Environmental Commissioner of Ontario

Managing a Complex Energy System – Results

Annual Energy Conservation Progress Report – 2010 (Volume Two)

Environmental
Commissioner
of Ontario

Commissaire à
l'environnement
de l'Ontario

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December 2011

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 – 2010 of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario.

The Annual Energy Conservation Progress Report – 2010 is my independent review of the Ontario government's progress in conserving energy, and is issued in two separate documents. The first volume covered the broader policy framework affecting energy conservation in Ontario. This second volume describes initiatives underway, assesses energy savings derived from these initiatives and measures progress on meeting targets.

Sincerely,

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List of Acronyms

AMI	Advanced Metering Infrastructure
BIP	Business Incentive Program
BOMA	Building Owners and Managers Association
BBP-EB	Better Buildings Partnership for Existing Buildings
C&I	Commercial and Institutional
CDM	Conservation and Demand Management
CME	Canadian Manufacturers and Exporters
COU	Council of Ontario Universities
DR 3	Demand Response 3
DSM	Demand-Side Management
EBR	*Environmental Bill of Rights, 1993*
ECO	Environmental Commissioner of Ontario
EM&V	Evaluation, Measurement and Verification
ERIP	Electricity Retrofit Incentive Program
GEA	*Green Energy Act, 2009*
GHG	Greenhouse Gas
GS	General Service
GWh	Gigawatt-hour
HVAC	Heating, Ventilation and Air Conditioning
IGUA	Industrial Gas User's Association
IO	Infrastructure Ontario
IPSP	Integrated Power System Plan
ISO	International Organization for Standardization
kW	Kilowatt
kWh	Kilowatt-hour
LDC	Local Distribution Company
LRAM	Lost Revenue Adjustment Mechanism
LTEP	Long-Term Energy Plan
m^2	Square Metre
m^3	Cubic Metre
MDM/R	Meter Data Management and Repository
MOI	Ministry of Infrastructure
MUSH	Municipalities, Universities/Colleges, Schools, and Hospitals
MW	Megawatt
OCECS	Ontario Colleges Energy Conservation Secretariat
OEB	Ontario Energy Board
OPA	Ontario Power Authority
PJ	Petajoule
RFP	Request for Proposal
RPP	Regulated Price Plan
RTOS	Real Time Operating System
TOU	Time-of-Use
TWh	Terawatt-hour

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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.

This is the second volume of the *Annual Energy Conservation Progress Report – 2010.* Volume One, released in June 2011, focused on the policy framework for energy conservation, providing an extensive review of electricity developments as well as a concise analysis of a regulatory decision affecting funding of natural gas conservation. This second volume measures progress against established energy targets, and reviews natural gas industrial conservation programs, the Ontario Power Authority's Conservation Fund, and electricity retrofit programs for commercial and institutional buildings.

The Value of Conservation

The ECO believes that the value of energy conservation was often ignored during public debates on energy in 2010. This neglect contrasts with the obvious benefits - economic, societal, and environmental - directly derived from saving energy, as described in this Report. The ECO reminds the government of the proven ability of conservation to help avoid the construction of new and often unpopular energy supply projects, to save customers money, and to reduce the environmental impacts of energy infrastructure. The ECO urges the government to prioritize conservation funding.

Energy Targets

The ECO reviewed progress against three government conservation targets and examined new targets set by the government in 2010.

Reducing Ontario Electricity Demand by 2,700 MW by 2010

According to the Ontario Power Authority (OPA), conservation initiatives undertaken from 2005 onwards reduced peak electricity demand by 1,751.9 megawatts (MW) in 2010. This represents a 7 per cent reduction in peak demand, but falls short of the target set by the Minister of Energy for a 2,700 MW reduction in peak demand by 2010. In addition, the ECO believes that the reported savings likely overestimate the actual savings by a small amount, due to some methodological concerns.

Despite not reaching the 2010 target, Ontario's conservation efforts delivered positive benefits by reducing the need for new generation and saving electricity ratepayers money. The reduction in peak demand is approximately equivalent to the capacity of three natural gas peaking power plants. By investing about $1.7 billion in conservation programs from 2006 to 2010, Ontario saved electricity ratepayers $3.8 billion in avoided electricity supply costs.

Conserving Electricity in Government Operations

To support a culture of conservation, the Ontario government pledged to reduce electricity use in its own facilities by 20 per cent by 2012 (relative to the baseline amount consumed in the 2002/2003 fiscal year). The government intended to achieve these savings primarily through facility upgrades, supplemented by employee engagement and other actions.

The government reduced its electricity consumption by 8 per cent by 2007, and estimates that it will reach approximately 75 per cent of its target by 2012, reducing electricity consumption by some 15 per cent relative to 2002/03. Progress in ministries that manage their own facilities (known as "custodial ministries") has lagged behind progress in ministries where Infrastructure Ontario serves as the facility manager: this discrepancy is caused by insufficient dedicated funding and a lack of programs to reduce energy consumption in custodial facilities.

The ECO recommends that the Minister of Infrastructure use the *Green Energy Act, 2009* directive power to remove the barriers faced by custodial ministries to achieve the government's electricity conservation target.

Implementing Smart Meters and Time-of-Use Pricing

The government set targets to install smart meters for all eligible electricity customers by the end of 2010 and to have 3.6 million customers billed using time-of-use (TOU) prices by June 30, 2011.

The smart meter installation target was almost met, with 97 per cent of eligible customers receiving smart meters by the end of 2010. About 2.8 million homes and small businesses had moved from the existing two-tier price structure to TOU pricing by June 30, 2011, meaning almost three-quarters of the TOU target was achieved. Local Distribution Companies (LDCs) have worked diligently towards meeting the smart meter installation and TOU pricing targets; most of the delays in TOU implementation have resulted from unforeseen technical issues. While pleased with the progress made against both these targets, the ECO is disappointed that the Ontario Energy Board (OEB) is just beginning to collect and analyze the data in order to track the actual reduction in peak demand due to TOU pricing. This data is essential to setting TOU prices at levels that maximize the amount of induced conservation.

New Conservation Targets

In 2010, the government introduced two major new electricity targets.

- Electricity consumption and demand reduction targets were set for each LDC during the 2011 to 2014 period, reflecting the central role of LDCs in delivering conservation programs during this period.
- Province-wide electricity consumption and demand reduction targets were set for 2015 and later years. These are to be achieved by the OPA through the combined efforts of conservation programs delivered by LDCs, OPA programs for transmission-connected customers, previous conservation programs, codes, standards, and TOU rates. The OPA will deliver its strategy for meeting these targets in an updated version of the Integrated Power System Plan (IPSP).

The ECO is concerned that the LDC conservation targets will not be met. This concern is based on the late start in launching province-wide conservation programs, as well as the lack of programs designed by LDCs and approved by the Ontario Energy Board (OEB). These programs, known as Board-Approved Programs, will be needed for LDCs to meet their targets. To date, only two LDCs have applied for Board-Approved Programs and both applications were later withdrawn following unfavourable decisions by the OEB. The ECO believes this may undermine the credibility of the targets and conservation efforts. The ECO urges the government and the OEB to promptly implement options to ensure the target is met or otherwise reconsider the target timeline. The ECO also requests that the government, the OPA and the OEB clarify whether savings from TOU pricing will be counted towards LDC conservation targets.

The ECO is discouraged with the lack of transparency in setting the new province-wide targets. This was also the case with the LDC targets. The ECO believes that the government did not make enough information available about the method and assumptions underlying these targets. As a result, the public could not assess whether these target amounts were set to deliver the optimal amount of conservation.

Conservation Initiatives

The ECO reviewed the results of three major conservation programs that were active in 2010.

Natural Gas Industrial Conservation Programs

Energy efficiency is often given a low priority by industrial firms. Very cost-effective opportunities to save energy exist but are often not acted upon without utility involvement. To overcome these barriers, Ontario's natural gas utilities have offered industrial conservation programs combining technical assistance and financial incentives. These programs have consistently delivered large savings and have been more cost-effective than gas conservation programs in any other sector.

However, a recent OEB decision has changed the rules; it is no longer mandatory for utilities to offer natural gas conservation programs to their large industrial customers. Both Ontario's major gas distributors intend to continue to voluntarily offer industrial conservation programs for these customers but have reduced their proposed spending. The OEB action raises the possibility that distributors will continue to limit spending on more extensive programs out of concern that these will be rejected by the OEB. The likely result is that the coming years will see a decrease in the total amount of utility funds directed at industrial gas conservation.

The ECO suggests that had the OEB more explicitly considered the societal costs of energy consumption, such as greenhouse gas emissions, it would have maintained mandatory conservation programs for large industrial customers. This pattern of not considering the environmental consequences of energy consumption can be seen in other recent OEB decisions. The ECO

suggests a legislative amendment is needed to make the OEB more effective in promoting energy conservation; such a focus had been intended by the *Green Energy and Green Economy Act, 2009* but has not yet been achieved in practice.

The ECO recommends that the Ministry of Energy amend the *Ontario Energy Board Act, 1998* so that the Ontario Energy Board's objectives include having regard to the environmental costs associated with energy consumption.

Electricity Retrofit Programs for Commercial and Institutional Buildings

The ECO reviewed four separate conservation programs, operating between 2007 and 2010, that sought energy efficiency improvements in existing commercial and institutional buildings. The ECO finds that these programs delivered electricity savings in a cost-effective fashion, but generally did not achieve their amount of targeted savings.

The OPA has replaced these four programs with a new province-wide program that launched in 2011. This program provides financial incentives for building retrofits, but also includes new supporting measures, such as funding for audits, building commissioning, and building operator training. The ECO supports these program enhancements but believes that additional changes, such as increased incentive levels, or more education and outreach efforts, may be needed to meet the ambitious program targets.

The ECO also identifies a barrier to program participation that was noted in the previous generation of commercial retrofit programs and remains in the new program. Some potential program participants declined to join because they are legally required, as a condition of the programs, to give the OPA ownership of all environmental attributes associated with retrofits funded through the programs. Environmental attributes are the benefits and entitlements that can be claimed due to the positive environmental impacts, such as reduced greenhouse gas emissions.

The ECO recommends that the Ontario Power Authority release claims to ownership of environmental attributes arising from conservation projects funded with the aid of Ontario Power Authority incentives.

The Conservation Fund

The ECO examined the Conservation Fund grant program that is operated by the OPA to stimulate innovation in conservation, test unique elements of conservation initiatives, build capacity, and provide pilot results to inform future OPA programs. From 2005 to 2010, the Fund provided almost $15 million to 97 projects across all sectors, and tested a number of initiatives that are now incorporated into OPA's regular program portfolio. The OPA plans to make more use of targeted Requests for Proposals on specific priority areas for conservation investment. The ECO believes that there is a continuing need for a program such as the Conservation Fund to drive improvements in conservation program design and encourage innovation.

1: Introduction

1.1 The ECO's Reporting Mandate and Approach

The Environmental Commissioner of Ontario (ECO) is required under the *Environmental Bill of Rights, 1993* (*EBR*) to report annually to the Speaker of the Legislative Assembly of Ontario on the province's progress in energy conservation.[1] Our reports review: the results of initiatives to reduce or make more efficient use of all major sources of energy; the progress in achievement of government-established energy conservation targets; and, the barriers to conservation and efficiency. This is Volume Two of the 2010 Annual Energy Conservation Progress Report. It analyzes conservation program data, reviews initiatives undertaken and measures progress towards targets. Volume One, released in June 2011, reviewed recent policy developments primarily in electricity and natural gas conservation, and also provided an in-depth discussion of barriers to alternative renewable energy sources.

The quality and utility of our reports depend on information that the ECO sources from other organizations. To fulfill our legislative mandate, the *EBR* empowers the ECO to request information from ministries, energy agencies and companies. Access to this data is critical to our work. For this Report, the ECO was encouraged by the efforts of the Ministry of Energy, Ontario Power Authority (OPA) and distribution companies to share information and discuss the data provided.

1.2 Context of the Report

Volume One of the 2010 Report focused on electricity policy developments, with a brief discussion of regulatory changes affecting natural gas conservation. Volume Two continues in the same vein with a broad review of several electricity initiatives and a targeted analysis of industrial natural gas conservation programs.

As was the case with the release of the first volume, the politics of electricity, particularly around distributed generation, became even more prominent in the latter half of the year. Views for and against renewable energy became more entrenched. Concerns about the aesthetic, cost and health impacts of renewable and gas-fired generation framed the energy debate. Discussion of conservation centred on the role, if any, of energy companies and agencies in delivering conservation programs and the rate impact of funding such programs.

In the ECO's view, lost in this debate was discussion of the value of conservation. Ontarians witnessed a lopsided public policy discourse that concentrated on energy prices rather than costs, neglecting the economic and environmental impacts of growth in energy demand not moderated by conservation. The implicit value of conservation in reducing the need for new generation capacity received little attention.

This Report reviews the performance of conservation programs and the achievement of target milestones in 2010. Before reporting energy savings in the main body of the Report, this section outlines some of the implicit reasons for conserving energy that seldom received mention in 2010.

1.3 Why Value Energy Conservation?

The Future is Uncertain

Does Ontario need more energy supply? Provincial planners forecasting energy demand growth will usually answer yes, but qualify that their estimates are scenario-based and contingent on a number of variables, such as economic and population growth, weather and the performance of conservation efforts. As a result, planners often overestimate our energy needs.

Consider a historical example from Ontario's long-term electricity planning. In 1989, Ontario Hydro published a plan that projected a large gap between supply and demand, determining that the province would require supply capacity capable of meeting peak demand of 40,000 megawatts (MW),

and the plan proposed building several additional nuclear reactors and natural gas combustion turbine units (see Figure 1). For several reasons (e.g., slower economic growth), the projected demand did not materialize. It was also during this period that efficiency began to contribute strongly, energy intensity improved and for the first time, growth in consumption and growth in gross domestic product did not move in lockstep. The province still does not require such a large amount of capacity – even during Ontario's all-time peak demand in the summer of 2006, the maximum electricity use was 27,005 MW.[2] Peak demand in 2010 was 25,075 MW.[3]

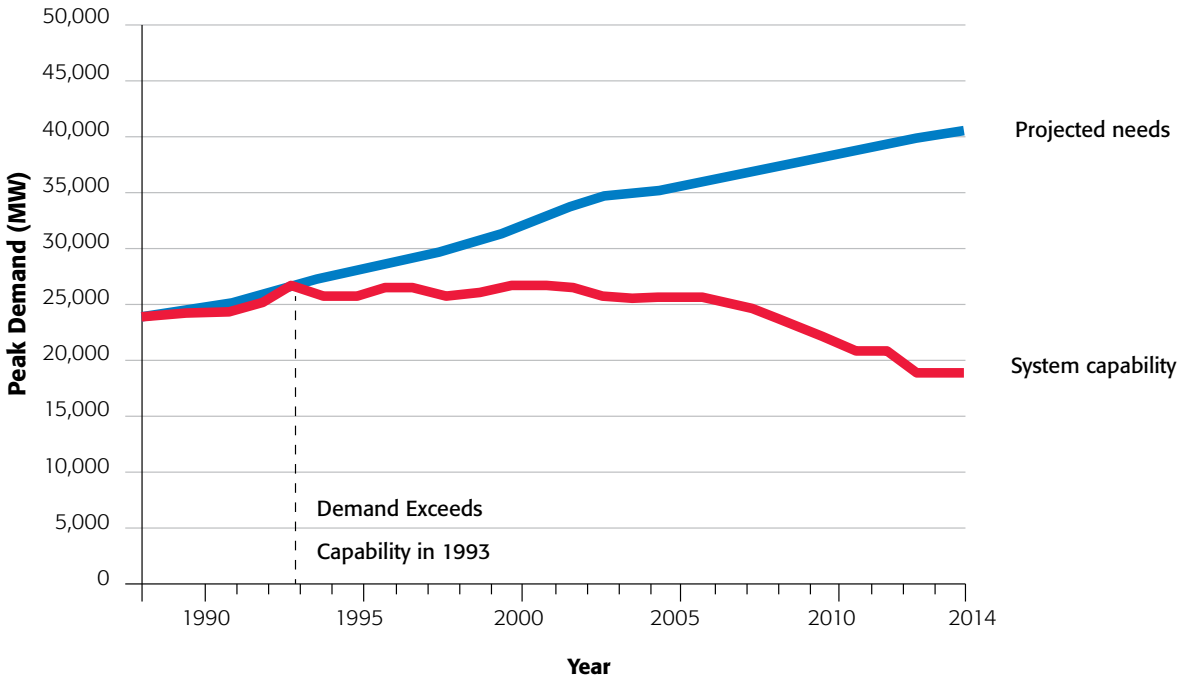

Figure 1: 1989 Projected Capacity and Demand

Source: Ontario Hydro, *Providing the Balance of Power: Ontario Hydro's Plan to Serve Customers' Electricity Needs,* p. 12

Ontario faces similar uncertainties today: structural economic change domestically and a highly uncertain economic outlook globally. The uncertainty underscores the old adage that "forecasts should be used and not believed." Ontario's electricity plan has been revised recently, particularly with respect to anticipated industrial demand and conservation targets. Ontario's power consumption is now roughly equal to what it was a decade ago (about 142 terawatt-hours [TWh] annually). The Long-Term Energy Plan (LTEP) assumes that consumption will be almost flat for most of this decade (see Figure 4 in Section 2.4.1 of this Report), in part because conservation is expected to offset roughly two-thirds of the projected growth in demand over the next five years.[4] For the longer term, projected growth is more difficult to estimate and there may be further conservation opportunities that could help avoid building some of the new planned supply projects. This is good news. As witnessed in 2010, willing host communities of power plants of any type are few and far between.

> The Long-Term Energy Plan (LTEP) assumes that... conservation is expected to offset roughly two-thirds of the projected growth in demand over the next five years.

Meeting Our Service Needs While Using Less Energy – Three Pillars of an Ontario Energy Policy

Efficiency – More Value From Less Energy

Energy is not an end in itself. What we are really after are the *services* that energy provides – like heating, cooling, lighting and mobility. Achieving the same or higher level of service using less energy is possible with a strong regulatory focus on technologies that force energy efficiency improvement. Great potential exists in the retrofit market to incent or mandate efficiency improvements.

Reduction of Use – Rewarding Behaviour That Uses Less Energy

Energy efficiency through technological changes alone will not be enough to avoid the need for new supply.[5] The energy we stop wasting, or unnecessarily consuming, is the cheapest and most readily available energy source there is. Therefore, programs, regulations and pricing policy should reward behaviour that yields an absolute reduction in energy demand. Reducing consumption reduces individual energy bills even as the rate or unit price of energy climbs. Collectively, it contributes to a "system benefit" – a reduction in costs for all ratepayers – because energy production, transportation and storage costs are lower. When less energy is used, there is less demand on the system and new energy supply infrastructure can be avoided. This lowers the land use impacts from the extraction, production and delivery of energy, and benefits extend to the individual level in terms of longer product lifespan and reduced capital costs.[6]

Distributed Energy – Living Within Our Means

Distributed energy, ideally from renewable sources and efficient Combined Heat and Power Systems, located close to the demand served might also be considered a pillar of conservation, though admittedly different than the two above. Distributed energy brings our energy use "up close and personal." It instills the thinking that, individually and as a society, Ontarians need to live within their means. By locating efficient supply close to demand, we reduce delivery losses and also recover energy that we now waste. Our energy supply is planned not as a remote centralized infrastructure but as a distributed network with nodes of net zero consumption. Becoming aware of one's energy footprint usually leads people, businesses and institutions to take additional actions to reduce this footprint.

Unless We Invest in Conservation, It Won't Happen

We need to invest in conservation because spending money on incentives now will save us more money later. Financial incentives to consumers for conservation serve a necessary purpose. While consumers undertaking conservation investments and practices may reduce their energy bills, they are not credited for the wider system or environmental benefits that their actions produce. If energy policy does not provide incentives or appropriate pricing, consumers may not invest in conservation to a level that is optimal to society at large.

Expenditures on conservation incentive programs cost less than supplying energy to consumers. For example, the OPA estimates the cost of energy efficiency programs is 5 to 7 cents per kilowatt-hour (kWh), which is cheaper than all new supply options.[7] Natural gas utilities' demand-side management programs are also cost effective, recently delivering between 7 and 14 dollars in net benefits for every program dollar spent on conservation.[8]

Energy conservation benefits us economically and environmentally, through lower infrastructure impact on the natural environment, lower greenhouse gas (GHG) emissions, increased societal resilience to unforeseen events like fuel price swings or extreme weather, and increased energy security. Limiting or eliminating funding for energy conservation programs means these benefits are lost.

Results are Becoming Apparent

Evidence of the benefits of conservation is beginning to accrue and can be seen in the results of the last five years. The progress towards the government's 2010 electricity conservation target has been neither dazzling nor dull, but conservation programs take time to refine and deliver results. If cancelled, momentum is lost. The ECO urges the government to prioritize conservation funding.

2: Progress on 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. Section 2.1 of this Report summarizes the status of government-established targets that were set prior to 2010, targets newly introduced in 2010, and targets that have already been achieved. The ECO has analyzed many of these targets in more detail in Section 2.3 of this Report (as well as previous reports), and references to these sections are provided where applicable.

