply with O. Reg. 397/11, the UCD contains much more information and provides the ability to easily sort and compare similar schools. Without public access, these additional features are only accessible to EDU and school boards. In response to an ECO information request for data, EDU noted that utility data belongs to school boards and it was acquired through an agreement between the ministry and boards that the data remain confidential. According to the ministry, the UCD was developed *not* to be a public reporting tool, but as a resource tool to be used only by school boards.

A caution of the Ministry of Education was that publication of board data could be misinterpreted by those lacking knowledge of the sector's operation. This could result in baseless criticism of a board's energy use. It might also lead to inappropriate comparisons of the sector with other BPS institutions based on dissimilar building operations or different datasets. Essentially, EDU is concerned with managing public expectations. The ministry believes that school boards must have the opportunity to review data before publication to avoid misleading perceptions. The UCD is only a resource tool and does not automatically result in energy reduction – retrofits, operational changes and upgraded technology do, but funding is needed for these.

The ECO acknowledges that the database was developed with certain understandings between the parties involved. However, the ECO strongly disagrees with the restricted accessibility to data that such understandings engender. As the ECO has previously stated, Ontarians should have the ability to view the energy performance of the province's school boards and schools.[98] Although there are

valid privacy concerns regarding public access to individual residential utility data, the same issues do not extend to publicly funded school boards. Parents, members of the community or any Ontarian interested in knowing a public school's energy performance should be provided with this information. Other jurisdictions have already adopted such an approach.[99] The concerns about publishing data raised by EDU are not inherent to the issue of accessibility. Rather, they are educational issues to be addressed through improved energy literacy.

Furthermore, the ECO believes providing open access to schools' utility data can provide economic and social benefits that will further energy conservation in the province. For example, access will enable interested organizations to perform data analytics and offer innovative solutions to school boards, while also building energy management skills and capacity. Public information on the energy performance of Ontario's schools will also increase awareness and support the province's goal of building a culture of conservation. As a preliminary step, the ECO encourages EDU to publish the aggregated energy consumption data that it is readily available from the UCD.

In the ECO's opinion, the issue of access to the database appears to have arisen because schools own the data but the ministry, as funder of the database, is the custodian of this information. There appear to be two options to resolve this problem: (1) the ministry could obtain the agreement of school boards that detailed school and board data will be made publicly available; or (2) management of the database could be transferred to a third party (such as an association of school boards or other sector group) that will provide public access. The ECO believes EDU should make the database publicly available by July 2013, to coincide with the energy consumption reporting requirements under O. Reg. 397/11.

The ECO recommends that the Minister of Education ensure that the Ontario public has unrestricted access to the Utility Consumption Database by July 1, 2013.

5 APPENDICES

APPENDIX A: CURRENT ENERGY CONSUMPTION

Introduction

The ECO has chosen to examine energy consumption by fuel type in Ontario. This approach is taken because this office is responsible for reporting on the progress of government activities related to reducing or making more efficient use of electricity, natural gas, propane, oil and transportation fuels.

Like earlier ECO reports, this analysis relies on the energy consumption statistics contained in the Report on Energy Supply and Demand in Canada (RESD) and produced by Statistics Canada. Unlike earlier ECO reports, however, only preliminary data were available for the 2009 calendar year due to significant methodological changes for data surveys that supply information to the RESD.[100] Going forward, this office will use data from Statistics Canada that incorporate these methodological changes.

Analysis

According to the preliminary data for 2009, the total energy demand for Ontario was 2,374 petajoules (PJ). Figure 5 shows the breakdown of this energy demand by fuel type. Natural gas and transportation fuels accounted for about 73 per cent of the total energy used. Meanwhile, electricity accounted for 19 per cent of Ontario's overall energy demand. Propane, oil and other fuels accounted for roughly 8 per cent of Ontario's overall demand. This trend is virtually identical to what was observed in 2008 and 2007, as reported in previous years' ECO Annual Energy Conservation Progress Reports.

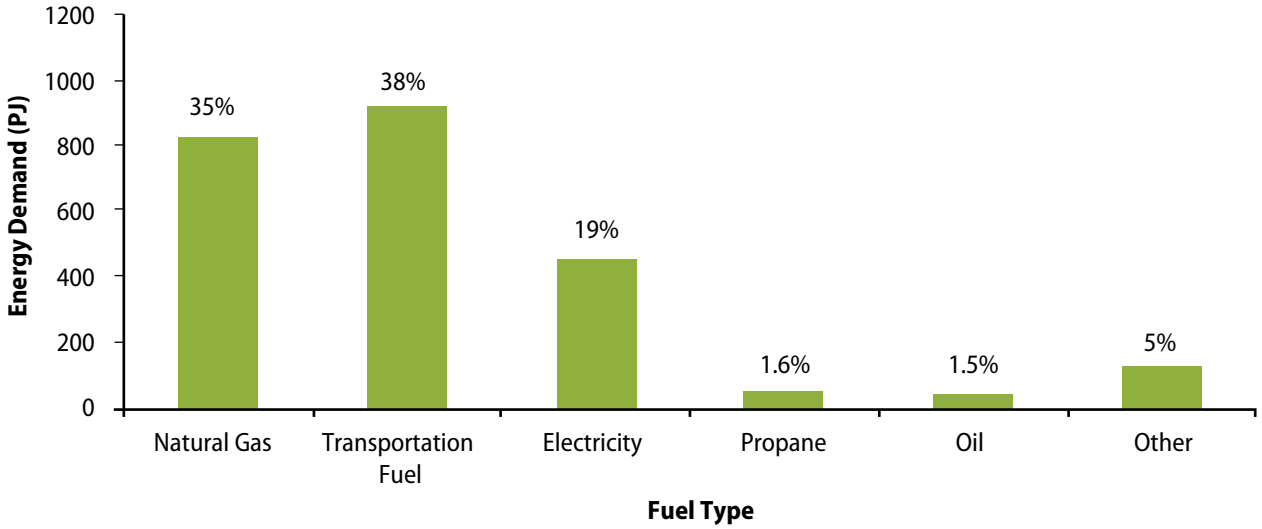


Figure 5: Ontario 2009 Total Final Energy Demand by Fuel Type

Notes:

Oil demand is based on kerosene, stove oil and light fuel oil amounts; Transportation Fuel is based on motor gasoline, diesel fuel oil, heavy fuel oil, aviation gasoline, and aviation turbo fuel amounts; details of Oil and Transportation Fuels come from Table 4-8 of Statistics Canada's 57-003-X report; Other fuel amount is based on Ontario's total final energy demand for 2009 (preliminary).

The information in this table should not be compared with information published in future ECO reports. After the 2009 preliminary data were released by Statistics Canada, significant methodological changes occurred (changes were made to improve data quality for the Annual Industrial Consumption of Energy survey, and a new survey – the Annual Survey of Secondary Distributors of Refined Petroleum – began in 2009). Next year's ECO report will incorporate these methodological changes.

Source: Statistics Canada – Catalogue no. 57-003-X *Report on Energy Supply and Demand in Canada – 2009 Preliminary*.

Table 16 provides numerical details for Figure 5, along with the demand values for 2007 and 2008 calendar years. For 2009, overall energy consumption in Ontario declined 7.4 per cent compared with 2008 levels. Statistics Canada attributes this decrease to declining energy demand in Ontario's manufacturing sector, although all sectors saw some reduction in energy demand.[101] To provide greater context for this decrease, across Canada there was an observed decline in energy consumption for the second consecutive year and a decrease in final demand occurred across all major sectors of the economy. At the national level, the greatest decrease came from the residential and agriculture sectors. In Ontario, the greatest decrease came from the industrial sector, where total industrial demand for primary and secondary energy fell 16 per cent, followed by the agriculture sector (9 per cent), residential sector (7 per cent),

commercial and institutional sector (5 per cent), and the transportation sector (3 per cent). In 2009, real gross domestic product fell in Ontario by 3.6 per cent.[102]

Table 16: Annual Ontario Final Energy Demand by Fuel Type

Year	Natural Gas (PJ)	Transportation Fuel (PJ)	Electricity (PJ)	Propane (PJ)	Oil (PJ)	Other (PJ)	Total (PJ)
2007	930	953	486	40	44	186	2,639
2008	881	938	507	43	37	157	2,563
2009	824	913	449	38	36	114	2,374

Note: The information in this table should not be compared with information published in future ECO reports. After the 2009 preliminary data were released by Statistics Canada, significant methodological changes occurred (changes were made to improve data quality for the Annual Industrial Consumption of Energy survey, and a new survey – the Annual Survey of Secondary Distributors of Refined Petroleum – began in 2009). Next year's ECO report will incorporate these methodological changes.