There is some uncertainty whether all directives from the Minister of Energy to the OPA that specify an amount of expected conservation savings should be considered to be government-established targets. The OPA's view is that the purpose of many of these directives was to provide the OPA with the authority to spend funds on the specified type of conservation program, and that the amount of conservation savings was included only as a maximum, in order to set limits on OPA's spending authority. The alternate view is that these directives were indeed intended as targets – if the Minister of Energy directed the OPA to take actions to reduce electricity demand in the residential sector by "up to 150 Megawatts", to provide one actual example, then the Minister was intending that the total amount of savings procured would be close to the specified amount. Table 4 in Section 2.1 lists these directives, as well as the amount of savings that the OPA has procured under their authority.

The OPA intends to record all new savings from 2011 onwards to one of three directives: Conservation and Demand Management Directive for electricity distributors (Table 2); Demand Management, Demand Response (DSM/DR) and High Efficiency Combined Heat and Power Supply (Table 4); and, Industrial Transmission Connected Electrical Efficiency Program (Table 2). Therefore, no further progress on the other directives listed in Table 4 will be made, even if the OPA implements new conservation programs in a sector that was the subject of one of these older directives.

Ontario's two largest natural gas utilities (Enbridge Gas Distribution and Union Gas) also have annual performance targets for their conservation activities. While these targets are not considered government-established targets, the ECO also reports on them in order to provide a more complete understanding of the state of conservation in Ontario. Both utilities have two targets: a target that measures the net benefits of their portfolio of conservation programs; and, a target that measures the impact of utility market transformation programs, which focus on bringing about a fundamental change in the marketplace that will lead to long-term conservation benefits even after the utility program is discontinued. Progress on these targets is shown in Section 2.2.

2.1 Update on Government-Established Energy Targets

Table 1: Summary of Government-Established Energy Targets

ECO Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
2009 (Volume Two), Section 3.1	Premiers' agreement at the 2008 Council of the Federation	Ministry of Energy	2008	2020	A 20% energy efficiency improvement in Ontario by 2020.	Progress on the target is undetermined. The ministry stated that improvements of at least 20% are being realized but did not provide the methodology supporting the claim. Ontario tracks progress on its energy efficiency initiatives but does not track progress on national initiatives where some savings are expected to be achieved.
2010 (Volume Two), Section 2.3.3	Activation of time-of-use (TOU) prices	Local Distribution Companies, with oversight by the Ontario Energy Board	2009	June 2010 and June 2011	A two-step target: 1 million customers to receive TOU pricing by June 2010, 3.6 million by June 2011.	June 2010 target was achieved in September 2010. June 2011 target was not achieved at the time of writing this Report. As of August 2011, there were 3.1 million customers on TOU billing. The remaining customers are expected to be switched to TOU by end of 2012.
2010 (Volume Two), Section 2.3.2	Electricity conservation in Ontario government operations	Ministry of Infrastructure	2004 and 2007	2007 and 2012	A two-step target measured against a baseline of 2002/2003 electricity use: a reduction in government's own electricity use by 10% by 2007, and an additional 10% by 2012.	Government achieved 80% of its 2007 target. Government believes it will achieve 75% of its 2012 target.
2009 (Volume Two), Section 3.5	Low Carbon Fuel Standard	Ministry of Energy	2007	2020	A 10% reduction in carbon emissions from transportation fuels by 2020.	Still assessing viable options for compliance and timelines. Little identified progress towards target.

ECO Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
2009 (Volume Two), Section 3.6	Electric vehicle (EV) purchases	Ministries of Transportation, Economic Development and Innovation, Infrastructure, and Energy	2009	2020	1 in 20 vehicles driven in Ontario by 2020 to be an EV.	As of November 15, 2011, 130 purchase incentive grants and 225 green license plates have been issued for EVs. Installation of public charging infrastructure is underway at GO Transit stations. Preliminary infrastructure was installed in two stations in 2010, with plans for nine other stations over the 2011 to 2013 period.
2009 (Volume Two), Section 3.7	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.	No results are yet available. Database launched in August 2009 and rolled out over two years. Reports are currently in acceptance testing, expected to be completed by March 2012.
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 2009/2010 but not 2010/2011. Exceeded annual reduction targets for air travel in the first two years (2009/2010 and 2010/2011). Insufficient data to confirm annual reduction targets for energy used in government buildings in 2009/2010. Did not meet target for 2010/2011.

Table 2: Summary of New Energy Targets

ECO Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description
No ECO review	Industrial Transmission Connected Electrical Efficiency Program	Ontario Power Authority	March 2010	Not Provided	The Minister's Directive targets 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.
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	The Minister's Directive targets 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 are measured separately from Long-Term Energy Plan targets described below and in Section 2.4.2.
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	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: A net 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: A net additional 860 MW of peak demand savings and 4 TWh of energy savings (annual targets of 6,700 MW and 25 TWh). 2030 target: A net additional 400 MW of peak demand savings and 3 TWh of energy savings (annual targets of 7,100 MW and 28 TWh).

Table 3: Summary of Achieved Government-Established Energy Targets

ECO 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 2011	Standards contained in *Renewable Fuels Regulations* (*SOR/2010-189*).
2010 (Volume Two), Section 2.3.3	Installation of smart meters	Local Distribution Companies, with oversight by the Ontario Energy Board	2004	Target dates: 2007 and 2010 Actual dates: 2007 and 2011	A two-step target: 800,000 smart meters installed in homes and small businesses by the end of 2007, and in all homes and small businesses by the end of 2010.
2009 (Volume Two), Section 3.2	Province-wide electricity conservation set by government	Ministry of Energy	2005	2007	In 2008, OPA advised the ministry that the target (1,350 MW of reduction in peak demand) was met.

Table 4: Summary of Conservation and Demand Management Directives to the Ontario Power Authority

ECO Report Section	Initiative	Status	Description	Progress on Target
2010 (Volume Two), Section 2.3.1	Province-wide electricity conservation targets contained in June 2006 Supply Mix Directive (requesting an Integrated Power System Plan [IPSP])	Announced: June 2006 with a set completion date of 2010	2,700 MW reduction in peak demand by 2010 (an annual target that includes the 2007 electricity conservation target of 1,350 MW).	Although the proposed IPSP which contains the target is no longer valid, the ECO assumes this target remains in effect. The OPA indicates 65% of the target was achieved with 1,751.9 MW of peak demand savings in 2010.
2009 (Volume One), Section 5.1	Demand Management, Demand Response (DSM/DR) and High Efficiency Combined Heat and Power Supply	Announced: June 2005 and amended February 2006	Up to 500 MW through DSM/DR. June 2005 directive was for 250 MW or more of DSM/DR, 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 500 MW.	407 MW (81% of the target achieved)
2009 (Volume One), Section 5.1	Conservation and Demand-Side Management Initiatives (Residents of Low-Income and Social Housing)	Announced: October 2005	Up to 100 MW in reduced overall electrical energy consumption and demand.	3 MW (3% of the target achieved) *
2009 (Volume One), Section 5.1	Efficient Lighting and Appliances	Announced: October 2005	Up to 100 MW in reduced overall electrical energy consumption and demand by residential, commercial and industrial customers.	24 MW (24% of the target achieved) **
2009 (Volume One), Section 5.1	Toronto Reliability Supply and Conservation Initiative	Announced: February 2006 with a set completion date of 2010	Up to 300 MW through DSM/DR. In recognition of existing and planned conservation initiatives funded through September 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% of the target achieved)

ECO Report Section	Initiative	Status	Description	Progress on Target
2009 (Volume One), Section 5.1	Residential Sector	Announced: March 2006	Up to 150 MW through DSM/DR. 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% of the target achieved)
2009 (Volume One), Section 5.1	Commercial Buildings and MUSH (Municipalities, Universities/Colleges, Schools, and Hospitals) Sector	Announced: March 2006	Up to 150 MW through DSM/DR. 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% of the target achieved) ***

Note: 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. For example:

*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.

**The Great Refrigerator Roundup is targeted specifically at appliances and the Power Savings Blitz program is targeted mainly at lighting. However, these programs are now procured through the Local Distribution Company (LDC) Conservation and Demand Management (CDM) Directive.

***The ERIP, BOMA, BBP, and BIP and Power Savings Blitz programs all target the commercial/MUSH sector; however, these initiatives are procured under either the Toronto Directive or the LDC CDM Directive.

2.2 Update on Natural Gas Utility Conservation Targets

The year 2010 saw little in the way of new conservation programs from the gas utilities.[9] However, both utilities continued to deliver strong performance from their existing programs, providing nearly $470 million in net benefits, and reducing the use of natural gas by more than 185 million cubic metres in 2010. Union Gas reached a new all-time high in annual natural gas savings and was more successful than Enbridge in meeting its market transformation targets. The market transformation efforts for both utilities currently focus on promoting the installation of drain water heat recovery systems in new residential construction.

Table 5: Summary of Natural Gas Utility Conservation Targets

ECO Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
2009 (Volume 2), Section 4.2	Enbridge Gas Distribution demand-side management results target	Enbridge, with oversight by the Ontario Energy Board	Formula established in August 2006 through an Ontario Energy Board decision (EB-2006-0021)	December 31, 2010	$202.3 million in net benefits from utility conservation programs in 2010. Targets for program net benefits updated each year based on previous results.	$184.6 million in net benefits (91% of target), from 64.6 million m^3 of natural gas savings.[10]
2009 (Volume 2), Section 4.2	Union Gas demand-side management results target	Union Gas, with oversight by the Ontario Energy Board	Formula established in August 2006 through an Ontario Energy Board decision (EB-2006-0021)	December 31, 2010	$240.3 million in net benefits from utility conservation programs in 2010. Targets for program net benefits updated each year based on previous results.	$284.1 million in net benefits (118% of target), from 121.1 million m^3 of natural gas savings.
2009 (Volume 2), Section 4.2	Enbridge Gas Distribution market transformation targets – drain water heat recovery	Enbridge, with oversight by the Ontario Energy Board	October 30, 2009 by Enbridge (as part of EB-2009-0154)	December 31, 2010	13% of new homes built in 2010 to include drain water heat recovery systems. 20 new builders participating in drain water heat recovery program.	6.6% of 2010 housing starts (1,600 units) included drain water heat recovery system – only 50% of target achieved. 42 new participating builders – more than 200% of target achieved.
2009 (Volume 2), Section 4.2	Union Gas market transformation targets – drain water heat recovery	Union Gas, with oversight by the Ontario Energy Board	October 30, 2009 by Union Gas (as part of EB-2009-0166)	December 31, 2010	15.3% of new homes built in 2010 to include drain water heat recovery systems. 111 total builders participating in drain water heat recovery program.	15.7% of 2010 housing starts (2,331 units) included drain water heat recovery system – exceeded target. 116 participating builders – exceeded target.

Note: Natural gas conservation targets are not considered government-established targets. Net benefits are the excess of benefits over costs due to the utility's conservation programs, as measured by the Total Resource Cost test.

Sources: Union Gas, 2011, *Final Audited Demand Side Management 2010 Annual Report;* Nexant, 2011, *Independent Audit of 2010 DSM Program Results, Prepared for Enbridge Gas Distribution*

2.3 Discussion of Selected Existing Targets

2.3.1 Province-Wide 2010 Target of 2,700 Megawatts of Peak Demand Reduction

To support electricity conservation in Ontario, the Minister of Energy issued several targets to the OPA to reduce peak electricity demand requirements. Specifically, the Minister of Energy issued a Supply Mix Directive in June 2006 outlining the goal to reduce peak electricity demand by 6,300 MW by 2025.[11] Three incremental conservation targets were assigned to meet this goal:

1. A 1,350 MW peak demand reduction by 2007 (a target previously set in 2004);
2. A net additional 1,350 MW peak demand reduction by 2010; and
3. A net additional 3,600 MW peak demand reduction by 2025.

The Supply Mix Directive specified that the Integrated Power System Plan (IPSP) should be developed by the OPA to meet the reduction targets. Conservation in the directive was defined to include energy efficiency standards and a variety of load reduction initiatives, such as: geothermal heating and cooling; solar heating; fuel switching; and, small-scale (10 MW or less) customer-based electricity generation.

In September 2008, the government issued a revised Supply Mix Directive to the OPA, which requested a review assessing the viability of accelerating the original conservation targets.[12] The next year, the OPA reported that the first interim 2007 target had been met, with 1,379 MW of demand reduction achieved.[13]

The LTEP was released by the Ministry of Energy in 2010, followed by a new Supply Mix Directive in February 2011, introducing new energy conservation targets (see Section 2.4). Therefore, the original final peak demand reduction target of an additional 3,600 MW by 2025, as discussed above, no longer applies.

In this Report, the ECO is examining the government's results in meeting the second interim target listed above. The ECO considers this an aggregate target of 2,700 MW of peak demand reduction between 2005 and 2010. This value is determined by combining the first 1,350 MW of peak demand savings target for 2007 with the additional 1,350 MW of peak demand savings for 2010.

Results

As the ECO reported in our Annual Energy Conservation Progress Report – 2009 (Volume Two), the government achieved its first interim peak demand reduction target of 1,350 MW by 2007. Since then, efforts have continued towards meeting the 2010 target.

Results are shown in Table 6 and are categorized into four different areas.

- Energy Efficiency – customers reduce their electricity consumption but retain the same level of end-use service.
- Demand Management – customers reduce electricity demand during peak hours or shift demand to off-peak hours (also referred to as demand response).
- Customer-Based Generation – customers generate electricity using resources that are less than or equal to 10 MW for the purpose of load displacement (i.e., those customer-based generation resources that are located "behind the meter" and reduce demand from the grid).
- Fuel Switching – customers use other energy sources in place of electricity.

Table 6: 2010 Peak Demand Savings from 2008, 2009 and 2010 Initiatives

Conservation Resource	Instruments	2010 Net Peak Demand Savings (MW)
Energy Efficiency	OPA Business Programs	197.0
	OPA Consumer Programs	110.6
	Codes & Standards	89.1
	Non-OPA Energy Efficiency Programs	51.3
	OPA Low-Income Programs	3.9
	OPA Industrial Programs	0.5
Demand Management	OPA Demand Response 3	264.3
	OPA Demand Response 2	122.1
	peaksaver®	117.2
	Other OPA Demand Response	31.3
	Smart Meters & Time of Use	16.7
	OPA Demand Response 1	0.0
Customer-Based Generation		9.7
Fuel Switching		0.0
Total (MW)		**1,013.7**

Source: Ontario Power Authority

As summarized in Table 6, peak demand savings have been achieved through both OPA and non-OPA actions. OPA actions included work performed with Local Distribution Companies (LDCs). Non-OPA programs included those offered by the federal and provincial government, as well as actions promoted by natural gas demand-side management programs that also saved electricity.

As shown in Table 7, demand reductions due to Energy Efficiency and Demand Management were intended to provide the greatest contribution towards meeting the 2010 target. The results showed no measurable savings from Fuel Switching and only 9.7 MW of savings attributed to Customer-Based Generation.

Table 7: Achieved Peak Demand Savings Compared to 2010 Target

Conservation Resource	Target From 2007 IPSP (MW)	Results from 2008 – 2010 (MW)	Percentage of Target Achieved Between 2008 – 2010
Energy Efficiency	620	452.4	73%
Demand Management	570	551.6	97%
Customer-Based Generation	150	9.7	6%
Fuel Switching	70	0.0	0%
Total (MW)	**1,410***	**1,013.7**	**75% (of 1,350 MW)**

Note: *IPSP Target was for 1,410 MW of conservation by 2010, which is greater than the overall 1,350 MW target contained in the Supply Mix Directive to account for uncertainty of future energy savings.[14]

Source: Ontario Power Authority

Table 7 provides an overview of the progress made in conserving peak energy between 2008 and 2010. As shown in the table, the OPA reports that Ontario met 75 per cent of its 2010 interim target, with a peak demand reduction of approximately 1,000 MW (versus the stated target of 1,350 MW).[15]

The OPA claims this shortfall is due to delays in the implementation of time-of-use (TOU) rates, a decision not to pursue extensive fuel switching programs, and a more narrow definition of customer-based generation counting towards Conservation and Demand Management (CDM) activities.[16]

Some conservation efforts, such as improving energy efficiency and installing customer-based generation, continue past the first year of program implementation. On the other hand, many demand management resources do not persist and need to be newly acquired each year.

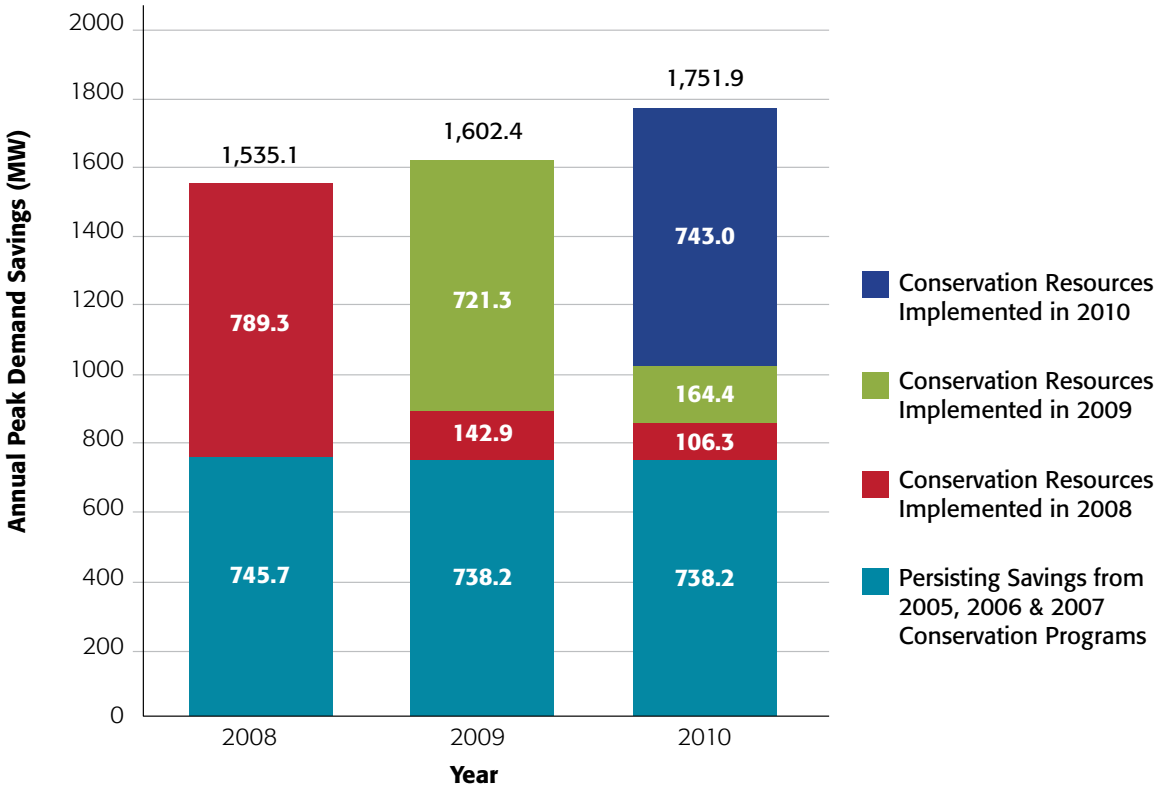

Figure 2: Annual Peak Demand Savings in Ontario – 2008, 2009, 2010

Sources: Ontario Power Authority and Ministry of Energy

As shown in Figure 2, more than 700 MW of peak demand reduction savings from 2005, 2006 and 2007 conservation programs were still delivering results towards Ontario's 2010 target. These savings, along with resources implemented during 2008, 2009 and 2010, provided 1,751.9 MW (65 per cent) of peak demand electricity savings in 2010. When considering Ontario's progress towards meeting the aggregate 2010 target of 2,700 MW in peak demand reduction, it is clear that Ontario fell short.

ECO Comment

Reporting Methodology

The achieved savings reported in Tables 6 and 7 are likely an overestimation of what was actually experienced in Ontario. To date, the savings delivered by Demand Management programs have not been reported as the verified amount of savings delivered by each program. Instead, they have been reported as the amount of demand reduction that programs are contracted to deliver. Reporting the amount of demand reduction under contract risks overestimating the electricity savings, as it does not consider how a program performed (i.e., the amount of savings actually delivered when a conservation program was activated).

For some programs, such as *peaksaver®* – where air conditioner units in households and businesses are adjusted to reduce energy demand – reporting the contractual resources does not significantly overestimate the savings achieved. On a going-forward basis, *peaksaver®* is expected to reliably deliver 109 MW[17] of peak demand reduction, which is similar to the OPA's reported 117 MW value for 2010.

However, for other Demand Management programs, such as Demand Response 3 (DR 3), the savings achieved are significantly smaller than the savings contracted. DR 3 is a program in which large electricity users commit to reduce electricity use during peak demand times in Ontario. In 2010, the program delivered its greatest electricity reduction on July 6, with an estimated 193.7 MW of savings.[18] This value is significantly less than the 264.3 MW of DR 3 savings reported when using the methodology of capacity contracted to measure savings.[19]

Although this reporting methodology means that Ontario fell further away from its 2010 target, the OPA notes that it will cease recording the Demand Management savings based on the amount of contracted capacity after 2010.[20] Instead, the OPA will report the anticipated future savings for Demand Management programs based on a number of factors, including the amount of electricity capacity under contract, the program's historical performance and load patterns. The ECO supports this change in methodology. As a result, future reports will more accurately indicate Ontario's progress towards achieving electricity conservation targets.

Understanding the Value of Conservation

Although Ontario did not reach its 2010 target, the province saved roughly 2.3 TWh of energy in 2010, from initiatives undertaken from 2008 onwards.[21] For comparison, the Lambton coal station supplied roughly 1.5 TWh in the twelve months from November 2010 to October 2011.

In terms of peak demand, 1,751.9 MW of peak demand savings were achieved in 2010. Ontario would have needed to install new capacity approximately equivalent to three natural gas peaking power plants to meet this demand had conservation actions not been taken.

A real value for conservation programs can be assigned by examining the cost of delivering conservation programs against the cost of building additional power generation stations. Between 2006 and 2010, Ontario invested approximately $1.7 billion in conservation programs. Though this may seem like a large amount, these investments are expected to save Ontario ratepayers $3.8 billion in avoided supply costs.

Conservation actions have a positive effect on the electricity system by avoiding the need for additional supply resources. A real value for conservation programs can be assigned by examining the cost of delivering conservation programs against the cost of building additional power generation stations. Between 2006 and 2010, Ontario invested approximately $1.7 billion in conservation programs.[22] Though this may seem like a large amount, these investments are expected to save Ontario ratepayers $3.8 billion in avoided supply costs.

2.3.2 Electricity Conservation Targets in Government Operations: An Update

For many years, the Ontario government has promoted a culture of conservation. To support this initiative, the government committed to reduce electricity use in its own facilities. The aggregate target was to reduce electricity use by 20 per cent by 2012, measured against fiscal year 2002/2003 electricity consumption levels.

This commitment was made in two stages. The first was in 2004, when the government committed to reduce electricity use by 10 per cent by 2007.[23] The second was in 2007, when the government committed to reduce electricity use by an additional 10 per cent by 2012.[24]

The government identified "target class facilities" and "non-target class facilities". This distinguished the buildings and assets to be included in this initiative.[25] The "non-target class" facilities category was created to exclude operations where energy conservation would pose a direct health and safety risk to the public or operations. As shown in Table 8, such excluded facilities include street lighting and communication towers.

Table 8: "Target Class Facilities" and "Non-Target Class Facilities" Sorted by Ministry

Ministry	Target Class Facilities	Non-Target Class Facilities
Ministry of Transportation	Truck Inspection Stations	Patrol Yards, Remote Airports, Street Lights
Ministry of Natural Resources	Parks	Fish Hatcheries, Ranger Camps, Forward Fire Stations
Ministry of Education	Provincial Schools	None – all facilities are included
Ministry of Community Safety and Correctional Services	Adult Detention Centres	None – all facilities are included
Ministry of Children and Youth Services	Youth Detention Centres	None – all facilities are included
Ministry of Energy and Infrastructure *	Offices, Courts, Ontario Provincial Police Detachments, Data Centres	Communication Towers, Exhibits, Storage

Notes: * The Ministry of Energy and Infrastructure was reorganized into two separate ministries in 2010. The facilities are now managed by the Ministry of Infrastructure.

Source: Ministry of Energy and Infrastructure

The government announced it would rely on a four-point plan to help achieve its target:[26] employee awareness programs, public engagement, facility upgrades, and working with private sector landlords to reduce energy use in leased facilities.

Specific projects that were to contribute to energy reduction included: a public awareness campaign across the Ontario Public Service; lighting upgrades; chiller replacements; heating, ventilation and air conditioning (HVAC) improvements; the Deep Lake Water Cooling project for certain government buildings in Toronto; and, additional building control measurements.[27] Such projects would also have an effect on fuel consumption. Therefore, the actions taken to meet this target complement the government's goal to reduce GHG emissions in Ontario.

The Ministry of Infrastructure (MOI, formerly amalgamated with the Ministry of Energy as the Ministry of Energy and Infrastructure) is responsible for reporting the aggregated energy use for government-owned facilities. MOI oversees Infrastructure Ontario (IO, which was merged with the former Ontario Realty Corporation in 2011), an agency that manages property occupied by the Ontario government on behalf of many ministries. Ministries managing their own facilities independently of IO are referred to as "custodial ministries."[28]

In 2007, the government claimed it had reduced electricity consumption by 12 per cent between 2004/2005 and 2006/2007, without having performed proper verification.[29] MOI committed to verify the energy reduction amounts and baseline data for this initiative. Hence, the ECO decided to review the validity of the government's claim in exceeding the 2007 target and the government's progress towards meeting the 2012 target more fully once the verification work was received from MOI.

Results

MOI hired a third-party consultant to verify its energy consumption data. Verification work began in 2009 and was completed in November 2010.[30] The purpose was to:

- Verify the 2002/2003 electricity baseline information, as well as January 1, 2006 to March 31, 2009 electricity consumption information for government-owned buildings;
- Verify the Ontario Realty Corporation (now IO) and custodial ministry portfolio for natural gas and other fuels used from January 1, 2006 to March 31, 2009, as well as verify the domestic (municipal) water consumption from January 1, 2008 to March 31, 2009; and,
- Provide recommendations on how to better manage utility and related fuel records and fuel consumption databases for the provincial government.

There was no normalization for weather and occupancy performed on the data.

The third-party consultant found that the government fell short of its 10 per cent reduction target for 2007 (measured against 2002/2003 fiscal baseline year consumption amounts). MOI and IO reached the 10 per cent electricity reduction target for 2007 in their managed facilities; however, custodial ministries did not meet the 10 per cent target. Overall, the government achieved approximate electricity savings of 8 per cent by the end of 2007.

MOI indicated that custodial ministries did not reach their target because of insufficient dedicated funding and programs to reduce energy consumption in custodial facilities. This affected the overall provincial government average for electricity savings and made it difficult for the government to achieve the 2007 electricity reduction target.

Based on the information collected and validated through the verification work, IO has been able to estimate how the government is trending toward the overall goal of a 20 per cent reduction in electricity use by 2012. Assuming that IO will continue to save 2 per cent of electricity per year in their managed facilities, and custodial ministries will each save 1 per cent per year, the government believes it will achieve approximately 75 per cent of its target by 2012. Custodial ministry performance will likely dictate how the government will perform overall in meeting the 2012 goal. Some custodial ministries may save more than 1 per cent, while others may not.

ECO Comment

The government should implement the lessons learned to expedite progress towards the 2012 target. Attempts should be made to remove barriers within custodial ministries. Section 10 of the *Green Energy Act, 2009* enables the Minister of Infrastructure to issue directives to ministries responsible for government facilities that could specify requirements relating to energy conservation and energy efficiency. In the ECO's opinion, such a directive should be posted on the Environmental Registry for public consultation.

The ECO recommends that the Minister of Infrastructure use the *Green Energy Act, 2009* directive power to remove the barriers faced by custodial ministries to achieve the government's electricity conservation target.

The underlying intent of having a third party validate energy bills for the government was to ensure that a systematic and consistent approach was being taken when communicating the government's progress toward publicly committed energy targets. The value in this is great and it is unfortunate that the third-party validation work began in 2009, five years after the original target was established and two years after the government announced it had achieved its 2007 target.

By not accounting for weather or occupancy changes, the government is measuring its energy reduction in a manner that is inconsistent with standard industry methods. Weather and occupancy changes can have a direct impact on energy usage; without including these factors, the measured energy savings are less accurate. Specifically, it becomes difficult to critically assess the reasons behind changes in the energy usage habits of a facility if the weather and occupancy details are unknown. These adjustments should have been included in the third-party analysis.

However, the work to improve energy conservation within government buildings is ongoing and adjustments for weather and occupancy changes are included in the Energy Master Plan, which will apply to future energy retrofit projects.

2.3.2.1 Energy Master Plan

The Energy Master Plan is a 10-year plan, beginning in 2009 and ending in 2019, with a focus on developing management tools to facilitate an increase in operational efficiency. This will not only reduce electricity use, but also reduce fuel and steam consumption. Some highlights of the plan include:

- Incorporating measurement and verification into all applicable projects;
- Providing quarterly energy reports;
- Implementing demand/load management programs;
- Setting targets for increasing energy awareness based on initial baseline assessment;
- Developing forecast-based energy targets for high-energy users and regions; and,
- Developing a fully verifiable greenhouse gas inventory.

Ultimately, this plan will help lower greenhouse gas emissions and energy costs for the government. It will also support more accurate tracking of results. For example, electricity savings from retrofit projects historically have not been verified; however, the Energy Master Plan includes a requirement for formal measurement and verification for energy conservation projects, including various retrofit projects. This is beneficial because achievement of planned efficiency improvements requires not only performing retrofits, but also monitoring performance of a retrofit after it is completed.

Even though the target was not met, the ECO commends the government for completing the energy consumption validation work for its facilities. The task of collecting and verifying the data through the third-party consultant, along with the ongoing data collection by Ontario Shared Services (an agency of the Ministry of Government Services), has given MOI and IO five years of reliable data for energy management activities. The validation work also consolidated the various databases. With this additional detail about energy use in its facilities, now incorporated into one consolidated database, the government is in a better position for setting, tracking, and verifying its energy reduction targets.

2.3.3 Smart Meter and Time-of-Use Implementation Target

In 2004, the provincial government announced a smart meter installation target as part of its plan to create "a culture of conservation and make Ontario a North American leader in energy efficiency."[31] The target requires the installation of smart meters for all low-volume consumers (households and small businesses) by 2010, with an interim target of 800,000 meters in place by 2007.

In 2009, the government announced the province-wide roll-out of TOU rates as part of the Regulated Price Plan (RPP) which regulates the price of electricity for low-volume consumers. The government targeted having one million consumers on TOU pricing by the summer of 2010, rising to 3.6 million by June 2011.

In support of the government's TOU pricing target, the Ontario Energy Board (OEB) has mandated TOU prices for all households and small businesses with smart meters. LDCs have been given mandatory TOU dates (ranging from June 2011 to December 2012) by which time they must begin implementing TOU prices for customers billed under the RPP. To enable the OEB to monitor progress, LDCs are also required to report monthly on their progress towards implementation of smart meters and TOU pricing.

There are three key activities a distributor must undertake in order to implement TOU pricing: smart meter installation, smart meter enrolment with the Meter Data Management and Repository (MDM/R), and activation of TOU pricing by the mandatory date.

Results

Tracking progress on achievement of the targets must take into account changes that affect the size of the customer base mandated to receive smart meters and be billed on a TOU basis. Since the first smart meter installation target was announced, the number of low-volume consumers has increased from 4.5 million to over 4.7 million. It is important to note that the total number of eligible low-volume consumers constantly fluctuates as some accounts are closed or new ones are opened. The eligibility of General Service (GS) customers (i.e., mainly small businesses and other customers with less than 50 kilowatts (kW) of monthly demand) as low-volume consumers can also fluctuate month-to-month depending on their electricity usage in a given billing period.

Smart Meter Installation Target:

As the ECO previously reported, the interim target of 800,000 meters installed by the end of 2007 was successfully met.[32] The final target requiring installation of smart meters for all low-volume consumers by the end of 2010 was not achieved – the target was missed by a narrow margin. By December 31, 2010, a total of 4.57 million smart meters had been installed, representing 97 per cent of eligible consumers (see Table 9). This includes 99 per cent of all residential customers and 76 per cent of eligible GS customers.

Missing the 2010 installation target was essentially the result of slower installation of smart meters for GS customers. LDCs began installing smart meters at different times and, in response to the target, some LDCs focused on residential meters first. Adding to the delay, some LDCs reported difficulties in acquiring three-phase meters for GS customers (different from the single-phase meter used for residential customers) that are compatible with their Advanced Metering Infrastructure (AMI).[33]

The ECO considers the smart meter installation target to be achieved (given that the number of meter accounts fluctuates and the target is constantly moving). As noted in Table 9, over 4.7 million smart meters had been installed as of July 31, 2011, representing over 99 per cent of all eligible customers.

Table 9: Smart Meter Installation Target – All Low-Volume Consumers by December 2010

	Target Date: December 31, 2010		Target Achieved: July 31, 2011	
	RPP Consumers	Smart Meters Installed	RPP Consumers	Smart Meters Installed
Residential	4,308,140	4,262,152	4,320,242	4,315,004
General Service	406,737	307,824	413,376	375,981
Total	**4,714,963**	**4,570,270**	**4,733,618**	**4,690,985**
Percentage of Target Achieved		**97%**		**99%**

Source: Ontario Energy Board

Time-of-Use Implementation Target:

As the ECO previously reported, the summer 2010 TOU target was met in September 2010 with over one million consumers being billed using TOU pricing.[34] The next step of the TOU pricing target was to have 3.6 million customers on TOU billing by June 2011. By June 30, 2011, 2.8 million homes and small businesses, more than half of all RPP consumers, were on TOU pricing.[35]

Several LDCs have experienced unexpected technical issues during their transition to TOU billing which has delayed TOU implementation. In Ontario, a single meter data management system, the MDM/R, provides a common platform for storing, processing and managing all smart meter data.[36] Before an LDC can bill based on TOU pricing, it must first integrate its back office systems with the MDM/R. This requires acquiring new or upgrading existing AMI and billing systems that are compatible with the MDM/R, and then performing a series of software and firmware tests. During this process, several LDCs experienced unanticipated delays due to operational or technical issues, and have applied to the OEB for an extension of their mandated TOU date. At the time of writing this Report, 21 of the 39 LDCs with a mandatory June 2011 TOU date have applied for extensions, 19 have been approved and 2 denied.

Table 10: Time-of-Use Implementation Target – 3.6 Million Consumers by June 2011

	Target Date: June 30, 2011	As of August 31, 2011
Residential	2,532,929	2,966,322
General Service	139,870	160,635
Total	**2,803,547**	**3,126,957**
Percentage of Target Achieved	**78%**	**87%**

Source: Ontario Energy Board

According to the most recent data available at the time of writing this report, there are currently more than 3.1 million RPP consumers on TOU billing. Of the 76 LDCs with TOU mandatory dates:[37]

- 6 LDCs have completed TOU billing for all their RPP consumers;
- 4 LDCs have completed TOU billing for all RPP consumers with the exception of certain customers temporarily exempt for technical reasons;
- 16 LDCs have transitioned some of their RPP consumers to TOU billing; and,
- The balance of LDCs have yet to convert any customers to TOU billing.[38]

Conservation Impact of TOU Pricing

TOU prices take into account when, as well as how much, electricity is used to better reflect real differences in the cost of supplying electricity at different times. TOU prices can also provide an incentive to shift load, that is, move some usage away from peak periods to off-peak and mid-peak periods when the cost is lower. Load shifting is particularly important for Ontario as the difference between peak demand and average demand has risen over the past 15 years, due to increased use of air conditioning. Expensive sources of electricity supply, primarily natural gas "peaker plants" are needed to meet these periods of high demand. However, TOU pricing in concert with other conservation measures can reduce the need for future peaker plants.

Despite the recent drop in demand caused by the recession, growth in electricity demand is expected to increase as shown in Figure 3. Under a medium growth scenario, by 2030 peak demand is expected to reach a level similar to Ontario's summer peak record set in 2006. In a high growth demand scenario, peak demand could rise much faster. The IPSP will need to allow for flexibility in meeting this scenario and TOU prices can play an important role.

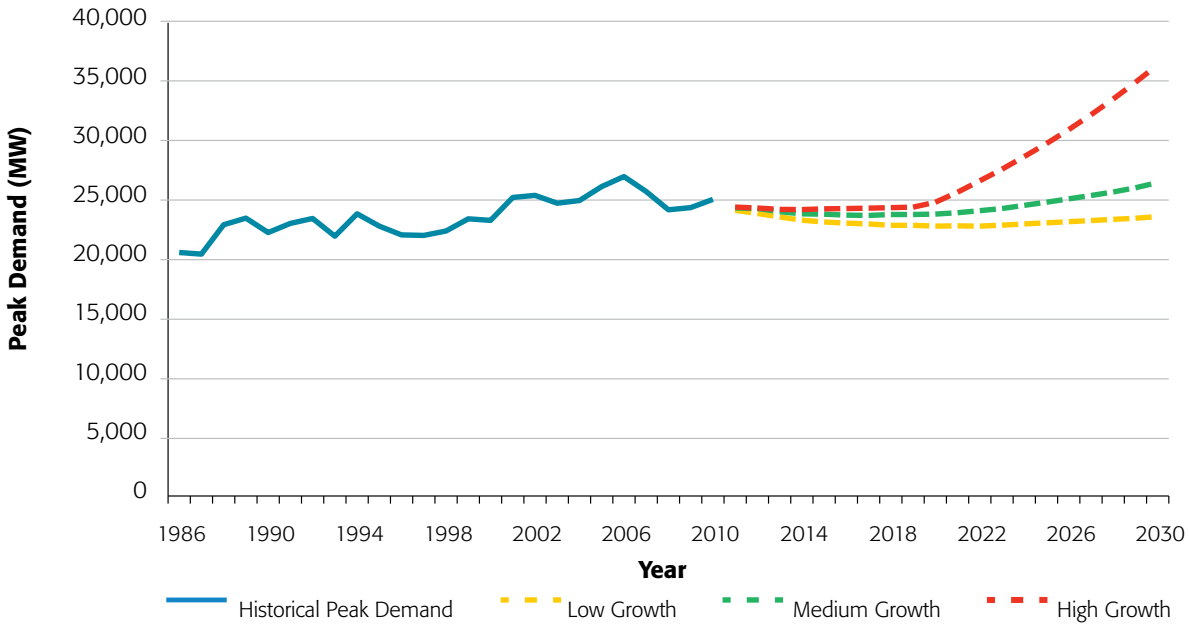

Figure 3: Historical and Forecast Peak Demand Under Three Demand Scenarios

Source: Ontario Power Authority

By 2030, the OPA forecasts that smart meters and TOU pricing will contribute 409 MW of peak demand savings, although this is dependent on the price differentials and time periods for peak and off-peak TOU rates.[39] At this time, however, there is insufficient data to accurately determine the impact of TOU pricing. To address this issue, the OEB has begun a data collection project to collect smart meter usage data from customers across the province, comparing patterns of electricity consumption before and after TOU billing. The database will be used to support an analysis of the current TOU regime and provide a basis for evaluating any alternative approaches to the TOU pricing structure or price setting methodology in the future.[40] The OPA, in collaboration with key stakeholders, is also developing an evaluation methodology that will enable measurement of the conservation impact of TOU pricing.[41] The methodology is expected to be finalized in time to measure the TOU impact of the 2011 to 2014 conservation programs.

ECO Comment

TOU billing is still relatively new in Ontario; with implementation staggered across the province, there is currently insufficient data to assess the conservation impact. However, according to a survey of recent studies across North America, TOU pricing can reduce on-peak demand between 3 to 5 per cent.[42] Although the effect of TOU may seem small, it is not unimportant. For example, a 5 per cent drop in peak demand is equivalent to the generation capacity of two or three peaker plants. Furthermore, TOU rates can ensure less electricity is used at peak times when power is most expensive.

There are also additional opportunities to increase savings from smart meters and TOU pricing. As the ECO has previously noted, increasing the price differential between on-peak and off-peak prices and converting to suite metering in multi-unit residential buildings could potentially deliver greater savings.[43] Furthermore, TOU pricing in combination with enabling technologies, such as load control devices or real-time feedback, has been found to increase conservation impacts.[44] As additional technologies and methods of responding to TOU rates continue to be developed, the potential for demand savings may increase.

The ECO is disappointed that data collection and analysis to track the actual reduction in peak demand due to TOU pricing is just beginning now. Given that reducing peak demand was the prime driver for introducing smart meters and TOU pricing in the first place, the ECO would have expected that a method of tracking the impact of TOU pricing on consumers' electricity consumption patterns would have been in place sooner. Had this methodology been established sooner, preliminary results from LDCs already billing using summer TOU rates (e.g., Toronto Hydro, Hydro One) could have been evaluated. This would have enabled the OEB to respond more rapidly in making changes to TOU rates or time periods in order to reduce peak demand, if needed. The ECO encourages the OEB to make use of this data as part of its semi-annual updates to TOU prices.

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Although the June 2011 TOU implementation target has not yet been achieved, the ECO believes that LDCs have worked diligently and made good efforts towards meeting the government's smart meter installation and TOU pricing targets. Most of the delays in TOU implementation have resulted from technical issues uncovered during the extensive testing processes. The OEB has carefully assessed each application for extension and mandated TOU implementation as soon as technically feasible. The ECO believes a good balance has been achieved between ensuring technical issues are resolved prior to TOU billing and encouraging TOU implementation.

The ECO will continue to monitor the progress of the implementation and impact of TOU pricing, including the OPA's TOU impact evaluation methodology and the OEB's data collection project, for inclusion in future reports.

2.4 Newly Established Electricity Conservation Targets

The years 2014 and 2015 are the next key dates for observers of Ontario's progress on electricity conservation. In 2010, the government announced policies that established two new distinct sets of targets: one for the 2010 to 2014 period setting CDM targets to be met by LDCs; and, a second set of targets to be achieved province-wide from activities of all organizations responsible for conservation – LDCs, the OPA, governments and others – for milestone years (2015, 2020, 2025 and 2030) in the period covered by the government's LTEP.

2.4.1 Local Distribution Companies' Conservation and Demand Management Targets – 2014

As a condition of their licence, each Ontario LDC has been assigned a CDM target by the OEB. The target stipulates an amount of both demand reduction (MW) and energy savings (GWh).[45] Each LDC's conservation target is essentially proportional to its share of provincial peak demand and annual electricity consumption, based on recent historical data for its franchise area.