Source: Statistics Canada – Catalogue no. 57-003-X *Report on Energy Supply and Demand in Canada – 2009 Preliminary.*

Energy demand in Ontario's industrial sector is expected to remain below the highs reached in the early to middle part of last decade even as the economy continues to recover from the recession of 2008-2009. Ontario's Independent Electricity System Operator (IESO) expected such a trend, and anticipated that electricity demand in the industrial sector will continue to be below historical levels. In its 18-Month Outlook from December 2009 through May 2011, the IESO noted that the "economic recovery is unlikely to stimulate a significant rebound in electricity demand. Over the coming months, industrial energy [electricity] demand will continue to be hampered by the high dollar and rationalization within the manufacturing sector."[103]

Distribution-Connected Energy Generation Resources in Ontario

The IESO constantly monitors Ontario's demand and supply at the transmission level. The agency ensures that electricity is properly flowing across these lines and meeting Ontarians' needs. There has been an increase in the amount of energy generated by facilities that are connected directly to the distribution level of the grid and this amount is expected to grow. As shown in Table 17, about 1,000 MW of this generation currently exists in Ontario. Since these sources are connected directly at the distribution level (and not the transmission level), they are not monitored by the IESO and are excluded from the IESO's review of Ontario's electricity system.

In total 1,306 MW of these energy contracts were connected to the distribution system. The following table (Table 17) shows how this generation breaks down by generation source type and how much electricity was produced in 2011. Total electricity production from distribution-connected resources was about 4.5 TWh in 2011, roughly 3 per cent of total generation.

Table 17: Electricity Capacity and Generation from Distribution-Connected Resources in Ontario, 2011

Electricity Generation Source	Capacity (MW)	Electricity Generation (MWh)
Bioenergy	60	397,000
CHP	267	1,690,000
Hydro	325	1,482,000
Solar Ground	352	351,000
Solar Roof	68	21,000
Wind	235	516,000
Total	**1,306**	**4,457,000**

Source: Ontario Power Authority.

APPENDIX B: BARRIERS TO ENERGY CONSERVATION

The legislative mandate of the ECO requires that we identify barriers to energy conservation in Ontario. The approach we have taken in our reports has been to analyze specific policies and programs that have an impact on energy conservation, which naturally leads to identification of barriers that are preventing these policies and programs from performing optimally. Three years into our energy conservation mandate, it is appropriate to list some of the major issues we have identified. Table 18 below summarizes key barriers (grouped into five categories). For each barrier, the table provides references to sections of ECO Energy Conservation Progress Reports where the barrier was identified and discussed in more detail, as well as noting whether any government action has taken place to overcome the barrier.

Table 18: Summary of ECO-Identified Barriers to Energy Conservation

Barrier One: Energy is sold at a price that does not reflect its full cost, including the cost associated with its environmental impact. Underpricing can lead to increased electricity consumption and peak demand.		
Examples	**ECO Review**	**Action to Date**
There are direct price subsidies for electricity, particularly the Ontario Clean Energy Benefit.	2010 (Volume One, Section 4.1)	**MEDIUM** – Ontario Clean Energy Benefit has been capped (as of September 1, 2012) and applies only to the first 3,000 kWh consumed per month. However, this still subsidizes the vast majority of residential and small business consumption.
There is no accounting for the environmental costs of energy production, particularly greenhouse gas emissions.	2009 (Volume One, Section 5.2); 2011 (Volume One, Section 6.1.1). Also discussed in ECO Greenhouse Gas Progress Reports	**LOW** – No direct price adder. No incorporation of environmental costs in cost-benefit analyses of gas and electric utility conservation programs.
Electricity pricing does not reflect variation in supply costs at different times of day and year.	2010 (Volume One, Section 4.2); 2010 (Volume Two, Section 2.3.3)	**MEDIUM** – Time-of-use pricing introduced for small customers (preceded by smart meter rollout), and critical peak pricing introduced for large customers. Time-of-use pricing differential needs to be increased (as part of Ontario Energy Board's semi-annual updates to the Regulated Price Plan) to incent additional load shifting.
Many customers in multi-unit buildings are not individually billed for electricity consumption.	2010 (Volume One, Section 4.3)	**HIGH** – *Energy Consumer Protection Act, 2010* and supporting legislation and regulations mandated individual metering in new residential buildings and provided clarity on unit metering rules in existing buildings.
Barrier Two: Lack of information prevents consumers from taking actions to save energy.		
Examples	**ECO Review**	**Action to Date**
There is no mandated disclosure of home energy information at time of sale.	2011 (Volume One, Section 3)	**LOW** – Relevant provisions of *Green Energy Act, 2009* never brought into force.
There is no reporting of accurate (time-varying) information on greenhouse gas emissions of electricity consumption.	2011 (Volume One, Section 5)	**LOW.**
Large consumers experience difficulty in obtaining full access to electric utility data.	2009 (Volume One, Section 6.2); 2011 (Volume Two, Section 4)	**LOW.**
There is a lack of energy benchmarking information for different building types.	2009 (Volume One, Section 6.2); 2011 (Volume One, Section 5)	**MEDIUM** – New energy reporting requirements for broader public sector (and supporting sector-based tracking tools) should provide improved source data for accurate benchmarking.

Barrier Three: Conservation policy for different energy sources is not integrated.		
Examples	**ECO Review**	**Action to Date**
No integrated energy plan addresses all energy sources.	2009 (Volume One, Section 4.3); 2010 (Volume One, Section 3)	**LOW** – Long-Term Energy Plan focused exclusively on electricity.
Lack of conservation programs addressing and integrating multiple energy sources	2009 (Volume Two, Section 4.2); 2010 (Volume One, Section 5.2.3.1); 2011 (Volume One, Section 6.3)	**MEDIUM** – Minor progress in co-ordination between gas and electric utility conservation programs, particularly for low-income households. However, previous government programs addressing multiple energy sources (e.g., Home Energy Savings Program), including energy sources other than gas and electricity, have been cancelled.
Incentives favour use of solar energy for electricity instead of heating.	2010 (Volume One, Section 8.2)	**LOW.**
There is no consideration of transportation fuels in broader public sector energy reporting requirements.	2011 (Volume One, Section 5)	**LOW.**
Barrier Four: Strong governance has been lacking.		
Examples	**ECO Review**	**Action to Date**
There are no consequences for entities failing to comply with government conservation policy direction: ▪ Ontario Energy Board – legislated objective to promote energy conservation has taken a backseat to objective to protect consumer interests. ▪ Ontario Power Authority – has failed to take action on conservation "targets" specified in government directions. ▪ Individual government custodial ministries – have failed to take action towards facility electricity consumption target.	OEB: 2010 (Volume One, Section 6); 2010 (Volume Two, Section 3.1) OPA: 2009 (Volume One, Section 5.1); 2011 (Volume Two, Section 2.1) Custodial government ministries: 2010 (Volume Two, Section 2.3.2)	**LOW.**
Electricity conservation funding and program delivery model are unstable.	2010 (Volume One, Section 5); 2011 (Volume Two, Section 3.2)	**LOW** – Ontario Power Authority and local distribution companies have noted that program continuity beyond 2014 is needed, but government has not yet taken any action.
There is a lack of opportunity for public input in development of energy policy.	2009 (Volume One, Section 5.1); 2010 (Volume One, Section 3.3.1); 2010 (Volume Two, Section 2.4)	**MEDIUM** – Government has in a few cases provided an opportunity for public input. Even then, government has not always explained how public input was considered in the decision-making process (e.g., development of Supply Mix directive).
Smart grid responsibilities are fragmented and there is a lack of overall smart grid leadership.	2010 (Volume One, Section 7)	**MEDIUM** – Smart grid initiatives are advancing (e.g., Renewed Regulatory Framework, Smart Grid Fund), but co-ordination still lacking.