The OPA furnished the analysis that underpins the LDCs' targets, providing information to the government and the OEB for their establishment. In 2009, the government asked the OPA to advise it on the amount of the aggregate province-wide target to apply to distributors. After considering this advice, the government set a twofold aggregate target requiring demand and energy savings. The aggregate target was formally announced in a directive, known as the CDM Directive, sent from the Minister of Energy to the OEB in March 2010.[46] It specifies a 1,330 MW reduction in system-wide peak demand persisting in 2014, and 6,000 GWh of energy savings persisting at the end of 2014 to be accumulated over the period January 1, 2011 to December 31, 2014.[47] To put this in perspective, 1,330 MW is about 5 per cent of Ontario's current peak demand and 6,000 GWh is about 4 per cent of annual electricity consumption.

To apportion the target among distributors, the CDM Directive instructed the OEB to establish individual targets for LDCs ensuring that these targets, in total, met the aggregate province-wide amounts. To aid its decision, the OEB was also directed to consider advice from the OPA on the amount of achievable conservation and a methodology to allocate the aggregate target. To complete the formal co-ordination of the OPA's and the OEB's work on targets, in April 2010, the Minister directed the OPA to provide the OEB with this advice.[48]

The OPA followed several steps to develop its advice (see below). Using the aggregate target amount established by government, the OPA consulted LDCs and proposed a methodology to apportion target shares. Finalized distributor-specific targets were issued in November 2010, based on a modified OPA methodology that addressed LDCs' concerns raised during consultation.[49] Each distributor's target is shown in Appendix B.

Understanding the Targets

How the Amount of Achievable Conservation is Determined

The government receives advice on setting conservation targets that is informed by work the OPA does for power system planning. The OPA maintains a continuous planning process that incorporates options for resource requirements (i.e., amounts of conservation and new or existing generation) into the IPSP. To determine the resources that Ontario will need, a projection of electricity demand is made. A gross demand curve is initially determined. It assumes no new conservation is undertaken and only considers current regulations, codes, standards and programs. This baseline forecast represents a "business-as-usual" or "do-nothing" approach and shows what Ontario's use of electricity would be in the absence of any additional conservation.

Expected electricity savings from conservation activities are then applied against the gross demand curve. To do this, an achievable conservation potential is estimated by adding together, in a "bottom up" manner, the sum of the expected savings from programs, technologies, regulations and behavioural activities of consumers. In the short term, the majority of conservation comes from programs.[50] In the longer term, codes and standards contribute a larger share.

The amount of achievable conservation is subtracted from the gross demand curve. The result is an estimated net demand curve (a forecast of load growth that reflects a lower level of demand because conservation is factored in, see the red line in Figure 4). This difference between gross and net demand equals the expected savings from conservation, and is the potential or achievable amount of conservation – it is essentially equivalent to the target amount.

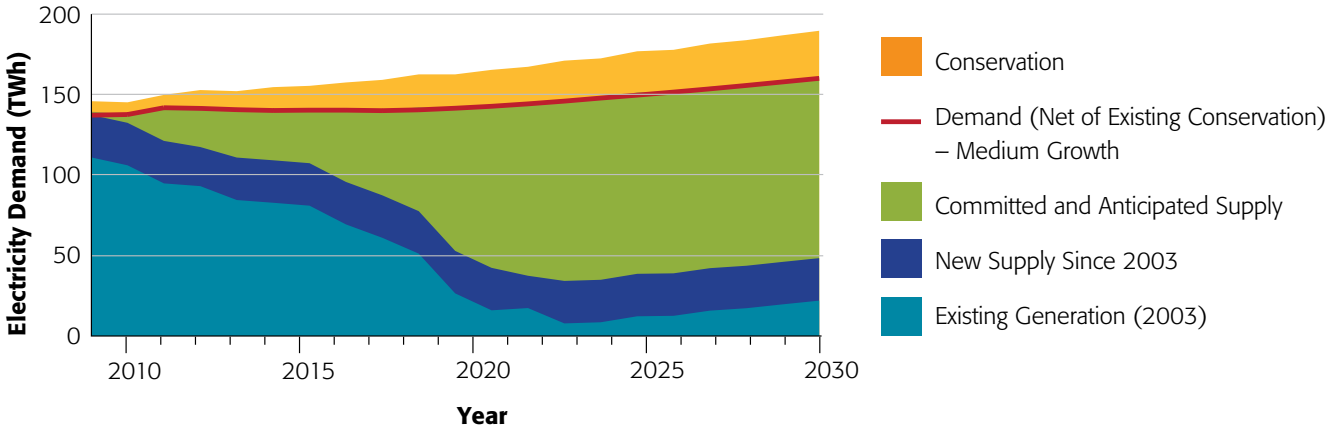

Figure 4: Ontario's Forecast Electricity Demand (2010 – 2030)

Source: Government of Ontario, *Ontario's Long-Term Energy Plan, Building Our Clean Energy Future*

How the LDC Target Amounts Were Established and Apportioned

To set the LDC CDM targets, the demand and energy savings from conservation were identified for the period January 2011 to December 2014 based on estimates of achievable conservation contained in the Integrated Power System Plan I (IPSP I) and work that the OPA undertook to update IPSP I.[51]

Electricity savings persisting from program activities prior to 2011 were excluded so that only the savings expected during the period 2011 to 2014 would be counted in the achievable conservation. The updated IPSP I forecast included savings from OPA-contracted programs that will be delivered by LDCs, as well as other activities that are considered outside of the control of LDCs (e.g., government programs, codes, standards, programs offered to transmission-connected industrial customers, TOU rates). These "other" activities were excluded from the estimate of achievable savings, except savings from TOU rates which were included.[52]

To apportion the target, consultations were held involving the OPA, OEB and LDCs. LDCs raised several methodological issues regarding allocation of the aggregate target.[53] For the most part, LDCs conceded that no better alternative methods were available to address these issues because of data limitations. Some LDCs sought exemption from being assigned a demand target because their peak occurs in winter and is not coincident with the province-wide system peak (which occurs in summer) but the OEB denied these requests.

Interpreting and Measuring the Target

Until the late 1990s, the province had a winter peaking grid but the trend is now toward a summer peaking pattern.[54] Whether the peak occurs in winter or summer has implications on the types of conservation programs that should be given priority and how the savings are verified. According to the Ministry of Energy, based on OPA forecasts, system-wide peak demand is expected to continue to occur in the summer for each of the years of the 2011 to 2014 period.[55]

Savings results must be verified using OPA Evaluation, Measurement and Verification (EM&V) protocols. For the demand target, these protocols measure the amount of summer peak reduction. The OPA will provide verification of results for most of the programs that LDCs deliver. As directed by the Minister of Energy,[56] the OPA is responsible for EM&V of OPA-Contracted Province-Wide Program results. LDCs will provide the required data to the OPA, and the OPA will provide each LDC with verified results of their demand and energy savings. LDCs will be responsible for EM&V of their Board-Approved Programs, and must use OPA protocols to report results to the OEB. The OPA will provide advice on the use of the protocols but is not responsible for producing verified results for the LDCs to report.

2.4.1.1 Definitions

Measures refer to any action or behaviour to reduce or make more efficient use of electricity (e.g., homeowners replacing old fridges with ones that use less power; a business installing high-efficiency motors and lights; government passing regulations to require sale of efficient appliances or construction of more efficient buildings; a person using cold water and a clothesline to wash and dry their laundry).

Persistence of savings refers to the period of time that a measure operates and provides energy savings. When a measure is implemented, savings will persist, or keep delivering, until the measure ceases to operate (either because the measure malfunctions or is physically removed from service or the consumer discontinues the behaviour).

Peak is the highest or maximum value of demand occurring during a specified period of time. It may be an instantaneous value or the average for a defined time interval (e.g., one-hour, monthly or summer peak). Peak demand is also known as peak load.

System-wide peak is the highest value of demand across Ontario's entire electricity grid from which Local Distribution Companies and customers directly connected to transmission lines (e.g., large industries) withdraw power for delivery to customers or their own use, respectively. System-wide peak is also referred to as provincial peak.

Annual savings are amounts of electricity reduction that are calculated as savings achieved in a given year from conservation measures implemented in that year plus any savings persisting in that same year from measures implemented in previous years.

Incremental savings are amounts of electricity reduction that are calculated as savings achieved in a given year from conservation measures implemented only in that year. They do not include savings persisting from previous years.

Cumulative savings are the sum of several years of annual savings. They equal the accumulated amount of electricity reduction and are calculated by adding together annual savings from two or more years. The Conservation and Demand Management Directive uses the term "accumulated" savings. Our report uses the term cumulative to mean the same thing.

Measuring the Energy Savings Target

The energy savings target requires achievement of 6,000 GWh accumulated over the period 2011 to 2014. The target is a cumulative amount calculated as the sum of the annual savings that accrue over the four-year period. Gigawatt-hours counted to meet the energy savings target will come from both energy efficiency and demand response measures, and the EM&V protocols provide several methods for LDCs to measure energy savings from energy efficiency and demand response programs.

The savings must persist, that is, be delivering savings in 2014. Persistence of savings is treated differently for efficiency versus demand response measures. Persistence of energy efficiency measures is based on the effective useful life of a measure, and is calculated as the median number of years that an installed technology is in place, operating and delivering savings. For the purpose of measuring achievement of the target, the energy savings are assumed to persist in their entirety, 100 per cent, for at least the four-year target period. Energy savings from demand response measures are assumed to persist entirely for only one year and must be reacquired each year.

2.4.1.2 An Example of Measuring a Local Distribution Company's Energy Savings Target

The tables below illustrate measurement of the energy savings target. The example uses a Local Distribution Company (LDC) whose cumulative energy target is 400 gigawatt-hours (GWh) to be achieved by December 31, 2014. It assumes the LDC achieves incremental savings of: 30 GWh in 2011; 50 GWh in 2012; 40 GWh in 2013; and, 30 GWh in 2014.

The example also assumes that most of the energy savings are derived from energy efficiency programs (90 per cent of savings), and a small amount (10 per cent of energy savings) is derived from demand response programs.

Under the Ontario Power Authority's Evaluation, Measurement & Verification protocols, recall that the 90 per cent portion of the energy savings acquired from energy efficiency programs will persist in their entirety for each year of the four years, but the 10 per cent portion of energy savings resulting from demand response measures will persist in their full amount for only one year and the savings will not carry forward through the four years. Therefore, in this example, 10 per cent of the incremental energy savings from a given year will not be counted in subsequent years' total annual energy savings. This means 10 per cent or 3 of the 30 GWh of 2011 incremental savings are not included in 2012, 2013 and 2014 because they are derived from demand response measures, but the 27 GWh derived from energy efficiency measures acquired in 2011 is included in subsequent years.

To determine its performance, an LDC would follow four steps. First, an energy target is assigned. Second, the LDC records incremental energy savings achieved in each year. Third, the annual energy savings for each year are calculated and added to determine the cumulative savings. Fourth, the cumulative savings are compared to the assigned target. In this example, the LDC will achieve 89 per cent of its target.

Step 1

LDC Name	2011-14 Energy Savings Target
Eco Light and Power	400 GWh

Step 2

	Year			
	2011	2012	2013	2014
GWh of Incremental Savings Acquired from Energy Efficiency Measures	27	45	36	27
GWh of Incremental Savings Acquired from Demand Response Measures	3	5	4	3
Amount of Incremental Energy Savings Acquired (GWh)	**30**	**50**	**40**	**30**

Step 3

Year Measures Implemented	Net Annual Energy Savings *				Accumulated Energy Savings (GWh)
	2011	2012	2013	2014	
2011	30	27	27	27	
2012	0	50	45	45	
2013	0	0	40	36	
2014	0	0	0	30	
Total Annual Energy Savings (GWh)	**30**	**77**	**112**	**138**	**357**

Note

Note: *Assumes energy savings from efficiency measures persist entirely for four years. Energy savings from demand response persist entirely for one year and are netted out from the amount of total annual savings of succeeding years.

Step 4

Amount of Target Achieved	89%

Measuring the Demand Reduction Target

The demand target requires a reduction in system-wide peak demand of 1,330 MW in 2014. Unlike the LDCs' energy savings target which uses a metric of cumulative savings, the LDCs' peak demand reduction target uses a metric of *annual* savings to measure achievement. Annual savings from several years are not summed as with the cumulative metric. Savings achieved in the target year and any savings from 2011 to 2013 that persist in the 2014 target year are measured.

Megawatts counted to meet the demand reduction target will come from both demand response and energy efficiency measures, and the EM&V protocols provide several methods for LDCs to measure peak reduction from demand response and energy efficiency programs. To measure demand reduction from efficiency programs, the methodology includes direct methods that involve taking actual hourly measurement of demand reduction before and after implementing a conservation measure, and indirect methods that use deemed or modelled quantities of savings. LDCs will likely use the indirect methods as they are less onerous to perform. Still another methodology is used to measure peak reduction savings from demand response programs. It involves measuring the load impact that results from the programs (i.e., the difference between a customer's actual measured electricity demand, and the customer's demand that would otherwise have occurred in the absence of a demand response program).[57]

ECO Comment

The ECO raises three concerns regarding the LDC CDM target: the likelihood of its achievement; methodological issues related to measurement; and, transparency in setting the target.

Achievement

Based on actions to date, the ECO is not confident that the target will be achieved. LDCs can deliver two sets of programs to meet their target: OPA-Contracted Province-Wide Programs and Board-Approved Programs. Under the CDM Directive, LDCs must achieve their targets by the end of 2014. No Board-Approved Programs have been launched as of December 2011, meaning that a year or more of the four-year savings from these programs has been forfeited. To date, only two LDCs have applied for Board-Approved Programs. Both applications have since been withdrawn: one following an unfavourable OEB order, and the second following an unfavourable OEB decision.[58]

The ECO believes that LDCs may fall short of their targets because achievement partly depends on implementing Board-Approved Programs. The OPA estimates that OPA-Contracted Province-Wide programs will provide only 78 per cent of the savings towards the 1,330 MW demand target and 91 per cent of the 6,000 GWh energy target.[59] Also contributing to a possible target shortfall is the fact that not all OPA-Contracted Province-Wide programs launched as expected on January 1, 2011, and will therefore post less than a full year's worth of savings in 2011.

In response to an information request, the Ministry of Energy stated that it is not considering a change of target amounts or timelines at this time. The ministry indicated that program and regulatory options – solutions involving the regulatory framework of the OEB, or assistance that the OPA could provide to LDCs – are being assessed as ways to help meet the target.[60] The ECO is concerned that greater OPA involvement in LDCs' custom programs, depending on the details, could amount to an abandonment of the original spirit of the *Green Energy and Green Economy Act, 2009*. Its intent, when conceived in 2009, was that LDCs should play a prominent role in program design.

It seems doubtful that programs can be ramped up to compensate for delays, and implementing the options being considered by the ministry to correct the situation may cause further delays. The ECO is concerned that adherence to a target, the achievement of which is doubtful, may undermine the credibility of the conservation effort and unfairly penalize LDCs. Non-achievement of a target made unrealistic by events will only provide grist for the mill of conservation opponents who argue CDM is not reliable for meeting Ontario's power needs.

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To avoid debasing the worth of targets, the ECO urges the government and OEB to promptly implement options to ensure the target is met or otherwise reconsider the target timeline. Absent options and if the government elects to adhere to the current targets and timelines, the ECO believes LDCs that have applied or do apply, in good faith, for Board-Approved Programs should not be penalized for missing their targets whether or not the programs are approved.

Measurement Methodology

Overall, considering the attempt to resolve methodological problems related to the allocation of targets, the ECO accepts the OPA's peak demand allocation methodology as a reasonable approach for determining target shares, at least until a refined methodology using data that is currently not available is developed. The ECO agrees with the OEB's denial of LDCs' requests for exemption from a peak reduction target. Demand targets were based on each distributor's historical average contribution to the provincial peak and not on each LDC's own system peak. Consequently, the methodology accounts for winter-peaking LDC load shapes, and assigns such LDCs a small share of system-wide summer peak reduction.

The ECO is concerned, however, about two methodological issues: one involves measuring the impact of TOU rates, and the other is related to the government's use of one metric to measure the energy savings target of the CDM Directive and a different one for the LTEP targets.

Time-of-Use Prices

Although LDC target amounts were set based on the assumption that peak savings resulting from TOU prices would be included (as noted above in the discussion on understanding the targets), methodological uncertainty now exists as to whether and how LDCs will be allowed to count these savings (estimated to be 184 MW in 2014 and 221 MW in 2015)[61] towards their targets. Section 3 of the CDM Directive, which sets out how targets are to be met, makes no mention of TOU prices. Therefore, the Directive could be interpreted as excluding them. The Board released a draft CDM code based on the Directive that did not explicitly mention TOU prices, and despite LDC comments requesting the TOU issue be addressed,[62] the OEB did not amend the draft code or even note the issue in its Decision on the finalized code.

The Ministry of Energy indicated to the ECO that it is working to provide certainty on this issue. The ECO urges the government, the OEB and the OPA to quickly clarify the issue, advise whether TOU savings count toward LDC targets, and if so specify how the savings are credited to ensure there is no double counting. In the ECO's opinion, TOU prices should count toward LDCs' targets. LDCs install, own and bill for meters. The ECO believes that consumers will embrace TOU prices if the LDC targets include TOU savings and LDCs are motivated to communicate TOU benefits to customers.

Cumulative Savings

The ECO questions why the government chose a metric of cumulative savings to set the energy savings target of the CDM Directive while adopting an annual savings metric for all other targets. According to the Ministry of Energy, the decision was based on a preference to treat the 2011 to 2014 period as self-contained to demonstrate the value of conservation.[63] The ECO notes an advantage of cumulative-based targets is to reward early action on conservation, but this has been offset by the

OEB decisions on Board-Approved Programs and the delay in launching OPA-Contracted programs. The ECO also notes a disadvantage of using cumulative targets is possible confusion among the public over conservation results. Taking the 2014 LDC and 2015 LTEP energy targets together, the different baselines and the switch from a 2014 cumulative target to a 2015 annual target adds complexity in communicating conservation policy.

Transparency – Access to Information and Participation in Target Setting

As on other occasions of implementing a key environmental policy, a ministerial directive was used to set the LDC CDM target. Leading up to the issuance of the CDM Directive, the Ministry of Energy sought advice from the OPA and consulted with LDCs to establish the aggregate target amount. It did not seek comment from other stakeholders or the public.

Inaccessibility of information contributed to a lack of transparency about the aggregate target amount. It was derived from the OPA's update of information contained in IPSP I. The OPA was under ministerial direction to examine acceleration of conservation targets but had not publicly released information. The opportunity to review updated IPSP information did not start until May 2011, more than a year after the CDM Directive established the target. Although Ministry of Energy and OPA officials were familiar with the details of the IPSP update, it was difficult for interested stakeholders or the public to analyze the target amount. In the ECO's opinion, this lack of access to information is unacceptable, especially considering that the 2010 province-wide target, which was also based on IPSP data, was not met. The ministry should have widely consulted, including the public, on the proposed aggregate target.

The lack of opportunity to test the viability of the targets was reinforced by the Minister's instruction in the CDM Directive that the OEB should establish these distributor-specific targets without a hearing (where the aggregate target amount could have been examined). With the aggregate target set, the Board did hold a consultation inviting LDC and other stakeholder comments on the allocation methodology of the target but made it clear that pursuant to the Minister's Directive, the forum was not a hearing and comments should focus on allocation, not address the aggregate target amount.

As a ministry prescribed under the *EBR,* the Ministry of Energy is obliged to post policy proposals like these on the Environmental Registry. The lack of participation in making decisions with significant environmental impact has been repeatedly pointed out by the ECO in previous reports.[64] The Environmental Registry afforded a readily available means to receive public input on the target, and the ECO believes it should have been used to post a proposal notice of the CDM Directive target.

2.4.2 Long-Term Energy Plan's Province-Wide Targets – 2015 and Beyond

The government announced new province-wide electricity conservation targets with the release of the LTEP in November 2010. Like the LDC CDM targets, the LTEP targets are twofold stipulating an amount of both peak demand reduction (MW) and energy savings (TWh) to be achieved. The government has established a 2015 target of a 4,550 MW reduction in provincial peak demand and 13 TWh of consumption savings. It also set interim targets in successive five-year intervals (2020, 2025) and a final target for 2030 (see Table 2). These targets were formalized through a new Supply Mix Directive sent from the Minister of Energy to the OPA in February 2011.[65] The Directive also instructed the OPA to exceed and accelerate the achievement of these targets, if doing so is feasible and cost-effective.

The year 2005 is used as a baseline and progress against the target includes savings from measures implemented starting in 2005. (The LDC CDM targets use 2011 as the baseline year). This means measurement of the LTEP targets will include electricity savings – both peak demand and energy consumption – persisting in 2015, and subsequent target years, from any measures that were implemented beginning in 2005 and carrying forward. As such, progress towards the targets would include any persistent savings resulting from programs implemented to meet the 1,350 MW target established for 2007 and the additional 1,350 MW target for 2010.

Understanding the Targets

How Achievable Conservation was Determined and the Target Amounts Established

Further detail on the methodology used in determining the LTEP targets (the gross-to-net demand curve and the assumptions underlying the achievable conservation potential) will presumably be contained in the OPA's revised Integrated Power System Plan II (IPSP II). Once filed, stakeholder comment on the methodology used in IPSP II can occur, although the target amounts are not open to revision.[66]

Interpreting and Measuring the Target

The LTEP established *annual demand* and *annual energy* savings targets for 2015, 2020, 2025 and 2030. The targets are all annual values to be achieved in the corresponding target year and there is no cumulative measurement.

The ECO estimates that if the CDM Directive's 2014 peak demand target is met and all savings from activities to meet it persist in 2015, LDC conservation programs implemented from 2011 to 2014 will contribute 29 per cent of the savings required to meet the LTEP's 2015 demand target. The remainder will be derived from other sources, such as: persistent savings from activities implemented prior to 2011, new programs launched in 2015, codes and standards, OPA programs for transmission-connected customers, and TOU pricing.

ECO Comment

Transparency – Access to Information and Participation in Target Setting

Our comments on the lack of transparency noted above for the CDM Directive targets also pertain to the LTEP targets. There was insufficient information publicly available about the method and assumptions underlying the targets. The government's November 2010 posting of a proposal notice, containing a draft 2010 Supply Mix Directive with conservation targets, for comment on the Environmental Registry was a positive step. Regrettably, a decision notice explaining how comments were considered is still pending, nearly one year after the comment period closed. Once this notice is posted and as the targets are examined upon filing of the IPSP II at the OEB, further comment may be warranted.

3: Progress on Selected Initiatives

3.1 Natural Gas Industrial Conservation Programs

Ontario's industrial sector consumes more natural gas than any other sector. Half of the natural gas used by Union Gas customers for final consumption and 22 per cent of the natural gas used by Enbridge customers for final consumption is consumed by industrial facilities.[67] Union Gas and Enbridge have been delivering successful industrial gas conservation programs for some time to help reduce industrial gas consumption. These programs have consistently been more cost-effective than gas conservation programs in any other sector. However, a recent decision by the OEB may lead to reduced spending on industrial gas conservation programs, and will lead to changes in the way that programs for this sector operate in Ontario.

Industrial Energy Conservation Potential and Barriers to Action

A recent report[68] by the Canadian Manufacturers and Exporters (CME) sheds some light on the potential for energy conservation in the industrial sector. On average, industrial firms have implemented relatively few technical and management best practices related to energy. Larger firms have implemented a higher percentage of best practices than have small- to mid-size companies. The CME estimates that if all economically feasible energy best practices were implemented by all industrial firms, total energy consumption in this sector would decrease by 29 per cent by 2030, compared with a business-as-usual scenario. Reduced use of natural gas accounts for half of these potential energy savings. Another report focusing specifically on Union Gas's service territory estimates that industrial gas consumption could be reduced by approximately one-third if all cost-effective conservation measures were implemented.[69]

The CME report also highlights some of the key barriers that prevent firms from making energy efficiency investments, even when they are cost-effective. The top five barriers noted by industrial firms are listed below.

- It is difficult to obtain company financing to implement energy efficiency projects.
- The payback period for energy efficiency projects is too long, or the return on investment is too low.
- Accessing assistance, funding and incentives from conservation programs requires too much effort.
- The company has a lack of human resources to focus on energy management.
- Production is the dominant focus, and energy management is not seen as a production element.

Utility Programs for Industrial Consumers

Unlike the commercial and residential sectors, natural gas is used by industry primarily for direct or indirect process heating, rather than space or water heating. Each facility will have a unique set of energy consuming industrial processes. For this reason, industrial energy conservation programs must be more flexible and customized than programs for the commercial or residential sectors (which often focus on incenting standardized energy efficient space heating or water heating technology).

The program offerings of both utilities are quite similar, as shown in Table 11. Both utilities provide financial and technical assistance to help a company undertake upfront actions that can identify energy savings opportunities, such as energy audits and process analyses, and then provide financial incentives for implementing projects that save energy.

The bulk of utility industrial conservation funding in recent years has gone towards financial incentives for investments in projects that improve energy efficiency. However, the early stage programs such as audits and the ongoing assistance of utility service consultants are critical. They help overcome some of the barriers noted above by raising the profile of energy efficiency at a plant, identifying opportunities for energy savings, and helping plant managers convince head office of the business case

for investment in energy efficiency. Without these program offerings, total investment in energy efficiency by firms would likely be significantly lower. Union Gas estimates that approximately 60 to 70 per cent of industrial energy audits lead to at least one follow-up investment in energy efficiency by the company.[70] In recent years, utilities have placed increased emphasis on this function of informational and technical assistance.

Table 11: Industrial Conservation Programs Offered by Union Gas and Enbridge Gas Distribution in 2010/11

Activity	Program Offerings - Enbridge Gas Distribution	Program Offerings - Union Gas
Technical and Informational Assistance	Free assistance (walk-through assessments, equipment performance testing, help finding suppliers and applying for incentives, etc.) for consumers using more than 750,000 m^3 of natural gas annually. Workshops, newsletters, etc.	Free assistance (advice, walk-through assessments, combustion testing) for distribution contract customers.[71] Workshops, newsletters, etc.
Energy Audits	Incentives covering 50% of audit cost for: HVAC audits, steam plant audits, steam trap surveys, insulation surveys, and process integration analyses.	Incentives covering 50% of audit cost (66% for process improvement analyses) for: energy audits, steam trap surveys, and process improvement analyses.
Energy Efficiency Projects	Incentive for energy efficiency projects of $0.08/$m^3$ of annual natural gas savings ($0.10/$m^3$ for HVAC measures) to a maximum of $100,000 per project.	Incentive covering 15% of incremental costs for energy efficiency projects to a maximum of $40,000 per project. Fixed incentive levels for standardized industrial space heating technologies (e.g., destratification fans, infrared heaters, condensing boilers).
Demonstration Projects	Not available	15% incentive for new energy efficient gas-fired technologies that do not have significant market share in Ontario.

Program Results

The importance of conservation programs for the industrial sector, relative to the utilities' conservation programs for all sectors, differs between Union Gas and Enbridge. Figures 5 and 6 show the natural gas savings achieved by Union and Enbridge conservation programs in recent years, divided into savings from industrial and non-industrial programs. Savings from Union Gas's industrial programs have risen dramatically in recent years and accounted for more than 60 per cent of Union's total savings in 2010. On the other hand, savings from Enbridge's industrial programs have been declining in recent years and accounted for less than a third of total gas savings from conservation programs in 2010. These differences reflect the gas distributors' differing customer mixes, with Union Gas having a greater number of large industrial consumers that have significant potential for large energy savings from conservation projects.

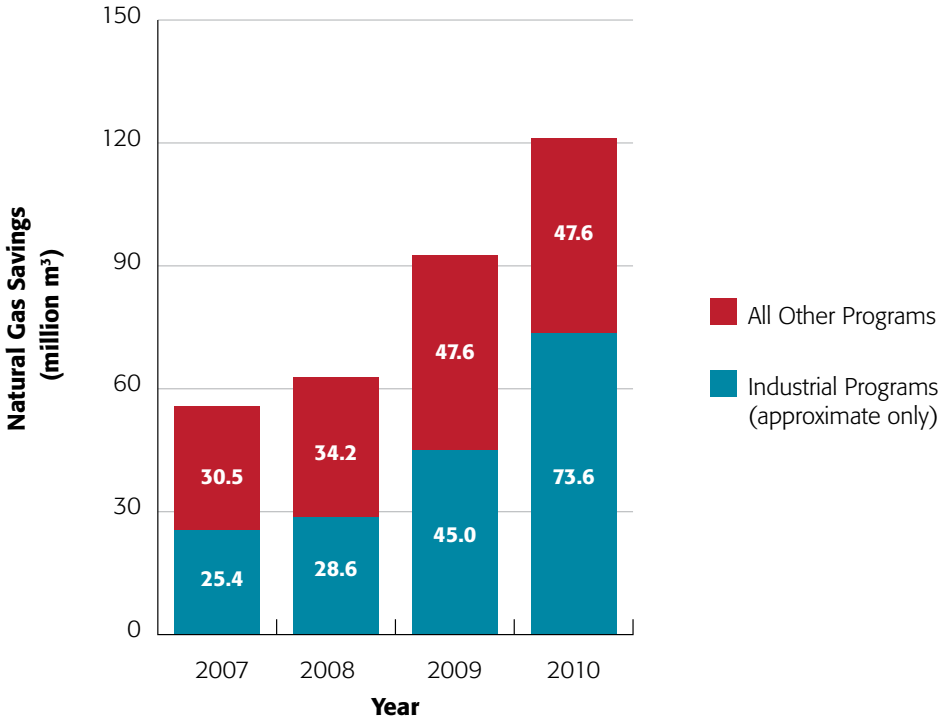

Figure 5: First Year Natural Gas Savings from Conservation Programs – Union Gas

Note: Savings are "first year" savings – the energy saved in the first year after installing the energy efficiency measure. Many measures will provide savings for a number of years, so lifetime gas savings will be higher. Union Gas does not report conservation program savings by sector, but by rate class. The vast majority of industrial program savings come from the Distribution Contract class. This graph assumes that 70% of reported savings in the Distribution Contract rate class come from industrial customers, consistent with estimates provided by Union Gas.

Source: Union Gas annual DSM reports and audit reports

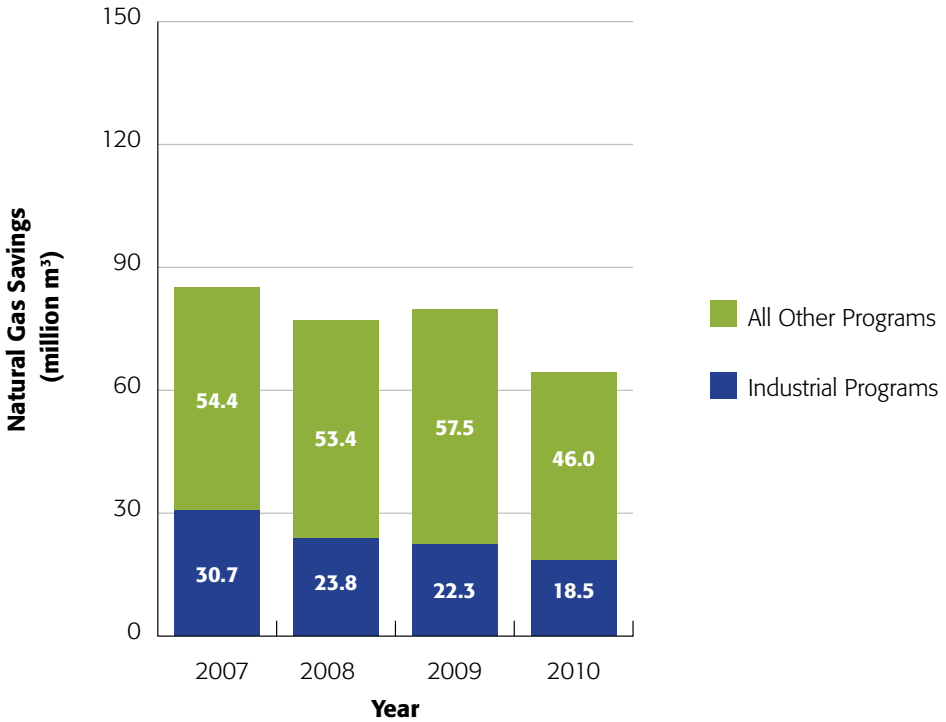

Figure 6: First Year Natural Gas Savings from Conservation Programs – Enbridge Gas Distribution

Source: Enbridge Gas Distribution annual DSM reports and audit reports

Some of the most popular types of energy efficiency projects undertaken by industrial customers to reduce gas consumption have been process improvements, heat recovery projects that help industrial plants recover and reuse high-grade heat, and maintenance projects to make boilers and burners run more efficiently.

Cost-Effectiveness of Industrial Gas Conservation

In recent years, utility industrial conservation programs have delivered large savings in a very cost-effective fashion. Each utility dollar allocated in 2009 towards industrial conservation investments contributed net benefits, in the form of reduced gas costs, of up to $30 (Enbridge) to $40 (Union). This is a much higher return than utility conservation programs in other sectors.[72]

In recent years, utility industrial conservation programs have delivered large savings in a very cost-effective fashion… opportunities to save energy exist in the industrial sector but, without utility involvement, they are often not acted upon.

Using a different cost-effectiveness metric, a recent study[73] compared the benefit:cost ratio of Enbridge's custom conservation projects in different sectors, including the costs of conservation investment borne by both the utilities and participating industrial customers. Under this metric, any value higher than one indicates that a project was cost-effective. The benefit:cost ratio for Enbridge's custom industrial projects was higher than for other sectors in all years between 2007 and 2010, reaching 7.7 in 2010, indicating that these projects were very cost-effective.[74]

These results lend support to the findings of the CME study (discussed previously) that energy efficiency is often given a low priority within industrial firms, as they demonstrate that very cost-effective opportunities to save energy exist in the industrial sector but, without utility involvement, they are often not acted upon. Comments from utility program staff also support this view, noting that energy is often a fixed cost paid by a firm's head office, while plant managers are focused solely on their facility's production numbers. Utility staff also noted that many firms would only undertake energy projects that were overwhelmingly cost-effective and would pay back their investment cost within two years or less.

The Opt-Out Controversy

Historically, Ontario's gas utilities have been required to offer conservation programs to all classes[75] of customers. The funds spent on conservation have been recovered through natural gas rates, in proportion to the amount spent on each customer class.

The OEB recently completed a review of the conservation guidelines for natural gas distributors. During this review, the Industrial Gas User's Association (IGUA), a trade association representing many of the very largest industrial gas consumers, recommended that ratepayer-funded utility conservation programs for industrial customers should be discontinued.[76] IGUA commented that utility conservation programs for large industrial consumers are unnecessary, as companies for whom energy is a major cost pressure are already fully motivated to pursue energy efficiency. IGUA also expressed concerns that conservation programs may be anti-competitive, by forcing firms who have opted not to take advantage of energy efficiency programs (for whatever reason, be it lack of capital or the choice to allocate capital to alternative investments) to indirectly subsidize their competitors that are participating in utility conservation programs. IGUA recommended that, if utility conservation programs for industrial consumers are to be continued, these programs should focus on facilitation of energy efficiency through information and technical assistance, which are much lower cost programs, rather than direct financial incentives.

CME, which represents a broader range of small, medium, and large industrial firms, also commented,[77] stating that it supports conservation programs by the natural gas utilities, so long as the benefits outweigh the costs. CME noted that the concern about cross-subsidization was partially mitigated because conservation programs are made available to all equivalent customers. CME further commented that feedback from commercial and small industrial customers was almost entirely supportive of gas conservation programs and that these types of business "do not have the expertise or resources to undertake sophisticated conservation activities in the absence of the type of programs offered by gas [utilities]."[78] CME strongly supported continuation of utility Demand-Side Management (DSM) for these customers. However, CME did note that many larger customers have the capability to conduct their own conservation activities, and recommended that the OEB should review whether gas DSM should be offered to the largest industrial rate classes, and if so, whether an "opt out" provision should be provided.

In a decision[79] that established the new conservation guidelines for gas utilities, the OEB determined that, utility conservation programs for large industrial customers (defined as customers in rate classes T1 and 100 for Union, and class 115 for Enbridge) will no longer be mandatory. If utilities propose programs for these customers, the OEB will consider them on their own merits.

Implications of the Decision

The OEB's decision will have a large impact on industrial gas conservation programs, particularly for Union Gas, where customers from the T1 and 100 rate classes accounted for slightly more than half of Union's total gas delivered and total gas saved from all of its conservation programs.[80] The impact will be much less for Enbridge, where customers from the 115 rate class accounted for only about 5 per cent of total gas delivered.[81] At the time of writing this report, OEB review of utility 2012-2014 conservation plans was pending. The utilities' proposed plans are described below.

In September 2011, Union Gas tabled its proposed 2012-2014 natural gas conservation plan with the OEB.[82] Union is proposing to continue to offer a program for its T1 and 100 class customers. Prior to making this decision, Union surveyed all customers in these rate classes, and 69 per cent of respondents supported Union offering some form of conservation programs.

The new program for T1 and 100 customers will no longer fund capital investments in energy efficient equipment. Instead, it will target incentives at operations and maintenance investments that save energy, such as steam system repairs, piping insulation, and combustion optimization. Union will also continue to offer technical assistance, including site energy assessments and incentives for process improvement studies. The intent is for Union's assistance to keep energy management a priority at these organizations. It is also meant to assist plant staff in making the case to senior management to invest in energy efficiency improvements, even though incentives for capital investments will no longer be available from the utility.

The budget for conservation programs for T1 and 100 customers (including a proportionate share of fixed overhead costs) is proposed to be $3.7 million in 2012, dropping from actual spending of $5.2 million in 2010.[83] The reduced industrial program budget will mean reduced gas savings, as the lifetime gas savings due to 2012 projects for T1 and 100 customers are expected to be 200 million m^3, reduced by a factor of 5 from the almost 1 billion m^3 of lifetime savings resulting from 2010 projects.[84]

Conservation programming for smaller industrial customers will also change. Incentives for operational and capital investments will continue to be available to these customers, although at a lower incentive level ($0.05/$m^3$) than in previous years. Union intends to launch a new market transformation program called the Integrated Energy Management Systems program. Building on pilot work conducted by the utilities in recent years, this program is focused on building a culture of energy management and encouraging certification under the new ISO 50001 energy management standard. Detailed monitoring of plant energy consumption using advanced submetering systems is used to establish energy targets and push the plant towards continuous energy improvement. The program is intended to provide a holistic energy management platform that can address both natural gas and electricity.

Enbridge's proposed 2012-2014 natural gas conservation plan was filed with the OEB on November 4, 2011.[85] The proposed plan includes a reduction in total industrial conservation spending, from $4.9 million in the 2011 budget to $4.15 million in the 2012 budget, and a shift in focus from larger industrial customers to small and medium customers. There is a proposed cap of $2.7 million on spending in the three rate classes that contain most large industrial customers (rate classes 110, 115, and 170). Annual gas savings from the industrial sector are estimated to be 15.3 million m^3 in 2012, down from actual savings of 18.5 million m^3 in 2010. Unlike Union, Enbridge will continue to offer incentives for capital investments in energy efficiency.

ECO Comment

The performance of Union Gas and Enbridge Gas Distribution in delivering conservation programs for the industrial sector has been exceptional. These programs have a long track record of delivering significant energy savings at a low cost, and have shown that the industrial sector has many energy conservation opportunities with very short payback periods.

It is disappointing, therefore, that the coming years will likely see a decrease in the total amount of utility funding directed at industrial gas conservation. The OEB's decision that utility programs for large industrial customers are optional and will be judged on their own merits has had a chilling effect, with utilities proposing reduced industrial conservation budgets, knowing that there is a possibility that more aggressive programs would be rejected by the OEB.

One option to address IGUA's concerns about cross-subsidization, which has been used with some success in other jurisdictions,[86] would allow utilities to continue to collect a conservation tariff on rates; however, these funds would go into a company-specific holding account earmarked for energy efficiency investments. Firms would have a set number of years within which to access these funds for energy efficiency investments (projects identified with or without utility assistance). If the funds were not used during this time, they would be accessible to other customers in a "use it or lose it" scenario.

Regardless of the total utility budget level for industrial gas conservation, it also remains to be seen whether the decision to focus this budget more on operational improvements and energy management practices, as opposed to incentives for capital investments, is the correct one. It may be that the continuing technical assistance provided by the utilities will enable industrial companies to continue to make capital investments in energy efficiency at a rate similar to the recent past, even though incentives will no longer be available. The ECO suggests that utilities should continue to track the implementation rate of industrial capital investments in energy efficiency projects identified in audits, to see if this rate shows a decline in the absence of incentive payments. This will provide evidence to inform the design of future utility industrial conservation budgets.

Lost in the debate around how to set utility conservation budgets and avoid cross-subsidization is a recognition of the societal costs associated with the use of natural gas, particularly GHG emissions. In the absence of any price on carbon, utility conservation programs serve as one small measure to correct for this external cost, as well as addressing the proven underinvestment in energy efficiency by industrial firms. The surcharge that large industrial firms pay to fund natural gas conservation programs is extremely modest – for Union Gas T1 and 100 customers, less than one-tenth of one cent per cubic metre of natural gas consumed.[87] By comparison, British Columbia's existing carbon tax (as of July 1, 2011) is approximately 4.8 cents per cubic metre of natural gas, two orders of magnitude higher.

The ECO believes unfinished business remains from the *Green Energy and Green Economy Act, 2009*, which amended the OEB's objectives to include promoting energy conservation while... "having regard to consumer's economic circumstances". However, no counterweight was included that required the OEB to also "have regard" to the environmental costs …The result has been a Board whose recent rulings have been indifferent and even hostile towards conservation, quite the opposite of what the government intended.

The ECO suggests that had the OEB more explicitly considered societal costs, it would have maintained mandatory conservation programs for large industrial customers. The Board's decision not to consider societal costs can be seen in other recent actions, such as a decision (in the new conservation guidelines for gas utilities) not to alter the cost-benefit test for natural gas conservation programs to include a cost for carbon emissions, despite broad support from stakeholders.

The ECO believes unfinished business remains from the *Green Energy and Green Economy Act, 2009,* which amended the OEB's objectives to include promoting energy conservation (both electricity and natural gas), while also "having regard to consumer's economic circumstances". However, no counterweight was included that required the OEB to also "have regard" to the environmental costs associated with energy consumption. The result has been a Board whose recent rulings have been indifferent and even hostile towards conservation, quite the opposite of what the government intended.

The ECO recommends that the Ministry of Energy amend the *Ontario Energy Board Act, 1998* so that the Ontario Energy Board's objectives include having regard to the environmental costs associated with energy consumption.

The overall goal of natural gas conservation in the industrial sector should be to continue on the path that the utilities have blazed, increasing the total investment in energy efficiency by utilities and firms in the industrial sector to capture more of the

ample cost-effective conservation opportunities. The ECO is not convinced that the change in direction and reduced funding for industrial conservation programs will accomplish this.