Barrier Five: Reach and effectiveness of available conservation programs are insufficient.		
Examples	**ECO Review**	**Action to Date**
Limited scope of conservation programs does not address all opportunities and sectors.	Electricity programs: 2010 (Volume One, Section 5); 2011 (Volume Two, Section 3.2) Line losses: 2010 (Volume One, Section 7) Gas programs: 2009 (Volume Two, Section 4.2); 2011 (Volume One, Section 6.1.1)	**MEDIUM** – Ontario Energy Board has restricted innovative conservation programming by electric utilities, but Ontario Power Authority actions are now providing a partial solution. There is still no incentive for distributors to invest in energy-saving infrastructure investments that reduce line losses. Gas utilities have offered only a very limited set of programs to the residential sector, although small changes have been made under the new gas conservation framework.
Limited program evaluation makes it difficult to assess and improve program effectiveness.	2009 (Volume Two, Section 2); 2010 (Volume Two, Section 2.3.3)	**MEDIUM** – Government programs (now cancelled) involved very little program evaluation, while programs run by gas and electric utilities have a more rigorous evaluation framework with both program operations and results subject to review. A late start in analyzing the impact of time-of-use pricing has prevented the Ontario Energy Board from adjusting time-of-use rates to provide maximum conservation benefit, although this analysis is now underway.
High upfront cost of some residential conservation investments has reduced uptake of these measures.	2010 (Volume One, Section 8.2)	**MEDIUM** – At one time, the government offered a pilot program offering zero-interest loans on "big ticket" residential conservation initiatives, such as geothermal, but this pilot program was not expanded, and other possibilities (such as on-bill financing) are not available in Ontario. On the other hand, the low-income conservation program has been expanded to fund deep energy retrofits at no cost to participants, and regulatory changes may spur some municipalities to offer low cost financing for deep retrofits for residents of all income levels.
Ontario Power Authority's ownership of environmental attributes from conservation projects has restricted program participation.	2010 (Volume Two, Section 3.2); 2011 (Volume Two, Section 3.2)	**LOW** – Project participants are allowed to request ownership of environmental attributes back from the Ontario Power Authority, but some potential customers remain unwilling to participate in conservation programs because of this issue.
Application process for electricity conservation programs is overly complex.	2011 (Volume Two, Section 3.2)	**MEDIUM** – Improvements have been made through Change Management process, but concerns remain.

APPENDIX C: ACHIEVED ENERGY TARGETS

Table 19: Achieved Government-Established Energy Targets

Report Section	Initiative	Responsibility to Address	Announced	Completed	Description
2009 (Volume Two, Section 3.5)	5% ethanol in gasoline by volume	Ministry of the Environment	2005	2007	Standards contained in Ethanol in Gasoline (O. Reg. 535/05)
2009 (Volume Two, Section 3.5)	5% ethanol in gasoline nationwide by December 15, 2010 2% biodiesel content in distillates pool by 2011	Environment Canada	December 2006	December 15, 2010, and July 1, 2011	Renewable Fuels Regulations (SOR/2010-189)
2010 (Volume Two, Section 2.3.3)	Installation of smart meters	LDCs, oversight by the Ontario Energy Board	2004	Target dates: 2007 and 2010 Actual dates: 2007 and 2011	A two-step target: (1) 800,000 smart meters installed in homes and small businesses by the end of 2007, and (2) in all homes and small businesses by the end of 2010 (estimated 4.5 million meters).
2010 (Volume Two, Section 2.3.3)	Activation of time-of-use (TOU) prices	LDCs, oversight by the Ontario Energy Board	2009	Target dates: June 2010 and June 2011 Actual dates: Sept. 2010 and Dec. 2011	A two-step target: (1) 1 million customers to receive TOU pricing by June 2010, and (2) 3.6 million by June 2011. June 2010 target was achieved in September 2010. June 2011 target was achieved in December 2011, with 3.6 million customers on TOU billing.
2009 (Volume Two, Section 3.2)	Province-wide electricity conservation set by government (only first of the two targets was achieved)	Ministry of Energy	2005	2007	In 2008, OPA advised the ministry that the target (1,350 MW of reduction in peak demand) was met.
2010 (Volume 2, Section 2.3.1)	Province-wide electricity conservation target contained in June 2006 Supply Mix Directive (requesting an Integrated Power System Plan [IPSP])	Ministry of Energy	June 2006	Target date: 2010 Actual date: Never achieved	The target was for 2,700 MW reduction in peak demand by 2010 (an aggregated target that includes the 2007 electricity conservation target of 1,350 MW). As of December 31, 2010 only 1,800 MW (67%) of target was achieved.

APPENDIX D: 2011 CONSERVATION RESULTS FOR EACH LDC

Local Distribution Company	Energy				
	Target		Achieved To Date		
	2011-2014 Cumulative Energy Savings	LDC's Share of Aggregate Provincial Energy Target	2011 Annual Energy Savings	2011-2014 Cumulative Energy Savings	Amount of 2011-2014 Energy Target Achieved
	GWh	%	GWh	GWh	%
Algoma Power Inc.	7.37	0.12	0.17	0.67	9.1
Atikokan Hydro Inc.	1.16	0.02	0.10	0.38	32.9
Attawapiskat Power Corporation	0.29	0.01	0.01	0.05	17.5
Bluewater Power Distribution Corporation	53.73	0.90	5.31	20.87	38.8
Brant County Power Inc.	9.85	0.16	0.42	1.62	16.5
Brantford Power Inc.	48.92	0.82	4.52	17.91	36.6
Burlington Hydro Inc. [2]	82.37	1.37	7.35	29.19	35.4
Cambridge and North Dumfries Hydro Inc.	73.66	1.23	12.94	51.55	70.0
Canadian Niagara Power Inc. [3]	25.08	0.41	1.92	7.63	30.4
Centre Wellington Hydro Ltd. [2]	7.81	0.13	0.33	1.28	16.4
Chapleau Public Utilities Corporation	1.21	0.02	0.12	0.43	35.9
COLLUS Power Corporation	14.97	0.25	0.82	3.19	21.3
Cooperative Hydro Embrun Inc.	1.12	0.02	0.07	0.28	25.3
E.L.K. Energy Inc.	8.25	0.14	0.55	2.10	25.5
Enersource Hydro Mississauga Inc.	417.22	6.95	42.35	166.98	40.0
Entegrus Powerlines Inc.	46.53	0.78	2.59	10.20	21.9
ENWIN Utilities Ltd.	117.89	1.96	8.27	32.19	27.3
Erie Thames Powerlines Corporation [3]	22.97	0.31	1.10	4.34	18.9
Espanola Regional Hydro Distribution Corporation	2.76	0.05	0.37	1.47	53.1
Essex Powerlines Corporation	21.54	0.36	2.16	8.27	38.4
Festival Hydro Inc.	29.25	0.49	2.25	8.89	30.4
Fort Albany Power Corporation	0.24	0.004	0.01	0.04	17.6
Fort Frances Power Corporation	3.64	0.06	0.11	0.43	11.7
Greater Sudbury Hydro Inc.	43.71	0.73	3.05	12.16	27.8

Peak Demand						
Target		Achieved To Date				
2014 Peak Demand Reduction Target	LDC's Share of Aggregate Provincial Peak Demand Target	2011 Peak Demand Reduction	2014 Persistent Peak Demand Reduction		Amount of 2014 Demand Target Achieved	
MW	%	MW	MW		%	
			Method 1	Method 2 [1]	Method 1	Method 2
1.28	0.1	0.02	0.02	0.02	1.7	1.7
0.2	0.02	0.02	0.02	0.02	8.0	8.0
0.07	0.01	0.01	0.001	0.001	1.2	1.2
10.65	0.8	3.16	1.06	3.15	9.9	29.5
3.3	0.25	0.33	0.11	0.33	3.4	10.0
11.38	0.86	1.23	0.95	1.19	8.4	10.5
21.95	1.65	2.59	1.74	2.56	7.9	11.7
17.68	1.33	3.22	2.46	3.19	13.9	18.0
6.4	0.48	0.52	0.39	0.52	6.1	8.1
1.64	0.12	0.12	0.09	0.11	5.6	6.5
0.17	0.01	0.04	0.02	0.02	11.0	11.0
3.14	0.24	0.23	0.16	0.20	5.1	6.2
0.34	0.03	0.05	0.01	0.05	4.1	14.6
2.69	0.2	0.23	0.15	0.20	5.6	7.5
92.98	6.99	15.89	10.08	15.41	10.8	16.6
12.12	0.91	1.59	0.64	1.58	5.3	13.0
26.81	2.02	3.10	2.12	2.79	7.9	10.4
5.22	0.32	0.30	0.28	0.28	5.3	5.3
0.52	0.04	0.06	0.06	0.06	11.0	11.0
7.19	0.54	2.49	0.48	2.47	6.7	34.3
6.23	0.47	0.71	0.54	0.67	8.7	10.8
0.05	0.004	0.001	0.001	0.001	1.4	1.4
0.61	0.05	0.01	0.01	0.01	2.3	2.3
8.22	0.62	0.87	0.69	0.85	8.4	10.3