3.2 Electricity Retrofit Programs for Commercial and Institutional Buildings

Electricity Consumption of Commercial and Institutional Buildings

While the amount of electricity used in the residential and industrial sectors has remained flat since 1990, electricity consumption in the commercial and institutional (C&I) sector increased by approximately 30 per cent between 1990 and 2005, and is projected to continue growing.[88] Rising electricity use in this sector is especially problematic because the timing of maximum electricity use in commercial buildings is closely tied to the timing of provincial peak demand events, with both occurring on hot summer weekday afternoons. Reducing electricity use in C&I buildings should be seen as a key strategy for containing peak demand and avoiding the need for new generation.

Fortunately, the cost-effective potential for reducing electricity use (both total consumption and peak demand) is also greatest in the C&I sector,[89] with the most savings potential to be found in the adoption of more efficient lighting, ventilation and space cooling.[90] Recognizing this, the Minister of Energy issued two directives to the OPA in early 2006 that provided procurement authority for the OPA to fund conservation programs for the C&I sector, one with a particular focus on the Toronto area.[91]

Retrofit Programs for Existing Buildings: 2007-2010

Although new buildings offer the greatest opportunity for energy-efficient design, the slow turnover of building stock means that the bulk of energy savings potential can be found in existing buildings. Between 2007 and 2010, the OPA funded four[92] different programs which sought energy efficiency improvements in existing C&I buildings.

> Reducing electricity use in C&I buildings should be seen as a key strategy for containing peak demand and avoiding the need for new generation.

- The Better Buildings Partnership for Existing Buildings (BBP-EB), operated by the City of Toronto, targeted municipal, academic, social services, and healthcare buildings located in Toronto.
- The Business Incentive Program (BIP), operated by Toronto Hydro, targeted smaller commercial buildings (less than 25,000 square feet) located in the City of Toronto.
- The BOMA CDM program, operated by BOMA-Toronto (Building Owners and Managers Association – Toronto), targeted large office buildings (more than 25,000 square feet) located in the City of Toronto.
- The Electricity Retrofit Incentive Program (ERIP), operated by LDCs, targeted commercial, industrial, institutional, and agricultural buildings outside the City of Toronto.

Three of the four programs (BOMA CDM being the exception) were also offered to multi-residential buildings.

All four programs offered financial incentives for building owners to install energy efficiency measures, which paid a set amount per unit of expected energy savings or peak demand savings. While the programs began with differing incentive levels, by 2010, all four programs had increased their incentives and were using the same two-tier incentive structure: $400 per kW of demand savings or $0.05 per kWh of first year energy savings for lighting measures, and $800 per kW or $0.10 per kWh for non-lighting measures.[93] The two-tier structure reflects the fact that higher-efficiency lighting is becoming a standard practice, and would be undertaken in many cases without an incentive. Other energy efficiency measures are less common, and require higher incentives to encourage adoption by building owners. The higher incentive may serve as a carrot to encourage deeper retrofits by building owners initially considering only lighting upgrades. In addition to incentives for energy saving measures, BOMA also offered funding to building owners for scoping studies that identified opportunities for energy savings, with the expectation that these would lead in many cases to energy efficiency investments.

Program Results

Lighting retrofits have been by far the most popular energy saving measure incented through the C&I retrofit programs, accounting for 89 per cent of demand savings in 2008 (a breakdown of savings by measure in later years is not available).[94] HVAC improvements were the next most important measure.

The net incremental peak demand savings (savings newly acquired in the year in question) achieved by each program in each year from 2007 to 2010 are shown in Figure 7.

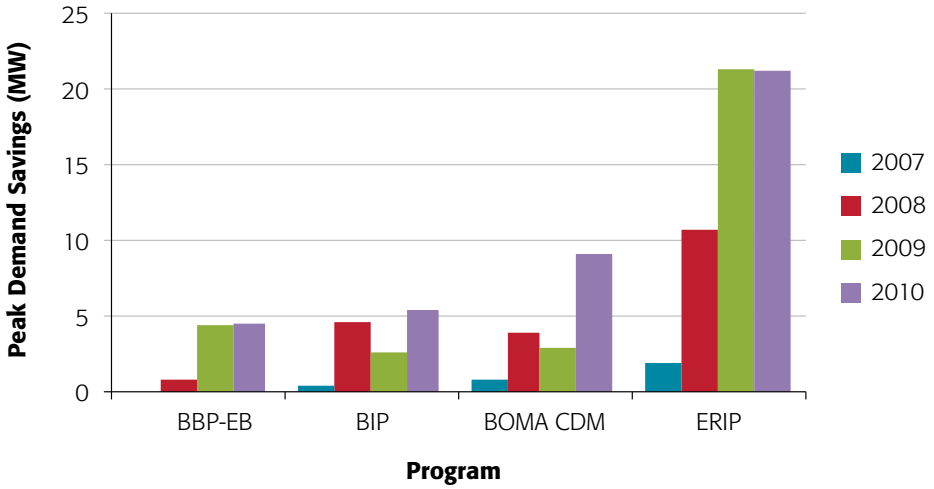

Figure 7: Net Incremental Peak Demand Savings From Commercial and Institutional Retrofit Programs

Source: Ontario Power Authority, Toronto Hydro[95]

All four retrofit programs had program objectives (peak demand targets) associated with them, expressed as the expected reduction in peak demand achieved by 2010, resulting from the projects undertaken in all four years of program operation. It was not specified whether the targets were to measure gross savings or net savings; net savings are typically lower as they do not count energy savings from program "free riders" (those who would have implemented the energy conservation measure even in the absence of a program incentive). As Figure 8 shows, the BIP and ERIP programs came close to or reached their targets, if gross savings is used as the target metric, while none of the four programs came close to reaching their targets, if net savings is used as the metric.

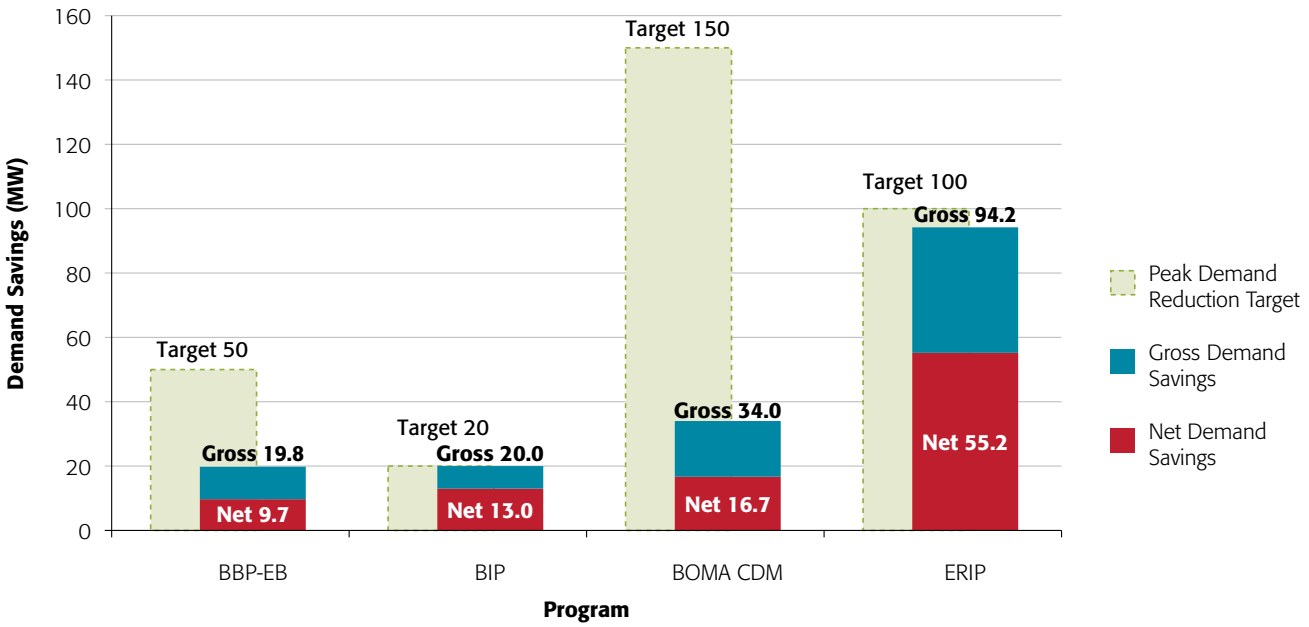

Figure 8: Commercial and Institutional Retrofit Programs: Performance Against Program Targets

Note: Demand savings report the annual demand reduction in 2010 derived from all program actions from 2007 to 2010.

Source: Ontario Power Authority, Toronto Hydro

Total program savings will increase slightly from the numbers shown here, as projects that were incented under the pre-2011 commercial retrofit programs but completed in 2011 are not included. The OPA expects approximately 9 MW of net savings to come from projects of this nature in the first half of 2011, for all four programs combined.[96]

All four programs delivered electricity savings at quite low cost in comparison with purchasing new electricity supply. In 2010, projects undertaken through the retrofit programs (excluding projects in multi-residential buildings) delivered energy savings at a levelized delivery cost of between 1.4 to 2.5 cents per kWh, less than the average cost of electricity and far less than alternative sources of new supply. [97]

Commercial and Institutional Retrofit Program Reboot: 2011-2014

In 2011, the OPA launched a new province-wide program, covering new and existing buildings in the commercial, institutional, multi-residential, and agricultural sectors.[98] LDCs will have the lead in delivering this program.

The new program includes an equipment replacement initiative for medium-to-large existing buildings that replaces the four C&I retrofit programs previously offered. The incentive structure remains unchanged ($800 per kW of demand savings, or $0.10 per kWh of first year energy savings, with lighting measures funded at only half this level). The program will also offer fixed per unit incentives for standardized energy efficiency measures such as high-efficiency lights and motors, an option also previously offered by the ERIP program.

Several new initiatives have been added to the program to complement the financial incentives for investments in energy efficient equipment:

- An audit incentive will cover up to 50 per cent of the cost of a building energy audit (typically several thousand dollars, depending on building size). Additional funding is available for larger buildings that wish to conduct a detailed follow-up analysis of a potential energy efficiency investment with a large capital cost.
- Incentives are provided for customers to conduct a commissioning process to optimize the performance of their chiller systems. To ensure that commissioning studies lead to actual savings, customers are required to implement any identified measure that would improve energy efficiency that has less than a two-year payback.
- The OPA will fund capacity building activities, including support for energy efficiency service providers, a contractor information network, and training for HVAC contractors, building operators and energy managers. The OPA also plans to promote energy management workshops and to develop support resources, such as guides for customers, vendors and contractors to build knowledge of energy efficiency measures for specific end uses.

For the new retrofit and building commissioning programs, the OPA has targeted 391.3 MW of demand savings and cumulative energy savings of 2,082 GWh by the end of 2014.[99] These program targets are based only on projects undertaken through the new 2011-2014 program and do not count persistent savings from projects implemented in earlier years. The program targets account for 29 per cent and 35 per cent of the overall 2014 LDC demand and energy targets, respectively (see Section 2.4.1).

ECO Comment

The results of C&I retrofit programs between 2007 and 2010 demonstrate that these programs can be a cost-effective means of delivering reductions in peak demand. However, program uptake to date has been lower than expected, perhaps due in part to the impact of the recession. The ECO supports the continued focus on these programs between 2011 and 2014, but believes that the targets for these programs may be overly ambitious, given that incentive levels remain unchanged. The task of reaching the targets will be made even more difficult because the C&I retrofit program has been slow to launch, reducing the four-year window for achieving program savings. If the targets are to be reached, it may be necessary to increase incentive levels to promote more cutting-edge measures – for example, it is unclear to the ECO whether the current practice of providing lower incentive levels for all lighting measures, including advanced lighting controls such as daylight harvesting sensors, is wise.

The ECO also supports the new program enhancements for audits, building commissioning and capacity building. The funding support for audits will hopefully drive building owners to undertake deeper retrofits that deliver enhanced energy savings, rather than focusing on lighting-only retrofits, as has been the case for most projects undertaken in recent years. Seeking more savings from non-lighting measures will become necessary because the simplest lighting retrofit measure – converting from T12 to T8 lighting – has achieved more than 70 per cent market penetration and will soon be essentially complete, locked in by changes to energy efficiency standards.[100] More could perhaps be done to encourage deeper retrofits – for example, many successful U.S. programs provide higher incentive levels for more comprehensive energy efficiency retrofits.[101]

While the OPA has improved the educational and capacity building aspects of the retrofit program, some gaps may still remain. Toronto Hydro, with the greatest population of C&I customers, applied to the OEB for approval of two outreach and education programs targeted primarily at larger C&I customers. These proposed programs were intended to market the complete suite of business conservation programs, particularly to building owners and managers. Toronto Hydro believed that these additional educational programs were needed to meet its conservation targets, and would drive participation into specific business programs, such as the retrofit program. However, the OEB denied Toronto Hydro's funding application, in part because it believed these programs could be funded through the OPA.[102] The ECO suggests that the OPA review whether additional educational and outreach programs targeted at building owners and managers are needed to support the suite of business conservation programs.

One barrier to program participation that should be addressed is the ownership of environmental attributes associated with energy efficiency projects funded through the retrofit programs. Environmental attributes are the benefits and entitlements that can be claimed due to the positive environmental impacts, such as reduced GHG emissions, that result from energy efficiency investments.

One barrier to program participation that should be addressed is the ownership of environmental attributes associated with energy efficiency projects funded through the retrofit programs. This was reported to be a barrier to program participation.

Under the previous retrofit programs, the rules regarding ownership of these attributes varied. For example, the BBP-EB program required potential program participants, other than the City of Toronto, to transfer ownership of these environmental attributes to the OPA.[103] This was reported to be a barrier to program participation.[104] Companies may be concerned that they are unable to validly claim credit for their energy conservation efforts, and publicly benefit from the goodwill associated with their reduced consumption, due to the uncertainty of what the OPA will do with the environmental attributes. For example, if the OPA sells the environmental attributes to a third party who uses them to offset real GHG emissions, only the third party buyer – not the OPA or the company that undertook the conservation action – can legitimately claim the reduced emissions. Otherwise double-counting will result.

For the new province-wide retrofit program (and other OPA programs), the OPA is again claiming ownership of any environmental attributes that arise due to electricity savings for which an incentive was paid. This is the case even though OPA incentives typically pay for only a portion of the incremental cost of an energy efficiency investment, with the customer paying the rest. Program participants can request that environmental attributes be transferred back to them; however, there is no guarantee that the OPA will grant this request.[105]

The ECO recommends that the Ontario Power Authority release claims to ownership of environmental attributes arising from conservation projects funded with the aid of Ontario Power Authority incentives.

As a longer-term strategy, the ECO believes that the focus of energy efficiency efforts in the C&I sector needs to be re-oriented towards measuring and improving whole building energy performance, rather than incenting individual measures. This would reward operational and maintenance improvements that may save energy at lower cost than capital investments, and promote a culture of continuous energy improvement so that energy performance does not slide backwards in the months and years after incentives have been obtained. The C&I retrofit program's new funding for building commissioning, energy managers, and building operator training are useful steps in this direction, although building energy benchmarking and labelling will also need to play a role in the future.

3.3 Ontario Power Authority's Conservation Fund

The Role of the Conservation Fund

Most energy conservation programs focus on obtaining near-term, tangible energy savings, often through incentives for energy efficient products. However, this is only one step in the effort to embed an energy conservation ethos into our society.

According to the OPA, the process of market transformation, which builds a larger role for conservation, is a continuum that moves along three stages:

- Stimulating innovation – for example, by testing and developing new energy conservation products and services;
- Accelerating market penetration – increasing the market share of energy conservation products and services, for example, through incentives; and,
- Locking in conservation – making accepted energy conservation products and services a legal requirement through regulations, codes or standards.

All three stages are supported by capacity building. This includes education and training initiatives that help build an adequate supply of trained providers of energy conservation, or help improve the ability of energy consumers to take action to reduce their energy consumption.

The first stage of conservation, stimulating innovation, is supported by two OPA grant programs: the Technology Development Fund and the Conservation Fund. The Technology Development Fund provides funding for development, demonstration or verification of innovative pre-commercial electricity technologies. The Conservation Fund is focused more on improving conservation program design and capacity building.[106] Its goals are to:

- Test new or unique elements of conservation initiatives;
- Build marketplace capability for the design, delivery, marketing and uptake of conservation initiatives; and,
- Use the results from pilot projects to help inform the development of future conservation initiatives.

The intention is that many funded projects, if proven successful, can be scaled up to achieve significant energy savings, either through an OPA or LDC conservation program, or by the project proponent. Funding for the Conservation Fund and Technology Development Fund is recovered from Ontario electricity ratepayers.

How the Conservation Fund Works

Each year, the Conservation Fund has a set amount of money available for project grants: approximately $3 million in recent years and raised to $5 million in 2010. The Fund has historically operated by issuing open calls for proposals. Project applications are accepted from both not-for-profit and for-profit entities. Projects are funded through one of three funding streams (see Table 12).

Table 12: Conservation Fund Streams of Funding

Funding Stream	Purpose	Maximum Amount of OPA Funding
Research	Determine the potential of conservation project concepts, with the goal of supporting a business case for a pilot project.	$100,000, up to 100% of total eligible[107] project costs
Development & Demonstration	Develop, test and/or demonstrate electricity conservation project concepts, that have already been designed, through real-world implementation.	$500,000, up to 75% of total eligible project costs
Strategic Opportunities (proposals accepted infrequently)	Support strategically important opportunities to realize market transformation with respect to reducing electricity use.	$1,000,000, up to 50% of total eligible project costs

Proposals pass through an Expressions of Interest stage and succesful applicants are invited to submit full proposals. Final proposals are evaluated by OPA staff, and a Business and Technical Review committee, which includes external reviewers. Final funding decisions are made by a Grant Review Committee that includes the Chief Executive Officer of the OPA. Successful applicants then enter into a Contribution Agreement with the OPA that includes contract terms, an outline of the project's deliverables, reporting and payment milestones and any conditions placed on the award.

Achievements to Date

The Conservation Fund was launched in 2005 (building on a grant program previously operated by the Ministry of Energy) and through 2010 had provided or committed a total of $14.9 million in funding to 97 projects, leveraging an additional $26.5 million in contributions from project partners. Funding has gone to projects spread across all sectors, with the C&I sector receiving the largest share of funding (as shown in Figure 9).

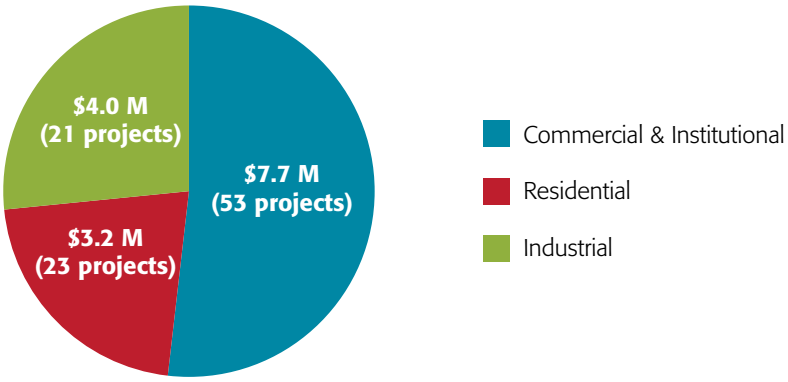

Figure 9: Conservation Fund Project Funding By Sector, 2005 – 2010

Source: Ontario Power Authority[108]

Some program elements of Ontario's current province-wide conservation programs that were first tested through the Conservation Fund include:

- Free pick-up and disposal of inefficient refrigerators;
- Free energy assessment and direct installation of energy efficient lighting for small businesses;
- Incentives for replacement of inefficient room air conditioners and dehumidifiers; and,
- Roving energy managers for industrial firms.

Training for energy efficiency-related careers was a focus of many projects, including development of a specialist major in energy for secondary school students, green building internships for post-secondary students, workplace training for building operators and contractors, and professional training for energy evaluators and managers. Some of these initiatives are being added to the OPA's regular stream of conservation programs in 2011.

Other types of funded projects included market research to identify conservation opportunities in different business sectors, benchmarking tools and energy management best practices for specific subsectors, and general awareness and behavioural change projects (particularly in non-residential sectors). The limited focus on electricity conservation in Ontario prior to 2005 meant that some projects had a large information-gathering component that assessed a sector and identified the energy savings opportunities.

3.3.1 A Higher Education in Energy Conservation

Post-secondary institutions have a vested interest in seeking out energy management practices, not only to create more comfortable learning environments but also to reduce the resources spent on utility bills instead of core academic activities. The potential for cost savings is substantial. Ontario's colleges and universities spend an estimated $235 million each year on energy.[109]

Benchmarking each building's energy performance is a key first step to understanding and reducing energy consumption. A key challenge for post-secondary institutions is the number and diversity of campus buildings and facilities, ranging from academic and administrative centres to laboratories, cafeterias and sports facilities. With funding provided by the Ontario Power Authority's (OPA) Conservation Fund, the Council of Ontario Universities (COU) and Colleges Ontario have developed innovative methods to determine how energy is being used in their buildings and facilities.

Council of Ontario Universities

The COU, an organization representing Ontario's universities, developed an energy benchmarking tool tailored to meet the specific needs of Ontario's universities. The initiative included the collection, compilation, and reporting of energy use from 2007 to 2009. With an impressive 100 per cent participation rate, data was collected for electricity, natural gas, water and steam consumption from 1,068 major buildings across the 22 campuses of all Ontario universities.[110] Universities will be able to use the data collected as an energy planning tool to better control energy costs: comparing their facilities' performance to similar buildings at other universities, identifying best energy-management practices, and analyzing anomalies and performing corrective measures. The project has also increased awareness within the sector about the importance of energy usage.