Local Distribution Company	Energy				
	Target		Achieved To Date		
	2011-2014 Cumulative Energy Savings	LDC's Share of Aggregate Provincial Energy Target	2011 Annual Energy Savings	2011-2014 Cumulative Energy Savings	Amount of 2011-2014 Energy Target Achieved
	GWh	%	GWh	GWh	%
Grimsby Power Inc.	7.76	0.13	1.06	4.16	53.6
Guelph Hydro Electric Systems Inc.	79.53	1.33	14.41	57.41	72.2
Haldimand County Hydro Inc.	13.3	0.22	1.56	6.21	46.7
Halton Hills Hydro Inc.	22.48	0.37	1.89	7.46	33.2
Hearst Power Distribution Company Limited	3.91	0.07	0.14	0.55	14.0
Horizon Utilities Corporation	281.42	4.69	32.40	128.51	45.7
Hydro 2000 Inc.	1.04	0.02	0.07	0.27	25.8
Hydro Hawkesbury Inc.	9.28	0.15	0.72	2.82	30.4
Hydro One Brampton Networks Inc.	189.54	3.16	13.09	51.94	27.4
Hydro One Networks Inc.	1,130.21	18.84	85.66	334.65	29.6
Hydro Ottawa Limited	374.73	6.25	35.85	141.40	37.7
Innisfil Hydro Distribution Systems Limited	9.2	0.15	0.56	2.20	23.9
Kashechewan Power Corporation	0.33	0.01	0.01	0.06	17.2
Kenora Hydro Electric Corporation Ltd.	5.22	0.09	0.08	0.31	6.0
Kingston Hydro Corporation	37.16	0.62	3.30	12.68	34.1
Kitchener-Wilmot Hydro Inc.	90.29	1.50	12.88	51.01	56.5
Lakefront Utilities Inc.	13.59	0.23	1.38	5.41	39.8
Lakeland Power Distribution Ltd.	10.18	0.17	0.55	2.18	21.4
London Hydro Inc.	156.64	2.61	21.13	84.04	53.6
Midland Power Utility Corporation	10.82	0.18	0.98	3.63	33.6
Milton Hydro Distribution Inc.	33.5	0.56	4.11	16.41	49.0
Newmarket - Tay Power Distribution Ltd.	33.05	0.55	3.71	14.69	44.5
Niagara Peninsula Energy Inc.	58.04	0.97	5.03	19.62	33.8
Niagara-on-the-Lake Hydro Inc.	8.27	0.14	1.02	3.87	46.8
Norfolk Power Distribution Inc.	15.68	0.26	1.07	4.13	26.3
North Bay Hydro Distribution Limited	26.1	0.44	2.35	9.24	35.4

Peak Demand						
Target		Achieved To Date				
2014 Peak Demand Reduction Target	LDC's Share of Aggregate Provincial Peak Demand Target	2011 Peak Demand Reduction	2014 Persistent Peak Demand Reduction		Amount of 2014 Demand Target Achieved	
MW	%	MW	MW		%	
			Method 1	Method 2 [1]	Method 1	Method 2
2.06	0.15	0.52	0.22	0.51	10.8	24.6
16.71	1.26	3.42	2.93	3.36	17.5	20.1
2.85	0.21	0.39	0.34	0.37	11.9	13.0
6.15	0.46	1.02	0.41	1.01	6.7	16.4
0.68	0.05	0.04	0.04	0.04	5.9	5.9
60.36	4.54	12.02	6.76	11.89	11.2	19.7
0.19	0.01	0.02	0.01	0.02	3.6	8.9
1.82	0.14	0.15	0.13	0.13	7.1	7.1
45.61	3.43	5.27	2.93	5.26	6.4	11.5
213.66	16.06	35.01	17.36	32.97	8.1	15.4
85.26	6.41	12.69	8.25	12.04	9.7	14.1
2.5	0.19	0.27	0.13	0.27	5.3	10.7
0.07	0.01	0.001	0.001	0.001	1.4	1.4
0.86	0.06	0.01	0.01	0.01	1.3	1.3
6.63	0.5	4.71	0.66	4.68	10.0	70.6
21.56	1.62	4.63	2.49	4.56	11.6	21.1
2.77	0.21	0.26	0.23	0.23	8.2	8.2
2.32	0.17	0.11	0.11	0.11	4.6	4.6
41.44	3.12	6.68	4.02	6.64	9.7	16.0
2.39	0.18	1.59	0.18	1.56	7.7	65.4
8.05	0.61	1.09	0.82	1.08	10.2	13.5
8.76	0.66	0.95	0.82	0.92	9.3	10.5
15.49	1.16	1.39	1.05	1.25	6.8	8.1
2.42	0.18	0.30	0.23	0.23	9.5	9.5
4.25	0.32	0.63	0.25	0.59	5.8	13.9
5.05	0.38	1.02	0.53	0.98	10.4	19.4

Local Distribution Company	Energy				
	Target		Achieved To Date		
	2011-2014 Cumulative Energy Savings	LDC's Share of Aggregate Provincial Energy Target	2011 Annual Energy Savings	2011-2014 Cumulative Energy Savings	Amount of 2011-2014 Energy Target Achieved
	GWh	%	GWh	GWh	%
Northern Ontario Wires Inc.	5.88	0.10	0.48	1.88	31.9
Oakville Hydro Electricity Distribution Inc.	74.06	1.23	6.76	26.94	36.4
Orangeville Hydro Limited	11.82	0.20	1.16	4.53	38.3
Orillia Power Distribution Corporation	15.05	0.25	1.95	7.57	50.3
Oshawa PUC Networks Inc.	52.24	0.87	2.61	10.35	19.8
Ottawa River Power Corporation	8.97	0.15	0.80	3.09	34.4
Parry Sound Power Corporation	4.16	0.07	0.21	0.79	19.0
Peterborough Distribution Incorporated	38.45	0.64	2.58	10.28	26.7
PowerStream Inc.	407.34	6.79	37.27	146.55	36.0
PUC Distribution Inc.	30.83	0.51	2.74	10.86	35.2
Renfrew Hydro Inc.	4.86	0.08	0.51	2.06	42.3
Rideau St. Lawrence Distribution Inc.	5.1	0.09	1.01	3.97	77.9
Sioux Lookout Hydro Inc.	3.32	0.06	0.06	0.25	7.4
St. Thomas Energy Inc.	14.92	0.25	1.25	4.90	32.8
Thunder Bay Hydro Electricity Distribution Inc.	47.38	0.79	2.16	8.50	17.9
Tillsonburg Hydro Inc.	10.25	0.17	0.55	1.98	19.3
Toronto Hydro-Electric System Limited	1,303.99	21.73	172.92	682.97	52.4
Veridian Connections Inc.	115.74	1.93	9.34	37.16	32.1
Wasaga Distribution Inc.	4.01	0.07	0.29	1.14	28.3
Waterloo North Hydro Inc.	66.49	1.11	6.49	25.67	38.6
Welland Hydro-Electric System Corp.	20.6	0.34	2.02	7.94	38.5
Wellington North Power Inc.	4.52	0.08	0.15	0.59	13.1
West Coast Huron Energy Inc.	8.28	0.14	0.49	1.94	23.5

Peak Demand						
Target		Achieved To Date				
2014 Peak Demand Reduction Target	LDC's Share of Aggregate Provincial Peak Demand Target	2011 Peak Demand Reduction	2014 Persistent Peak Demand Reduction		Amount of 2014 Demand Target Achieved	
MW	%	MW	MW		%	
			Method 1	Method 2 [1]	Method 1	Method 2
1.06	0.08	0.10	0.08	0.08	7.9	7.9
20.7	1.56	2.24	1.72	2.21	8.3	10.7
2.78	0.21	0.90	0.25	0.90	9.1	32.2
3.07	0.23	0.97	0.39	0.92	12.7	29.9
12.52	0.94	1.39	0.67	1.39	5.4	11.1
1.61	0.12	0.22	0.18	0.18	11.2	11.2
0.74	0.06	0.05	0.04	0.04	4.8	4.8
8.72	0.66	0.57	0.54	0.55	6.2	6.3
95.57	7.19	14.50	8.78	13.91	9.2	14.6
5.58	0.42	0.66	0.62	0.62	11.2	11.2
1.05	0.08	0.18	0.15	0.18	14.2	17.1
1.22	0.09	0.26	0.23	0.23	18.5	18.5
0.51	0.04	0.01	0.01	0.01	1.5	1.5
3.94	0.3	0.37	0.27	0.34	6.9	8.7
8.48	0.64	0.53	0.48	0.48	5.6	5.6
2.29	0.17	1.48	0.13	1.48	5.5	64.7
286.27	21.52	49.83	35.19	47.90	12.3	16.7
29.05	2.18	3.14	2.11	3.10	7.3	10.7
1.34	0.1	0.13	0.05	0.12	3.6	8.6
15.79	1.19	2.10	1.45	2.03	9.2	12.9
5.56	0.42	0.57	0.43	0.53	7.7	9.5
0.93	0.07	0.04	0.04	0.04	4.0	4.0
0.88	0.07	0.09	0.09	0.09	10.1	10.1

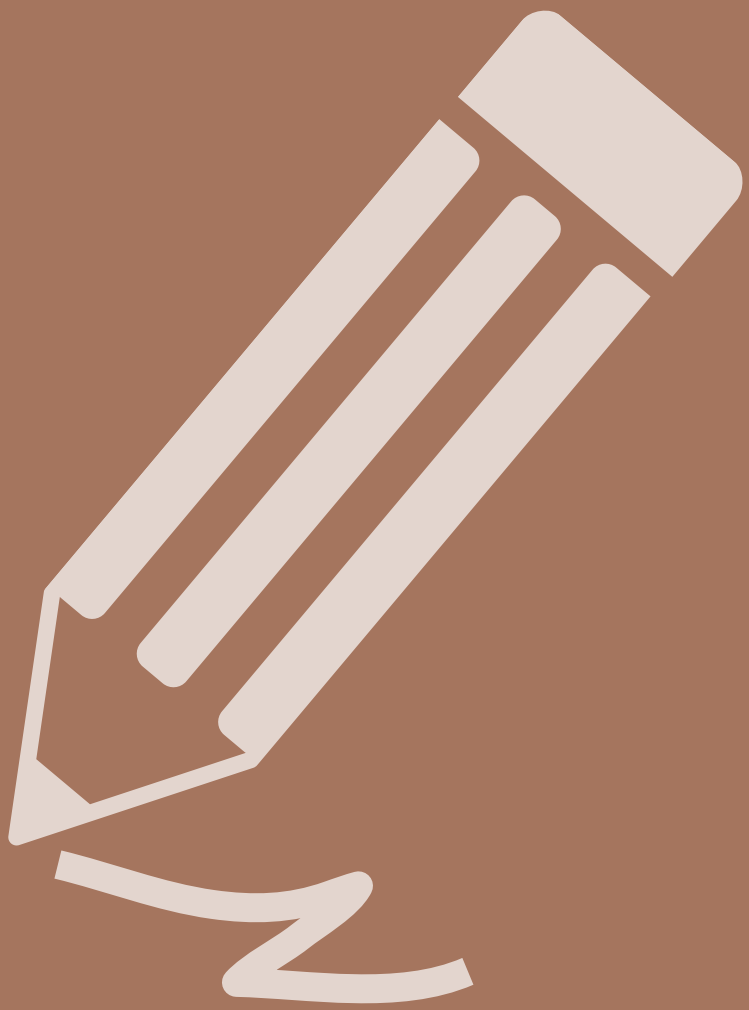
Local Distribution Company	Energy				
	Target		Achieved To Date		
	2011-2014 Cumulative Energy Savings	LDC's Share of Aggregate Provincial Energy Target	2011 Annual Energy Savings	2011-2014 Cumulative Energy Savings	Amount of 2011-2014 Energy Target Achieved
	GWh	%	GWh	GWh	%
Westario Power Inc.	20.95	0.35	1.61	6.33	30.2
Whitby Hydro Electric Corporation	39.07	0.65	3.05	12.11	31.0
Woodstock Hydro Services Inc.	18.88	0.31	5.14	20.17	106.9
TOTAL	**6,000**	**100**	**605.48**	**2,387.50**	**39.8**

Notes

1. "Method 1" of calculating progress towards 2014 peak demand target assumes that no savings from demand response programs persist in 2014. "Method 2" assumes that all savings from demand response programs persist until 2014.
2. LDC results are based on data provided by the Ontario Power Authority to the ECO. In some cases, the results presented here differ slightly from the values reported by LDCs in their 2011 CDM annual reports that were filed with the OEB (the differences are due to some late projects not being recorded in the OPA data provided to the ECO). The ECO has chosen to use the results provided by the OPA, in order to facilitate data analysis. The differences in results are very small at the provincial level, but are meaningful for a small number of individual LDCs. The three LDCs where the differences are most significant are Brantford Power (LDC-reported 2011 peak demand reduction of 1.34 MW), Burlington Hydro (LDC-reported 2011 peak demand reduction of 2.93 MW), and Centre Wellington Hydro (LDC-reported 2011 peak demand reduction of 0.23 MW and 2011 annual energy savings of 0.97 GWh).
3. Entegrus Powerlines Inc. was formed from the merger of Chatham-Kent Hydro Inc. and Middlesex Power Distribution Corp., while Erie Thames Powerline Corporation amalgamated with the former Clinton and West Perth LDCs, and Canadian Niagara Power Inc. (CNPI) amalgamated with the former Port Colborne Hydro Inc. For these distributors, the targets shown in this table are the sum of the individual distributor targets previously assigned by the OEB, and results are also summed across the previously distinct service territories. However, the OEB has not yet officially updated the CNPI target.

Peak Demand						
Target		Achieved To Date				
2014 Peak Demand Reduction Target	LDC's Share of Aggregate Provincial Peak Demand Target	2011 Peak Demand Reduction	2014 Persistent Peak Demand Reduction		Amount of 2014 Demand Target Achieved	
MW	%	MW	MW		%	
			Method 1	Method 2 [1]	Method 1	Method 2
4.24	0.32	0.39	0.36	0.36	8.5	8.5
10.9	0.82	1.04	0.69	1.04	6.4	9.5
4.49	0.34	2.93	0.89	2.92	19.9	65.0
1,330	**100**	**215.65**	**128.86**	**208.01**	**9.7**	**15.6**

ENDNOTES



ENDNOTES

1. For a full description of the reporting mandate and approach, see: Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume One), Rethinking Energy Conservation in Ontario* (Toronto: Ontario, 2010), 6.
2. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2011 (Volume One), Restoring Balance: A Review of the First Three Years of the Green Energy Act* (Toronto: Ontario, 2012), 7.
3. Office of the Premier of Ontario, "McGuinty Government Building Culture of Conservation," News Release, April 19, 2004.

   Office of the Premier of Ontario, "Meeting Ontario's Energy Challenge," News Release, April 19, 2004.

   Ontario Ministry of Energy, "Electricity Conservation and Supply Task Force report confirms need for new direction in Ontario's electricity sector," News Release, January 14, 2004.
4. Ontario Ministry of Energy, "Ontario's Bold New Plan for a Green Economy," News Release, February 23, 2009.
5. Ontario Power Authority, *2006 Annual Report: Laying the foundation for a sustainable electricity future* (2007), 4.
6. Electricity Distributors Association, *The Power to Deliver: Recommendations for the future of electricity distribution in Ontario* (2012), 14.
7. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2011 (Volume One), Restoring Balance: A Review of the First Three Years of the Green Energy Act* (Toronto: Ontario, 2012), 14.
8. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume One), Managing a Complex Energy System* (Toronto: Ontario, 2011), 23.