Colleges Ontario

Colleges Ontario, an organization representing Ontario's 24 colleges of applied arts and technology, established the Ontario Colleges Energy Conservation Secretariat (OCECS) to support and co-ordinate energy conservation initiatives for the sector. The central element of the OCECS project was the development of a province-wide energy monitoring tool known as the Real Time Operating System (RTOS). The RTOS is an advanced energy management initiative that supports the colleges' aggregated energy purchases, with the capacity to connect to metering equipment and provide users with real-time energy data including real-time energy costs, energy analytical tools, automatic reporting, energy cost allocation, and energy budgeting.[111] The RTOS, first successfully piloted at two Toronto-area colleges, is being implemented at all colleges across the province. When fully implemented, the RTOS will result in a consolidated database across the sector, thus allowing colleges' access to detailed historical and real-time data of their use of electricity, gas, water or steam. Combined with energy retrofits and facility manager training, the data measurement and tracking functions of the RTOS have enabled significant electricity savings from retrofits to be accurately measured and tracked.[112]

In addition to supporting capacity building, these projects have also prepared Ontario's universities and colleges to meet the reporting requirements of the new regulation, O.Reg. 397/11 – Energy Conservation and Demand Management Plans, made under the *Green Energy Act, 2009*. This regulation will require the broader public sector (municipalities, universities, colleges, schools and hospitals) to collect and submit energy consumption and greenhouse gas emissions data at a facility level, and to develop and implement energy conservation plans.

Future Directions

In 2010, the Ministry of Energy signalled that the Conservation Fund would continue to play a role in conservation innovation, directing the OPA to "continue to provide, through its Conservation Fund, support and funding of CDM research and innovation as a means to assist LDCs and others in their conservation efforts."[113] Annual funding was increased to $5 million in 2010, and it is currently expected that the budget will remain at this level in future years.

While open calls for applications will continue, the OPA plans to also make use of targeted Requests for Proposals (RFPs) on specific priority areas for conservation investment.

The OPA recently commissioned a research report to help identify the highest priorities for investment. While this report had not been released at the time of writing, the OPA has publicly identified some possible priority areas that may be the focus of future targeted RFPs:[114]

- Innovative financing;
- Green leases;
- Social marketing;
- Innovation in new construction (residential, commercial, Aboriginal);
- Water and wastewater treatment plant operator training;
- Sustainable communities; and,
- Commercial lighting design in retrofits.

In addition, the CDM Code for Electricity Distributors, released in 2010, has established the OPA as the funder of first resort for LDCs wishing to pilot-test new programs that have yet to be proven cost-effective.[115] It is likely that funding requests from distributors to the OPA for pilot programs will be routed to the Conservation Fund. The Fund's eligibility requirements were modified in 2010 to make LDCs eligible for funding. One LDC-led project has been approved to date. This project, led by Toronto Hydro, is testing the use of ice storage technology to provide cooling and reduce peak demand from air conditioning through a pilot site at the Toronto Zoo.

ECO Comment

The ECO believes that there is a continuing need for a program such as the Conservation Fund to drive improvements in conservation program design and encourage innovation. The Fund provides a mechanism for supporting and testing new ideas from outside sources, complementing the OPA's internal efforts to improve existing programs.

The ECO supports the OPA's intention to use a combination of open calls and targeted RFPs in priority areas, and suggests that the OPA should publicly confirm the Conservation Fund's future priorities, describing how the above priority areas were identified. This would provide advance notice to potential project proponents and help improve the quality of proposals. The OPA should also provide opportunities to suggest additional priority areas, and update priorities as necessary to take advantage of new information, such as any new energy forecasts prepared for the revised IPSP.

> … the OPA and the gas utilities should explore whether there are innovative projects with the potential to deliver both gas and electricity savings that could be jointly funded.

The ECO notes that the targeted approach on priority areas may mean a tighter focus on projects with the potential to deliver electricity savings specifically, as opposed to all forms of energy savings. As natural gas utilities are also able to fund pilot programs and research and development programs, the OPA and the gas utilities should explore whether there are innovative projects with the potential to deliver both gas and electricity savings that could be jointly funded.[116]

Finally, the ECO urges the OPA to continue to improve its efforts to ensure the knowledge gained from funded projects is made available to the broader conservation community. The OPA has taken some positive steps in this direction, such as distributing a newsletter, hosting occasional webinars, and posting project reports on the OPA website. However, some of these efforts appear to have stalled. The Conservation Fund newsletter (*The Incubator)* has not been published since winter 2009/10, and detailed project reports are no longer featured on the OPA website.

Appendix A:
Update of Ontario's Energy Consumption

Current Energy Consumption

Data from the calendar year 2008 is the most current energy consumption data available from Statistics Canada. Using this data, the total energy demand for Ontario was 2,563 petajoules (PJ) and Figure 10 shows how this energy demand was met. The ECO has chosen to examine energy consumption by fuel type because the ECO is responsible for reporting on the progress of activities related to reducing or making more efficient use of the following specific fuels: electricity, natural gas, propane, oil and transportation fuels. Natural gas and transportation fuels accounted for about 70 per cent of the total energy used. Meanwhile, electricity accounted for 20 per cent of Ontario's overall energy demand. Propane, oil and other fuels accounted for almost 10 per cent of Ontario's overall demand. This trend is almost identical to what was observed in 2007, as reported in the ECO's Annual Energy Conservation Progress Report – 2009 (Volume One).

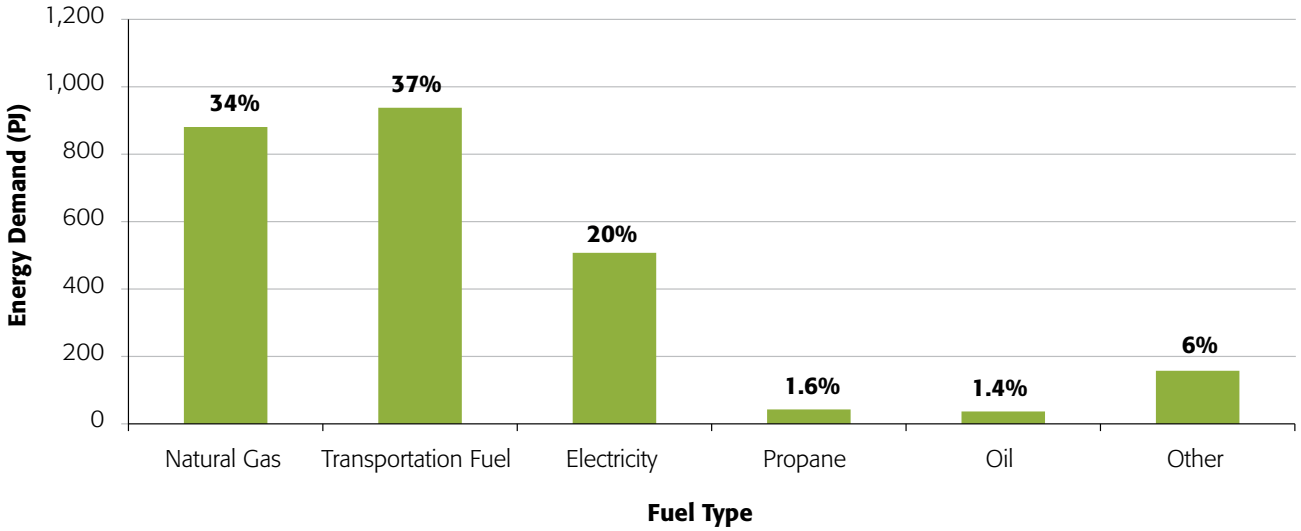

Figure 10: Ontario 2008 Total Final Energy Demand by Fuel Type

Note: In Figure 10 and Table 13, Oil demand is based on kerosene and stove oil, and light fuel oil amounts. Transportation Fuel demand is based on motor gasoline, diesel fuel oil, heavy fuel oil, aviation gasoline, and aviation turbo fuel amounts. Details of demand for Oil and Transportation Fuels come from Table 4-8 of Statistics Canada's 57-003-X report. Other fuel demand is based on Ontario's total final energy demand for 2008.

Source: Statistics Canada – Catalogue No. 57-003-X, *Report on Energy Supply and Demand in Canada 2008 Revision*

Table 13 provides numerical details for Figure 10, along with the demand values for 2007. Overall, the total demand for 2008 was almost 3 per cent less than 2007, while the distribution of demand by fuel type remained largely unchanged.

Table 13: 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

Note: *It is important to recognize that the Independent Electricity System Operator observed a decrease in electricity demand from 2007 to 2008. The Independent Electricity System Operator reports that electricity consumption for 2007 and 2008 was 547 PJ and 534 PJ, respectively. Both agencies monitor electricity usage in Ontario, however, Statistics Canada data has been chosen for this table because it is the only source that provides comprehensive coverage of all major energy sources.

Source: Statistics Canada – Catalogue No. 57-003-X, *Report on Energy Supply and Demand in Canada 2008 Revision*

Important external developments influenced Ontario's economy and, as a result, Ontario's energy demand. For 2008, these included the high Canadian dollar and the U.S. economic slowdown, both of which impacted Ontario's manufacturing sector. During the first five months of 2008, energy demand from industry directly connected to the electrical grid was 3.9 per cent lower than the same time period in 2007.[117]

As discussed in Section 2.4.1, without the province-wide 2010 CDM target, electricity consumption in Ontario would have been higher for 2008 (and 2007), regardless of the recession. For example, in 2008 activities taken to meet the CDM target were responsible for reducing peak electricity demand by 789.3 MW. These policies are resulting in a measurable reduction of electricity use in the province.

Energy Efficiency Trends

As shown in Figure 11, between 1990 and 2008, the energy efficiency of the residential sector improved (i.e., the intensity of energy use decreased). Over this period, natural gas and electricity became the more dominant energy sources, while heating oil use declined. The residential sector uses energy for various purposes and it is beneficial to examine energy in the different areas.

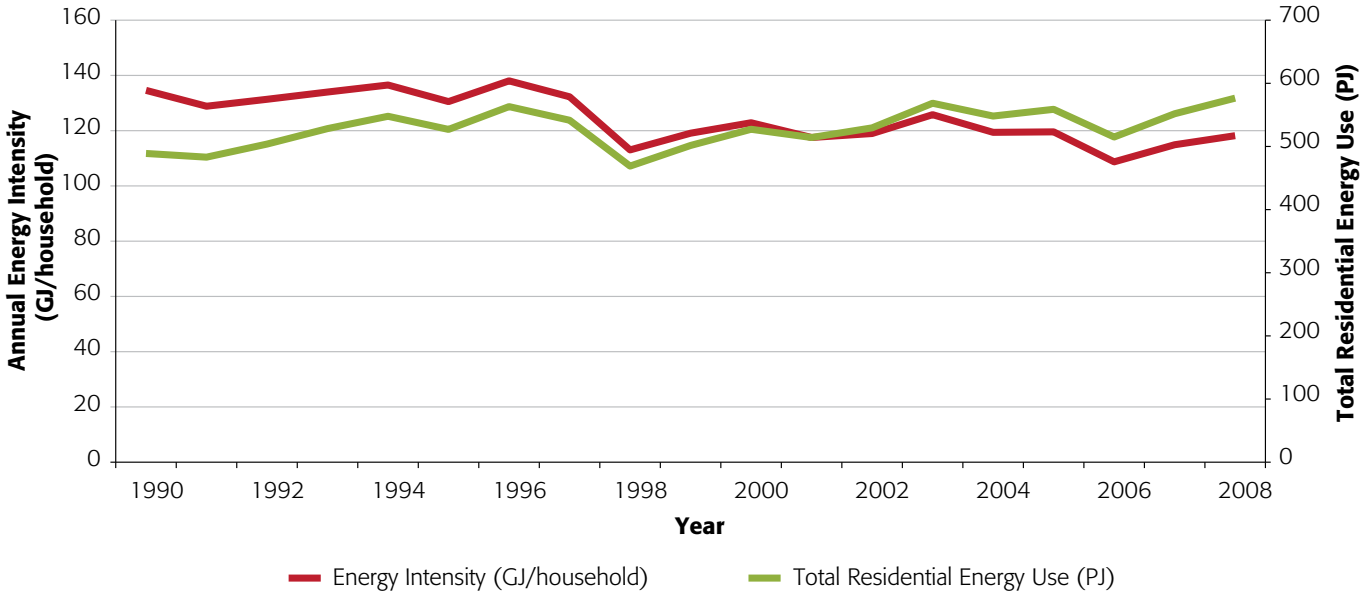

Figure 11: Annual Residential Energy Use and Intensity for Ontario

Source: NRCan Office of Energy Efficiency – Comprehensive Energy Use Database

Space and Water Heating

In Ontario, 81 per cent of all residential energy use was for space and water heating. The energy required to heat all dwellings increased by 19 per cent, from 303 PJ in 1990 to 361 PJ in 2008. Although the 18-year period saw a 16 per cent decline in space heating intensity, which was driven mainly by energy efficiency gains, it did not compensate for the fact that the number of households increased by 33 per cent.

Cooling

Similar to what was observed for space heating, space cooling energy intensity decreased from 1990 to 2008 by 17 per cent, likely due to energy efficiency gains from the increased stock efficiencies for both room and central air conditioning units. Total area of cooled floor space increased from 194 million m^2 in 1990 to 463 million m^2 in 2008, or by almost 140 per cent. The total energy used for space cooling during that same time period rose by 96 per cent.

Appliances

The increased number of minor appliances offset the benefits of the energy efficiency gains across most major appliances.[118] The number of minor appliances increased by 111 per cent from 1990 to 2008, which resulted in an energy demand increase for minor appliances of almost 140 per cent. As a result, there was an overall increase in total appliance energy use of just over 4 per cent from 1990 to 2008.

During that time period, the number of major appliances in Ontario homes increased by 46 per cent; however, these became more energy efficient and, as a result, the overall energy use in major appliances decreased by 22 per cent. Clothes dryers and ranges were the only two major appliances that experienced an increase in energy use (of 19 per cent and 26 per cent increase, respectively).

Appendix B:
Electricity Distributor Conservation Targets

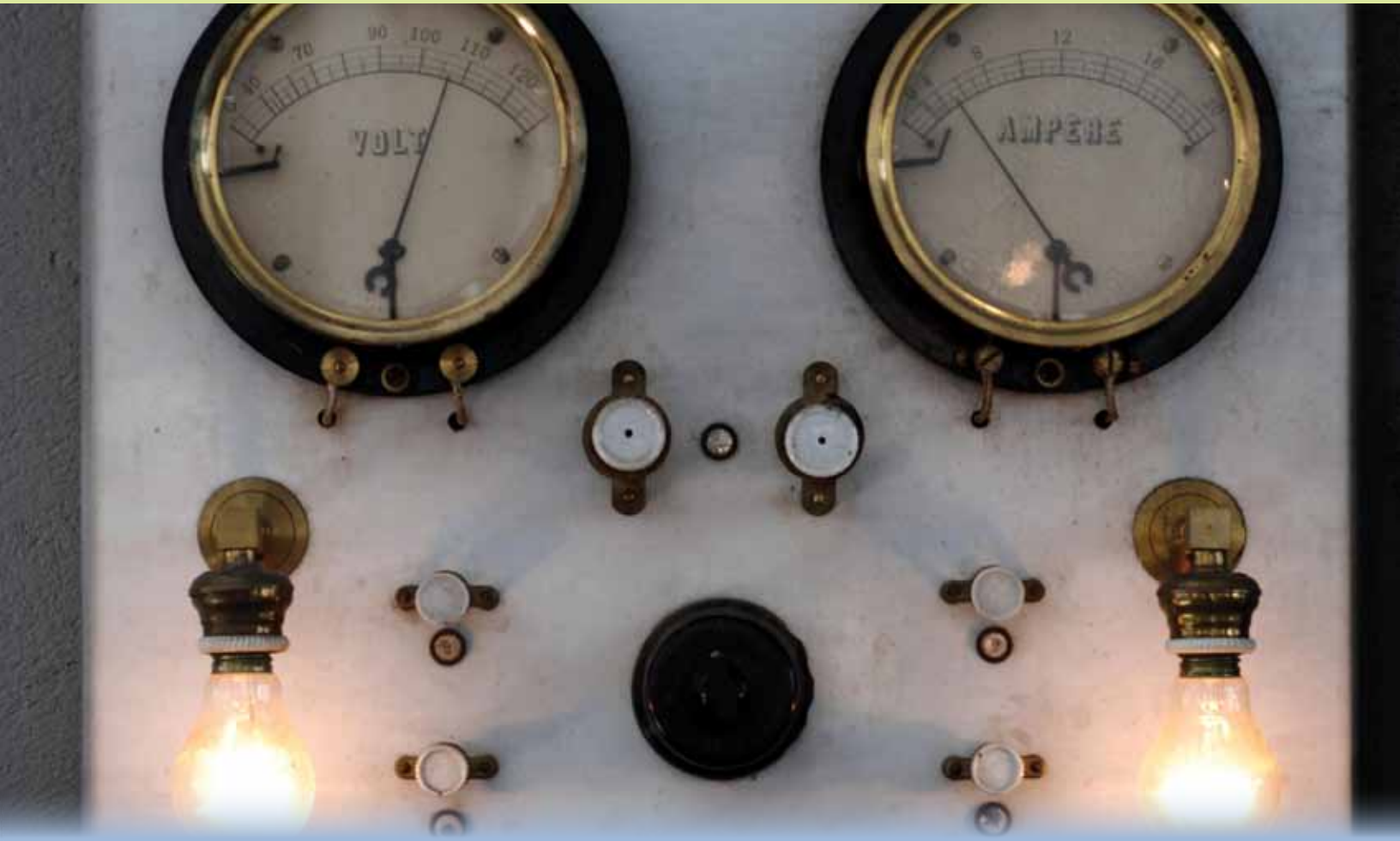

Table 14: Electricity Distributor Conservation Targets

	Local Distribution Company	2014 Summer Peak Demand Target (MW)	Portion of the Aggregate Target (%)	2011-14 Energy Target (GWh)	Portion of the Aggregate Target (%)
1	Algoma Power	1.3	0.10	7.4	0.12
2	Atikokan Hydro	0.2	0.02	1.2	0.02
3	Attawapiskat Power	0.1	0.01	0.3	0.005
4	Bluewater Power Distribution	10.7	0.80	53.7	0.90
5	Brant County Power	3.3	0.25	9.9	0.16
6	Brantford Power	11.4	0.86	48.9	0.82
7	Burlington Hydro	22.0	1.65	82.4	1.37
8	COLLUS Power	3.1	0.24	15.0	0.25
9	Cambridge and North Dumfries Hydro	17.7	1.33	73.7	1.23
10	Canadian Niagara Power	4.1	0.31	15.8	0.26
11	Centre Wellington Hydro	1.6	0.12	7.8	0.13
12	Chapleau Public Utilities	0.2	0.01	1.2	0.02
13	Chatham-Kent Hydro	9.7	0.73	37.3	0.62
14	Clinton Power *	0.3	0.02	1.4	0.02
15	Hydro Embrun	0.3	0.03	1.1	0.02
16	E.L.K. Energy	2.7	0.20	8.3	0.14
17	ENWIN Utilities	26.8	2.02	117.9	1.96
18	Enersource Hydro Mississauga	93.0	6.99	417.2	6.95
19	Erie Thames Powerlines *	4.3	0.32	18.6	0.31
20	Espanola Regional Hydro	0.5	0.04	2.8	0.05
21	Essex Powerlines	7.2	0.54	21.5	0.36
22	Festival Hydro	6.2	0.47	29.3	0.49
23	Fort Albany Power	0.1	0.004	0.2	0.004
24	Fort Frances Power	0.6	0.05	3.6	0.06
25	Greater Sudbury Hydro	8.2	0.62	43.7	0.73
26	Grimsby Power	2.1	0.15	7.8	0.13
27	Guelph Hydro Electric Systems	16.7	1.26	79.5	1.33
28	Haldimand County Hydro	2.9	0.21	13.3	0.22
29	Halton Hills Hydro	6.2	0.46	22.5	0.37
30	Hearst Power Distribution	0.7	0.05	3.9	0.07
31	Horizon Utilities	60.4	4.54	281.4	4.69
32	Hydro 2000	0.2	0.01	1.0	0.02
33	Hydro Hawkesbury	1.8	0.14	9.3	0.15
34	Hydro One Brampton Networks	45.6	3.43	189.5	3.16
35	Hydro One Networks	213.7	16.06	1130.2	18.84
36	Hydro Ottawa	85.3	6.41	374.7	6.25
37	Innisfil Hydro Distribution Systems	2.5	0.19	9.2	0.15
38	Kashechewan Power	0.1	0.01	0.3	0.01
39	Kenora Hydro Electric	0.9	0.06	5.2	0.09
40	Kingston Hydro	6.6	0.50	37.2	0.62
41	Kitchener-Wilmot Hydro	21.6	1.62	90.3	1.50
42	Lakefront Utilities	2.8	0.21	13.6	0.23
43	Lakeland Power Distribution	2.3	0.17	10.2	0.17
44	London Hydro	41.4	3.12	156.6	2.61
45	Middlesex Power Distribution	2.5	0.18	9.3	0.15
46	Midland Power Utility	2.4	0.18	10.8	0.18
47	Milton Hydro Distribution	8.1	0.61	33.5	0.56
48	Newmarket - Tay Power Distribution	8.8	0.66	33.1	0.55
49	Niagara Peninsula Energy	15.5	1.16	58.0	0.97
50	Niagara-on-the-Lake Hydro	2.4	0.18	8.3	0.14
51	Norfolk Power Distribution	4.3	0.32	15.7	0.26

Local Distribution Company		2014 Summer Peak Demand Target (MW)	Portion of the Aggregate Target (%)	2011-14 Energy Target (GWh)	Portion of the Aggregate Target (%)
52	North Bay Hydro Distribution	5.1	0.38	26.1	0.44
53	Northern Ontario Wires	1.1	0.08	5.9	0.10
54	Oakville Hydro Electricity Distribution	20.7	1.56	74.1	1.23
55	Orangeville Hydro	2.8	0.21	11.8	0.20
56	Orillia Power Distribution	3.1	0.23	15.1	0.25
57	Oshawa PUC Networks	12.5	0.94	52.2	0.87
58	Ottawa River Power	1.6	0.12	9.0	0.15
59	PUC Distribution	5.6	0.42	30.8	0.51
60	Parry Sound Power	0.7	0.06	4.2	0.07
61	Peterborough Distribution	8.7	0.66	38.5	0.64
62	Port Colborne Hydro	2.3	0.18	9.3	0.15
63	PowerStream	95.6	7.19	407.3	6.79
64	Renfrew Hydro	1.1	0.08	4.9	0.08
65	Rideau St. Lawrence Distribution	1.2	0.09	5.1	0.09
66	Sioux Lookout Hydro	0.5	0.04	3.3	0.06
67	St. Thomas Energy	3.9	0.30	14.9	0.25
68	Thunder Bay Hydro Electricity Distribution	8.5	0.64	47.4	0.79
69	Tillsonburg Hydro	2.3	0.17	10.3	0.17
70	Toronto Hydro-Electric System	286.3	21.52	1,304.0	21.73
71	Veridian Connections	29.1	2.18	115.7	1.93
72	Wasaga Distribution	1.3	0.10	4.0	0.07
73	Waterloo North Hydro	15.8	1.19	66.5	1.11
74	Welland Hydro-Electric System	5.6	0.42	20.6	0.34
75	Wellington North Power	0.9	0.07	4.5	0.08
76	West Coast Huron Energy	0.9	0.07	8.3	0.14
77	West Perth Power *	0.6	0.05	3.0	0.05
78	Westario Power	4.2	0.32	21.0	0.35
79	Whitby Hydro Electric	10.9	0.82	39.1	0.65
80	Woodstock Hydro Services	4.5	0.34	18.9	0.31
	Total	**1,330**	**100**	**6,000**	**100**

Note: *In December 2010, after CDM targets had been assigned by the OEB, Clinton Power, Erie Thames Powerlines and West Perth Power applied to the OEB to amalgamate as one company. In March 2011, the OEB granted the amalgamation. Erie Thames' electricity distribution licence was amended to incorporate the conservation and demand management targets of West Perth and Clinton Power.