   For time-of-use (TOU) pricing, a decision was made to reduce the length of the peak period thereby reducing the incentive to shift energy consumption (the end of the peak period was shortened from 9 p.m. to 7 p.m.). The Ontario Clean Energy Benefit provides a 10 per cent rebate on each kWh of electricity consumed. The volume-based design of the rebate rewards high consumers more than lower users (although the benefit has been capped at 3,000 kWh per month above which a rebate is no longer paid somewhat reducing its anti-conservation effect). A new Industrial Electricity Incentive Program starting in 2013, whose details are under design, may work against investment in conservation by providing special lower prices to large industries, like energy intensive resource companies (e.g., mines).
9. Ontario Ministry of Energy, *Results-based Plan Briefing Book 2011-12* (2011), 5-6, 9, 14. Available from: http://www.energy.gov.on.ca/docs/en/ENERGY%202011-12%20RBP%20EN.pdf
10. Ontario Power Authority, EB-2010-0279, 2011 Revenue Requirement Submission, Exhibit B-2-1, *Strategic Objective 2*, May 20, 2011. Available from: http://www.powerauthority.on.ca/regulatory-affairs/2011-revenue-requirement-submission-eb-2010-0279 (accessed October 21, 2012).
11. Some targets include a deadline for conclusion of the conservation activities and some specify energy savings from a particular sector or class of customers. Although not stated, the ECO assumes, unless otherwise indicated, that the quantity of energy specified represents net savings (i.e., adjusted for free riders and other factors).
12. In response to an ECO information request, the Ministry of Energy advised there are two different sets of ministry instructions related to targets, and made a distinction between planning directives and direction to authorize procurement of conservation resources.
13. Some examples include: lack of feasible compliance pathways for regulated parties; complexity inherent in using life cycle models; significant debate regarding how to appropriately measure the greenhouse gas impact of indirect land use change (for biofuels) and other indirect effects (for all fuels); and the ultimate effectiveness of an LCFS policy in reducing emissions due to "fuel shuffling"(e.g., fuel will be redirected to other uses or other jurisdictions, possibly through less efficient supply chains. Production and sales may thus be shuffled in a manner that meets the requirements for an LCFS, but it does not produce the desired outcome of greenhouse gas emissions reductions).
14. Assumes existing demand response remains under contract through 2014. See Section 3.2 for more details.
15. Ontario is currently working towards its new energy conservation targets. Therefore, future energy and peak demand savings will be counted towards the CDM Directive and Supply Mix Directive, which are listed in Table 2. The CDM and Supply Mix Directives are targets; however, planning targets are intended to be reviewed regularly through exercises like the Long-Term Energy Plan.

    To support these planning directives, the Ministry of Energy advised the ECO that the authority provided under the following three directions is sufficient to fund and implement current CDM programs to help meet the current provincial targets:

    - Demand Management, Demand Response and Higher Efficiency Combined Heat and Power Supply (June 2005 and amended February 2006). This directive called for up to 500 MW through demand-side management and/or demand response;
    - Conservation and Demand Management Program Under the GEA Conservation Framework: Low-Income Conservation Initiative (July, 2010); and
    - Conservation and Demand Management Initiatives Under the GEA Conservation Framework (April 23, 2010).
16. Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry, September 7, 2012.
17. Total gas savings for Union Gas include 0.5 million m3 from the Low-Income Weatherization program, which does not contribute to

TRC target. Total gas savings for Enbridge Gas Distribution do not include savings from the Low-Income Weatherization program.

18. Office of Energy Efficiency, "Energy Use Data Handbook Table 2: Canada's Secondary Energy Use by Sector, End-Use and Subsector," Natural Resources Canada. http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/aaa_ca_2_e_5.cfm?attr=0 (accessed November 5, 2011)

    This value refers to data from 2009 and includes thermal energy used for space heating and cooling, and water heating in the residential and commercial/institutional sectors only.

19. Onovwiona, H., Ugursal, V., "Residential cogeneration systems: a review of the current technology," *Renewable and Sustainable Energy Reviews,* 10 (2006), 390.

20. Canadian Industrial Energy End-use Data and Analysis Centre (CIEEDAC), *A review of Existing Cogeneration Facilities in Canada,* prepared for Natural Resources Canada, Environment Canada, and CIEEDAC Supporters (2012).

21. Government of Ontario, *Ontario's Long-Term Energy Plan, Building Our Clean Energy Future* (Toronto: Queen's Printer for Ontario, 2010).

22. Ontario Power Authority, *Green Energy Action, 2009 Annual Report* (2010), p. 16.

23. International Energy Agency, *Combined Heat and Power, Evaluating the benefits of greater global investment* (Paris: France, 2008).

24. Helsingin Energia, "History of the district heating in Helsinki," http://www.helen.fi/kaukolampo_eng/kl_historia.html (accessed September 19, 2012).

25. Compass Resource Management Ltd. *Ontario Power Authority District Energy Research Report – Final Report*, prepared for the Ontario Power Authority (2010).

26. Minister of Energy Dwight Duncan, Direction to the Ontario Power Authority, *Re: Clean Energy and Waterpower in Northern Ontario Standard Offer,* June 14, 2007.

27. Ontario Power Authority, "Combined Heat and Power Standard Offer Program (CHPSOP) Stakeholder Session," (presented February 25, 2011 and slides updated March 3, 2011).

28. Minister of Energy Gerry Phillips, Direction to the Ontario Power Authority, "Re: Procurement for Electricity From Combined Heat and Power (CHP) Renewable Co-generation Projects," April 10, 2008.

29. The directive limits this SOP to projects that are cost effective, located in areas where they can be accommodated by local distribution, and provide local benefits, such as increasing reliability and avoiding other costs to the local system.

30. In response to an ECO information request, the Ministry of Energy provided the ECO with the following policy rationale for each of the seven factors within the November 23, 2010 directive:

    i) Projects shall be located in parts of the province that the OPA identifies as appropriate.

    By the time of the November 2010 CHP directive, connection constraints and surplus generation were known issues in certain parts of the province. The OPA was allowed to consider where in the province newly procured CHP could be most effectively applied.

    ii) The cost effectiveness of the project.

    Ratepayer impact of new procurement was a prime consideration. Previous CHP procurements had found that CHP was being offered at prices higher than other forms of generation with the exception of solar power.

    iii) Whether the project can be accommodated by local distribution systems and whether there are local benefits associated with the project.

    CHP is typically connected at the distribution level. There may be distribution system constraints outside of transmission constraints.

    iv) Whether the project meets the technical requirements for CHP and is designed as an integral and financially viable source of supply to a heat load.

    To be considered as CHP, a project must generate useable electricity and a significant level of useable thermal output, otherwise the fuel efficiency and environmental benefits of CHP will not be realized in practice. The OPA was allowed to set requirements that would encourage viable, efficient and long-term CHP projects.

    The technical requirements, for example, require that connectable heat loads be identified and that a minimum useful heat threshold for heat is designed to be met or exceeded over the life of the contract with the OPA. To show that a CHP project will be viable over the term of an OPA contract and that electricity ratepayers are not subsidizing heat customers, the proponent should demonstrate that there are secured customers willing to purchase the required minimum heat output at market rates for the life of the contract.

    v) The extent to which a project is sized to match the heat load requirements.

    For maximum fuel efficiency and minimum environmental impact, CHP projects should be designed for the heat load, so that the electricity output follows heat demand. Projects that have higher useful heat outputs well beyond the minimum set by the OPA are generally more efficient and have a lower environmental impact.

    The OPA was allowed to consider the overall balance between generation and thermal output in order to encourage higher efficiencies than the minimum requirement.

    vi) A project's ability to accommodate electricity system load following and other operability requirements.

    CHP operations typically do not generate in a pattern that follows system demand, especially if they are properly following heat loads. There are technologies such as heat storage that allow CHP operators to adjust power generation somewhat to provide extra value of load flowing into the electricity system and the OPA was allowed to value CHP that was efficiently adaptable to system needs.

vii) Contract terms shall reflect a reasonable cost for Ontario electricity consumers and a reasonable balance of risk and reward between project proponents and Ontario electricity consumers.

The OPA was allowed to determine a fair value for the electricity generated from CHP projects.

31. Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry, September 7, 2012.

32. Independent Electricity System Operator, *18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System from April 2005 to September 2006* (2005).

    Independent Electricity System Operator, *18-Month outlook from December 2010 to May 2012* (2010).

33. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, August 27, 2012.

34. Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry, September 7, 2012.

35. The ECO requested additional details on this point and was directed by the Ministry of Energy to speak with the OPA for further information. The OPA indicated that past CHP procurement has been more expensive than other forms of dispatchable gas generation, and it is not fair to make comparisons between the prices paid for solar and CHP generation because each has different system benefits.

36. Ontario Power Authority, "CHP IV Procurement," http://www.powerauthority.on.ca/chp-iv-procurement (accessed September 19, 2012).

37. Ontario Power Authority, "Combined Heat & Power Standard Offer Program (CHPSOP)," https://cms.powerauthority.on.ca/combined-heat-power-standard-offer-program-chpsop (accessed September 19, 2012).

38. Ontario Power Authority, "Combined Heat & Power Standard Offer Program (CHPSOP)," https://cms.powerauthority.on.ca/combined-heat-power-standard-offer-program-chpsop (accessed September 19, 2012).

    Ontario Power Authority, "Energy Recovery Standard Offer Program (ERSOP)," http://www.powerauthority.on.ca/energy-recovery-standard-offer-program-ersop (accessed September 19, 2012).

39. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, August 27, 2012.

40. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 10, 2012.

41. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, August 27, 2012.

42. The OPA has developed a formalized approach to regional planning, under which it examines local supply and reliability needs to determine areas facing supply constraints that should be targeted for regional planning studies. The OPA is currently leading joint regional planning studies in several areas (Kitchener-Waterloo-Cambridge-Guelph, Windsor/Essex, Central-Downtown Toronto, York Region, and Ottawa). Regional plans are developed by a study team, which is led by OPA and includes LDCs and transmitters, as well as the IESO. The process starts with the development of a load forecast, as performed by LDCs, as well as a conservation forecast. A needs assessment is then completed, which focuses on meeting the IESO's Ontario Resource and Transmission Assessment Criteria to ensure regional reliability. The study team then examines a range of options and assesses the technical feasibility and cost of the different solutions. Information on the process indicates that a public consultation would then be performed with stakeholders, and a plan would be formalized. At this time, no plans have proceeded to the public consultation phase. Further information on the regional planning process can be obtained from: http://www.ontarioenergyboard.ca/OEB/_Documents/EB-2011-0043/OPA_Regional_Planning_Process.pdf

43. A similar approach was taken in California for its Self-Generation Incentive Program (SGIP), under which eligibility for participation is based on greenhouse gas emissions reductions. SGIP was developed in 2001 as a peak-load reduction program meant to encourage the development and commercialization of new distributed generation. A Senate Bill in 2009 modified the focus of the SGIP to include greenhouse gas reductions and directed the Commission to identify distributed energy resources that could provide greenhouse gas reductions and set incentive levels to encourage eligible generation projects to participate. Additional information about this program can be found here: http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/aboutsgip.htm

44. City of Toronto Energy Efficiency Office, "Embedded Energy Solutions - SEI Seminar Series – Energy Storage," (presented September 21, 2012).

45. Entegrus Powerlines Inc. was formed from the merger of Chatham-Kent Hydro Inc. and Middlesex Power Distribution Corp., while Erie Thames Powerline Corporation amalgamated with the former Clinton and West Perth LDCs, and Canadian Niagara Power Inc. (CNPI) amalgamated with the former Port Colborne Hydro Inc.

46. For a review of the CDM Code, see Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume One), Managing a Complex Energy System (*Toronto, Ontario: 2011), 31-38. For a review of the LDC targets, see Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume Two), Managing a Complex Energy System – Results* (Toronto, Ontario: 2011), 27-34.

47. The one exception is Greater Sudbury Hydro, which received approval from the OEB in 2008 (under a different conservation framework) for a suite of custom conservation programs, including thermal storage to shift heating to off-peak hours, parking lot plug controllers for block heaters, and traffic light and streetlight conversion. Because approved funding for these programs has not been exhausted, these programs were permitted by the OEB to continue operating in 2011 without requiring approval under the new framework. Greater Sudbury Hydro provided some preliminary results for these programs in its 2011 CDM Annual Report, but noted that these programs had not yet been evaluated.

Once savings have been fully verified, Greater Sudbury Hydro expects that these program results will count towards their 2014 conservation targets, although the OEB has not confirmed this.

48. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 17, 2012.

49. Hydro One and Hydro One Brampton withdrew their application (EB-2010-0331, EB-2010-0332) over concerns that the OEB might find their proposed programs duplicative of OPA offerings and that they were not in an immediate position to comply with the OEB's requirement for program evaluation plans. Toronto Hydro was approved by the OEB (EB-2011-0011) to fund two of their eight proposed programs (the others were rejected), but only on a reduced budget and limited term. Toronto Hydro determined that these restrictions made the programs uneconomic and restricted their impact, and elected not to proceed.

50. See Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume One), Managing a Complex Energy System* (Toronto, Ontario: 2011), 37, for the ECO's comments on duplication. The OEB's *Guidelines for Electricity Distributor Conservation and Demand Management* (released in April 2012 following the unsuccessful Toronto Hydro and Hydro One/ Hydro One Brampton applications), provided additional guidance on what the OEB considered to be duplication of OPA programs.

51. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 17, 2012.

52. Program schedules form a part of the contract signed between the OPA and each distributor, and describe the specific details of the conservation program. Finalization of a program schedule is a necessary step before the distributor can offer the program to customers.

53. Conservation measures installed in 2011, 2012, 2013 and 2014 will contribute four, three, two and one years, respectively, of energy savings towards the energy target. Thus, if 605.5 MW of new incremental savings are achieved each year, cumulative savings at the end of 2014 will be 605.5 GWh * (4+3+2+1) = 6,055 GWh. This assumes that all energy savings will persist through 2014 (a slight simplification, as the OPA predicts that a very small amount of 2011 savings will not persist until 2014).

54. See Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume Two), Managing a Complex Energy System – Results* (Toronto, Ontario: 2011), 44-48, for a review of these commercial retrofit programs and their 2010 performance.

55. Savings from other conservation initiatives that have no LDC involvement (such as energy codes and standards) are also excluded from contributing towards LDC targets.

56. This figure does not include approximately $12M in the OPA's operating budget for staff compensation, professional and consulting services and information technology, which is recovered through an OEB-approved usage fee.

57. See Ontario Power Authority, *OPA Conservation and Demand Management Cost Effectiveness Guide* (2010) for more information on the OPA's use of these tests.

58. This estimate assumes an average greenhouse gas emissions intensity for Ontario's electricity sector of 0.130 g CO_2 equivalent/ kWh, consistent with the 2010 value reported in Table A13-7 of: Environment Canada, *National Inventory Report: Greenhouse Gas Sources and Sinks In Canada* (2012). The true value of avoided greenhouse gas emissions from conservation is likely higher, as conservation substitutes for generation at the margin (such as natural gas), which has a higher emissions intensity factor than the average. The estimate of the value of avoided greenhouse gas emissions also assumes an annual discount rate of 4 per cent when calculating future benefits from avoided emissions, consistent with the method used in the OPA's cost-effectiveness tests.

59. Karen Howlett, "Secret Deals Lock Province Into Paying For Idle Power Plants," The Globe and Mail, October 1, 2012.

60. Hydro One also proposed that LDCs that serve as the Head Office contact should receive some portion of the total savings to reward their efforts in attracting these chain-wide retrofits. Currently, savings are allocated to LDCs according to the geographic area where each project takes place.

61. This issue was previously discussed by the ECO. See *Environmental Commissioner of Ontario, Annual Energy Conservation Progress Report – 2010 (Volume Two), Managing a Complex Energy System – Results* (Toronto, Ontario: 2011), 44-48.

62. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, August 27, 2012.

63. Ontario Ministry of Energy, information provided to the ECO in response to ECO inquiry, September 7, 2012.

64. Electricity Distributors Association, *The Power to Deliver: Recommendations for the Future of Electricity Distribution in Ontario* (2012).

65. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume One), Managing a Complex Energy System* (Toronto, Ontario: 2011), 38.

66. Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, September 17, 2012.

67. Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, September 17, 2010.

68. Ontario Ministry of Education, *Green Schools Resource Guide: A Practical Resource for Planning and Building Green Schools in Ontario* (2010), iv.

69. A study for the California Board for Energy Efficiency found students exposed to natural daylight in classrooms progress as much as 20 per cent faster on math tests and as much as 26 per cent faster on reading tests than students with no daylight exposure. Also, an analysis for the State of Washington showed incorporating green building measures in school designs improves indoor air quality and can reduce absenteeism rates by as much as 15 per cent.

United States Environmental Protection Agency, *Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs* (2011).

70. Ontario Ministry of Education, "About the Ministry," http://www.edu.gov.on.ca/eng/about/ (accessed August 28, 2012).

71. Through the Ministry of Education, the province funds nearly 98 per cent of education sector spending. School boards are funded through direct grants and the education portion of property taxes. School boards' expenses represented about 94 per cent of the ministry's total expenses in 2010/2011.

    Commission on the Reform of Ontario's Public Services, *Public Services for Ontarians: A Path to Sustainability and Excellence* (Toronto: Queen's Printer for Ontario, 2012), 203.

72. Ontario's 72 District School Boards are made up of 31 English-language public boards, 29 English-language Catholic boards, 4 French-language public boards, and 8 French-language Catholic boards. In addition, Ontario has 11 School Authorities (certain remote or distinct communities have school authorities instead of district school boards).

    Ontario Ministry of Education, "Education Facts," http://www.edu.gov.on.ca/eng/educationFacts.html (accessed August 28, 2012).

73. Ontario Ministry of Education, "Ministry of Education's Energy Management in Ontario's School Boards: Demonstration for the Office of the Environmental Commissioner of Ontario," slide 5 (presented October 24, 2012).

74. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume Two)*, *Rethinking Energy Conservation in Ontario – Results* (Toronto: Ontario, 2010), 26-27.

    Environmental Commissioner of Ontario, *Annual Report 2011/12: Losing Our Touch* (Toronto: Ontario, 2012), 138-143.

75. Cheri Hayward, Director School Business Support Branch, Ministry of Education, memorandum to Senior Business Officials, *Re: Energy Conservation Initiative, Incentive Programs Advisor, Utility Consumption Database 2009: SB27,* July 10, 2009.

76. Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, October 7, 2010.

77. The term "historical" is used to distinguish from real-time data collection. The database automatically collects consumption data based on the billing cycle of each utility, typically resulting in a three-month delay for some consumption data.

78. Some sites have more than one meter to accommodate portables, large additions, or multiple buildings on one site.

79. Ontario Ministry of Education, "Ministry of Education: Energy Management and Conservation Initiative," slide 10 (presented March 6, 2012).

80. Ontario Ministry of Education, "Environmental Education," http://www.edu.gov.on.ca/eng/teachers/enviroed/greenSchools.html (accessed August 28, 2012).

81. Under O. Reg. 397/11 all public sector organizations, including school boards, must submit annual energy consumption for their facilities and publish energy conservation and demand management plans every five years.

    Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2011 (Volume One), Restoring Balance, A Review of the First Three Years of the Green Energy Act* (Toronto: Ontario, 2012), 32-38.

82. All school boards were also required to sign a service agreement with their utilities in order to have the data sent electronically.

83. Examples include missing accounts, changes resulting from newly acquired or sold facilities, and inconsistencies with the format of data sent by local distribution companies.

84. At the time of writing, the Ministry of Education noted the data integrity of the Utility Consumption Database is currently at 98.9 per cent.

    Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, September 28, 2012.

85. Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, September 28, 2012.

86. Ontario Ministry of Education, information provided to the ECO in response to ECO inquiry, September 28, 2012.

    Ontario Ministry of Education, "Ministry of Education's Energy Management in Ontario's School Boards: Demonstration for the Office of the Environmental Commissioner of Ontario," (presented October 24, 2012).

87. Expenditures for electricity and natural gas represent 98 per cent of the total energy expenditures in the province for both the 2009/2010 and 2010/2011 school years.

88. Ian Jarvis, Enerlife, e-mail message to ECO staff, October 3, 2012.

89. ECO analysis of UCD data.

90. Retrocomissioning is a quality assurance process applied to existing buildings that seeks to correct problems with the construction, operation, systems and equipment that have developed over the life of the building and impede its energy efficient performance.

    United States Environmental Protection Agency, *ENERGY STAR Building Upgrade Manual* (2008).

91. Simcoe County District School Board, "About Us," http://scdsb.on.ca/about-us/ (accessed October 9, 2012).

92. The District funds conservation programs by reinvesting a portion of the avoided utility costs. Furthermore, schools are encouraged to use their award money to fund new or current conservation projects.

    Seattle Public Schools, "Resource Conservation - Utility Conservation Programs," http://www.seattleschools.org/modules/cms/pages.phtml?sessionid=db0983da500098d7c1a608c977fe920b&pageid=250431&sessionid=db0983da500098d7c1a608c977fe920b (accessed October 1, 2012).

93. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2011 (Volume One), Restoring Balance, A Review of the First Three Years of the Green Energy Act* (Toronto: Ontario, 2012), 36.

94. For example, both databases noted issues with the inconsistent format of utility account information and changes made to meters or account numbers.

    Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume Two), Managing a Complex Energy System – Results* (Toronto: Ontario, 2011), 21-23.

95. The Ontario EBT Working Group, operating under the Ontario Energy Board, states "For all transactions, when presenting energy, it is to be loss adjusted."

    The Ontario EBT Working Group, *The Electronic Business Transactions (EBT) Standards Document for Retail Settlement in the Electric Retail Open Access Industry Version 4.0* (January 2008).

96. The reporting requirement under O. Reg. 397/11 is for "energy consumption purchased for the year and consumed in connection with the operation", which the Ministry of Energy has interpreted as reporting metered consumption.

    Ministry of Education, e-mail message to ECO staff, October 26, 2012.

97. Ministry of Education, e-mail message to ECO staff, October 26, 2012.

98. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume Two), Rethinking Energy Conservation in Ontario – Results* (Toronto: Ontario, 2010), 26-27.

99. For example, the Gaia Project, an educational charity based in New Brunswick, makes utility data from participating schools available to the public. The Seattle Public Schools District also collects and publicly publishes data for energy, water and waste.

    The Gaia Project, "School Utility Bills," http://www.thegaiaproject.ca/data/school-bills (accessed October 1, 2012).

    Seattle Public Schools, "Utility Conservation Program: Shared Savings Award & Utility Data," http://www.seattleschools.org/modules/cms/pages.phtml?sessionid=b424fc16e3fec045fe7cd12aeaf47af1&pageid=250432&sessionid=b424fc16e3fec045fe7cd12aeaf47af1 (accessed October 1, 2012).

100. Statistics Canada's "57-003-X 2009 Preliminary Report" was released May 18, 2011. Statistics Canada made significant methodological changes to the source data after the preliminary 2009 data was published. Old data sets were terminated and replaced (CANSIM tables 128-0009 and 128-0010 have been terminated and replaced by CANSIM tables 128-0016 and 128-0017), and a new survey began in 2009 that affects the consumption information for four fuels: diesel, light fuel oil, heavy fuel oil, and motor gasoline. Such changes mean that caution should be used when making comparisons between old and new data. Since the preliminary 2009 data were not affected by these methodological changes, comparisons can be made between preliminary 2009 data and data contained in earlier ECO reports that included information for the calendar years 2008 and 2007. Further information regarding this change is available from the January 13, 2012 release of The Daily, "Energy supply and demand." Available from: http://www.statcan.gc.ca/daily-quotidien/120113/dq120113b-eng.htm

101. Statistics Canada, 2011, *Report on Energy Supply and Demand in Canada – 2009 Preliminary*, Catalogue no. 57-003-X, 9.

102. Statistics Canada, 2010, *Provincial and Territorial Economic Accounts Review – 2009,* Catalogue no. 13-016-X, Vol. 6, no. 1, 12.

103. Independent Electricity System Operator, *18-month Outlook from December 2009 – May 2011*, (2009), iv.

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