Of all the LDCs, the top five are responsible for 59 per cent of the aggregate energy target and two (Toronto Hydro and Hydro One Networks) account for 41 per cent of the total.

Endnotes

Endnotes

1. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume One): Rethinking Energy Conservation in Ontario* (Toronto, Ontario, 2010), 6, which contains a full description of the reporting mandate and approach.

2. Independent Electricity System Operator, Ontario Demand Peaks, in the database http://www.ieso.ca/imoweb/media/md_peaks.asp (accessed October 11, 2011).

3. Independent Electricity System Operator, Market Data: Hourly Demands, in the database http://www.ieso.ca/imoweb/marketdata/marketData.asp (accessed October 11, 2011).

4. Actual electricity consumption in 2010 was 142 TWh. Without conservation, electricity consumption would be expected to be 159 TWh in 2015. However, because of conservation, actual electricity consumption in 2015 is projected to be only 146 TWh. Sources: Independent Electricity System Operator, "Diverse Supply Mix Provides Flexibility in Operating Ontario's Power System - Integration of Renewable Resources Well Underway", News Release, January 7, 2011, http://ieso.ca/imoweb/media/md_newsitem.asp?newsID=5529; Government of Ontario, *Ontario's Long -Term Energy Plan, Building Our Clean Energy Future* (Toronto, Queen's Printer for Ontario: 2010), 15, 40.

5. Andrew Rudin, "Why We Should Change Our Message and Goal from 'Use Energy Efficiently' to 'Use Less Energy'" (paper presented at the ACEEE 2000 Summer Study on Efficiency and Sustainability, Pacific Grove, California, August 25, 2000). http://www.andrewrudin.com/Files/Papers/changeourmessage.pdf (accessed October 11, 2011).

6. Eric A. Woodroof *et. al.*, "The 'Secret Benefits' From Energy Conservation Contribute Value Worth An 18% Improvement to Energy Savings", *Strategic Planning for Energy and the Environment*, Vol. 28, No. 1 (Spring 2008), 34.

7. Ontario Power Authority, IPSP Stakeholder Consultation Session: Conservation, May 26, 2011, 8. http://www.powerauthority.on.ca/sites/default/files/page/IPSP%20Conservation%20Consultation%20Slide%20Deck.pdf (accessed October 11, 2011).

8. Environmental Commissioner of Ontario, *Annual Energy Conservation Report – 2010 (Volume One): Managing a Complex Energy System*, (Toronto, Ontario: 2011), 40.

9. Enbridge had proposed several new programs (a solar thermal water heater program for social housing units, and an industrial pilot program to subsidize industrial metering and data collection equipment and fund on-site energy engineers for industrial firms), but did not proceed with either of these programs, due to Ontario Energy Board rulings (*EB-2009-0154, Decision and Order; EB-2009-0172, Decision: Return on Equity for Earnings Sharing and DSM Industrial Pilot Program).*

10. TRC savings based on Shared Savings Mechanism results, gas savings based on Lost Revenue Adjustment Mechanism results.

11. Minister of Energy Dwight Duncan, Directive to the Ontario Power Authority, June 13, 2006. http://www.powerauthority.on.ca/sites/default/files/page/1870_IPSP-June13,2006.pdf (accessed September 6, 2011).

12. For a more detailed history, refer to Section 5.1 in the ECO's Annual Energy Conservation Progress Report – 2009 (Volume One).

13. Ontario Power Authority, *2007 Final Conservation Results, 2009,* 4.

14. Ontario Power Authority, *Integrated Power System Plan, version 080904, August 29, 2008.* Exhibit D, Tab 4, Schedule 1, page 15 of 25. http://www.powerauthority.on.ca/sites/default/files/page/4870_D-4-1_corrected_071019.pdf (accessed September 6, 2011).

15. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 23, 2011.

    Ministry of Energy, information provided to the ECO in response to ECO inquiry, November 10, 2011.

16. The OPA's new definition of customer-based generation does not include renewable resources procured through the FIT and microFIT programs, as these are considered supply resources, not conservation.

17. Ontario Power Authority, *Evaluation Summary: 2010 Residential and Small Commercial Demand Response Initiative and Hydro Ottawa peaksaver® Small Commercial Pilot*, 2011, 2.

18. Freeman, Sullivan & Co., *2010 Impact Evaluation of Ontario Power Authority's Commercial and Industrial Demand Response Programs September 2011,* 8.

19. Freeman, Sullivan & Co., *2010 Impact Evaluation of Ontario Power Authority's Commercial and Industrial Demand Response Programs September 2011,* 7.

    264 MW is a combination of the OPA's Business DR-3 and OPA's Industrial DR-3 programs (Industrial DR-3 is 249.6 MW of peak demand and Business is 14.7 MW of peak demand).

20. Ontario Power Authority, personal correspondence with ECO staff, September 27, 2011.
21. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 23, 2011.
22. Government of Ontario, *Ontario's Long-Term Energy Plan, Building Our Clean Energy Future* (Toronto, Queen's Printer for Ontario: 2010), 38.
23. Ontario Ministry of Government Services, "Backgrounder: Energy Conservation in Ontario Government Operations; Statement to the House by the Honourable Gerry Phillips, Chair of Management Board of Cabinet Energy Conservation in the OPS," News Release, April 1, 2004.
24. Government of Ontario, *Go Green: Ontario's Action Plan on Climate Change August 2007* (Toronto, Queen's Printer for Ontario: 2009), 31.
25. Ministry of Energy and Infrastructure, information provided to the ECO in response to ECO inquiry, August 9, 2010.
26. Chief Energy Conservation Officer, *Our Conservation Challenge 2005 Annual Report*, Ontario Power Authority, 2005, 35.
27. Chief Energy Conservation Officer, *Our Conservation Challenge 2005 Annual Report,* Ontario Power Authority, 2005, 36.
28. Custodial ministries include: Ministry of Education, Ministry of Health, Ministry of Transportation, Ministry of Natural Resources, Ministry of Community and Social Services, Ministry of Children and Youth Services, Ministry of Community Safety and Correctional Services.
29. For more details, refer to Section 3.4 in the ECO's *Annual Energy Conservation Progress Report – 2009 (Volume Two)*.
30. Ministry of Infrastructure, information provided to the ECO in response to ECO inquiry, September 20, 2011.
31. Government of Ontario, "Working with Ontarians to Save Energy, Money and the Environment," http://news.ontario.ca/opo/en/2004/04/mcguinty-government-building-culture-of-conservation.html (accessed September 26, 2011).
32. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume Two): Re-thinking Energy Conservation in Ontario – Results* (Toronto, Ontario: 2010), 20.
33. Advanced metering infrastructure refers to more than just the smart meter. It is the term used to describe all of the hardware, software and connectivity required for a fully functioning smart metering system. It includes the Advanced Metering Regional Collector (which gathers the meter reading in a defined area), Advanced Metering Control Computer (which retrieves and temporarily stores meter readings from the regional collector before they are transmitted to the MDM/R), web presentment (preliminary customer usage data available on a secure website), and the data communications infrastructure such as repeaters (wireless range extenders).
34. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume Two): Re-thinking Energy Conservation in Ontario – Results* (Toronto, Ontario: 2010), 20.
35. Ontario Energy Board, *Monitoring Report: Smart Meter Deployment and TOU Pricing – June 2011,* August 2, 2011.
36. The Meter Data Management Repository (MDM/R) processes meter reads and provides LDCs with hourly billing data that aligns with the three time-of-use rates.
37. Fort Albany Power, Attawapiskat Power, and Kashechewan Power Corporation do not have a mandatory TOU date. These distributors serve remote First Nation communities and are the only non-profit, federally-incorporated electricity distributors.
38. The distributors with all eligible customers on Time-of-Use (TOU) pricing are: Chatham-Kent Hydro Inc., Halton Hills Hydro Inc., Lakeland Power Distribution Ltd., Middlesex Power Distribution Corporation, Midland Power Utility Corporation, and Milton Hydro Distribution. Distributors with TOU pricing completed for all customers except those temporarily exempted are: Horizon Utilities Corporation, Lakefront Utilities Inc., Orillia Power Distribution Company, and Oshawa PUC Networks Inc.
39. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, October 11, 2011.
40. Ontario Energy Board, letter, March 31, 2011. "Re: Review of the Structure and Price Setting Methodology for Time-Of-Use Prices; Staff Report to the Board. Board File No.: EB-2010-0364".
41. Stakeholders include the Ministry of Energy, the Ontario Energy Board, Hydro One and members from an impending Evaluation Committee.
42. Ahmad Faruqui and Sane Sergici, "Household Response to Dynamic Pricing of Electricity: A Survey of 15 Experiments," *Journal of Regulatory Economics 38* (2010): 221.
43. Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2010 (Volume One):*

Managing a Complex Energy System (Toronto, Ontario: 2010), 26.

44. Ahmad Faruqui and Sane Sergici, "Household Response to Dynamic Pricing of Electricity: A Survey of 15 Experiments," *Journal of Regulatory Economics 38* (2010), and Guy R. Newsham and Brent G. Bowker, *The Effect of Utility Time-Varying Pricing and Load Control Strategies on Residential Summer Peak Electricity Use: A Review,* National Research Council Canada – Institute for Research in Construction, (Ottawa, Ontario: June 2010).

45. Demand savings (measured in watts or multiples of watts, e.g., megawatts) are also referred to as peak savings and capacity savings. Energy savings (measured in watt-hours or multiples of watt-hours) are also referred to as consumption savings.

46. Minister of Energy Brad Duguid, Directive to the Ontario Energy Board, March 31, 2010. http://www.ontarioenergyboard.ca/OEB/_Documents/GEGEA%20Implementation%20and%20Readiness/minister_directive_20100423.pdf (accessed September 6, 2011).

47. The residential sector will provide 19 per cent of the aggregate energy target (1,150 GWh) with the balance (4,850 GWh) coming from other end users.

48. Minister of Energy Brad Duguid, Directive to the Ontario Power Authority, April 23, 2010. http://www.powerauthority.on.ca/sites/default/files/page/16600_MEI_Directive_CDM_Initiatives_under_GEA_Apr_23_10.pdf (accessed September 6, 2011).

49. LDCs provided useful guidance on the methodology for determining and apportioning peak demand. To allocate the share of the peak demand target, the sum of an LDC's demand at the top 10 system peak hours in 2008 and 2009 was divided by the sum of demand of all the LDCs during the 10 hours of the same years. As there is no available data of each LDC's demand at the times that system peak occurs, and as peak demand on individual LDC systems does not necessarily coincide with occurrence of the system peak, the OPA used Independent Electricity System Operator data for all delivery points on the provincial grid to develop the allocation methodology. The peak hours were also aligned with the evaluation methodology and protocol that the OPA uses to measure conservation savings for province-wide programs that LDCs contract with the OPA to deliver, as well as programs LDCs will deliver themselves, to ensure that the demand savings from the conservation programs are coincident (i.e., coincide with the top hours where demand on the electricity system peaks) and that the programs will actually provide demand reductions at peak.

    To allocate the consumption savings, an LDC's 2008 residential customers' consumption was added to its non-residential consumption and divided by the 2008 residential and non-residential consumption amount of all LDCs with CDM targets. Conservation potential and load growth was assumed to be the same across all LDCs. CDM activity prior to 2011 is taken into account in the target allocation methodology inasmuch as the target amount is based on historical data, and LDCs that were active and successful prior to 2011 would have a lower portion of total province-wide consumption on which their target is based.

50. For example, this would include kilowatt-hours of reduced consumption from replacing old appliances with new ones. Certain assumptions about the technologies implemented – like efficiency performance, market penetration rates, the duration of time that savings will be delivered – are made to calculate the expected savings, and these have a dominant influence on the amount of potential conservation. Demand response (DR), sometimes referred to as demand management, is a type of conservation program, particularly important for peak reduction. Savings from DR programs are incorporated into the OPA's planning for resource requirements. In the projection of future electricity demand, DR programs are treated as a supply resource that will be reacquired each year and contribute to the resources available to meet the gross demand curve. Although it is treated as a supply resource, like other conservation, DR displaces supply from new generating stations that would otherwise need to be built.

51. The IPSP forecast of achievable conservation in the near term (2008-13) was revised and updated based on the performance of programs to 2009; the conservation forecast was adjusted down to reflect assumed slower economic growth during the 2011-2014 target period; and, conservation savings from time-of-use rates, non-OPA programs and customer-based generation (excluding the FIT and microFIT programs) were also forecast. A forecast of savings for the year 2014 was developed and added as an incremental increased amount of savings based on savings from program performance in 2013. The savings were developed in a bottom-up manner by program (i.e., not by LDC or geographic area).

52. Ontario Power Authority, "The Establishment of LDC Conservation Targets Under the Green Energy Act – Target setting and allocation methodology advice from the OPA", 14, contained in Ontario Energy Board, *Electricity Conservation and Demand Management, EB-2010-0216*, Letter dated June 22, 2010.

http://www.ontarioenergyboard.ca/OEB/_Documents/EB-2010-0216/Board_ltr_CDM_targets_20100622.pdf (accessed September 26, 2011).

53. The need to adjust some individual LDC targets (e.g., Hydro One) because of embedded distributors was resolved. Dissatisfaction with several assumptions made to set target shares – uniform load growth across all distributors, a top-down approach and the use of customer class rather than number of customers – was expressed by some LDCs. Utilities cautioned that these were fairly coarse measures to determine distributor-specific targets.

54. In 1998, for the first time in Ontario's history, peak demand occurred in summer because of demand for air conditioning in southern Ontario, and the province has remained summer peaking (not weather normalized) in each year since then except 2000 and 2004. System-wide peak does not refer to the peak demand on an individual LDC`s distribution grid. Many LDCs still experience peak demand on their individual grid in winter because of the nature of their load (i.e., demand for heat during winter and less demand for summer air conditioning).

55. Ministry of Energy, e-mail message to ECO staff, September 30, 2011.

56. Minister of Energy Brad Duguid, Directive to the Ontario Power Authority, April 23, 2010. http://www.powerauthority.on.ca/sites/default/files/page/16600_MEI_Directive_CDM_Initiatives_under_GEA_Apr_23_10.pdf (accessed September 6, 2011).

57. The EM&V protocols provide five methods for LDCs to measure peak reduction from energy efficiency programs. Two direct methods involve taking actual hourly measurement of demand reduction (or alternatively a sample of measurements and inferring data from non-sampled installations) before and after the installation of conservation measures. The average of the maximum demand reduction achieved during the peak hours of 1 p.m. to 7 p.m. weekdays in the months of June, July and August is then calculated. LDCs can also use a weighted average of the maximum demand reduction, June, July August weekdays 1 p.m. to 7 p.m. (weighting June 30%, July 39%, August 31%). This methodology may be more suitable for weather-sensitive conservation measures or facilities with variable load shapes.

    Conservation actions that reduce demand outside of these monthly hours are not counted as contributing to achieving the system-wide peak demand target because they do not coincide with the time that system peak occurs. Savings from winter programs are counted toward an LDC's energy savings target.

    Three indirect methods to calculate demand savings from efficiency programs are available and LDCs will likely use one of these methods as they are less onerous to perform. Distributors can allocate savings from installed measures into the peak hours using: existing data on average load profiles of measures based on results from existing OPA EM&V studies; or, results from energy simulation models; or, by estimating peak savings for installed measures based on data in the OPA's Measures and Assumptions list. For an example of existing EM&V reports published by the OPA, see the Cadmus Group, "2008 and 2009 Great Refrigerator Roundup Program – Impact Evaluation", June 2010. http://www.powerauthority.on.ca/sites/default/files/new_files/2009%20Great%20Refrigerator%20Roundup%20Program%20Evaluation.pdf (accessed October 9, 2011).

    A different set of EM&V protocols is used to calculate peak demand savings from demand response programs. For a description of the methodologies to measure demand reduction from energy efficiency and demand response programs, see: Ontario Power Authority, *EM&V Protocols and Requirements 2011-2014* (2011), particularly, *STG-10 Demand Savings Guidelines*, 101-106 and *STG-16 Demand Savings Guidelines*, *Protocols for Estimating Load Impacts Associated with Demand Response Resources in Ontario* (2009), 125. http://www.powerauthority.on.ca/sites/default/files/20110406%20-%20EM&V%20Protocols%20and%20Requirements.pdf (accessed September 3, 2011).

58. An application made by Hydro One was determined by the OEB to be incomplete, and the Board ordered Hydro One to resubmit. Toronto Hydro's application was approved in a reduced scope with consent given for only two of eight programs and only on a "test" basis. The rationale for the decision varied depending on the program, but the OEB decided several of the proposed programs were duplicative of OPA-Contracted programs.

59. Ontario Power Authority, *Tier 1 Conservation Programs Webinar Series: 2011 Industrial, Commercial/Institutional and Consumer Program Design,* July 29, 2010, http://sn.adobeconnect.com/p59683322/?launcher=false&fcsContent=true&pbMode=normal (accessed September 19, 2011).

60. Ministry of Energy, e-mail message to ECO staff, September 30, 2011.

61. Ministry of Energy, e-mail message to ECO staff, October 18, 2011.

62. Ontario Energy Board, *Conservation and Demand Management Code for Electricity Distributors, EB-2010-0215*, September 16, 2010. See particularly Electricity

Distributors' Association and Coalition of Large Distributors submissions.

63. Ministry of Energy, personal correspondence with ECO staff, September 27, 2011.

64. For further information, see *Annual Energy Conservation Progress Report - 2009 (Volume One): Rethinking Energy Conservation in Ontario*, Section 5.1, page 22-23 of the ECO's *2003/2004 Annual Report*, and subsequent Annual Reports.

65. Minister of Energy Brad Duguid, Directive to the Ontario Power Authority, February 17, 2011. http://powerauthority.on.ca/sites/default/files/new_files/IPSP%20directive%2020110217.pdf (accessed September 8, 2011).

66. Ontario Power Authority, *IPSP 2011 Stakeholder Consultation Session, May 26, 2011*. http://www.powerauthority.on.ca/sites/default/files/page/IPSP%20Conservation%20Consultation%20Slide%20Deck.pdf (accessed September 8, 2011).

    The OPA advised stakeholders, in IPSP consultations started in May 2011, that it was not seeking input on the Supply Mix Directive and LTEP, which contain the targets, since these had already been decided.

67. ICF Marbek, *Natural Gas Energy Efficiency Potential, Residential, Commercial and Industrial Sectors. Summary Report – Update 2011* (2011, prepared for Union Gas), 8, 28; Marbek Resource Consultants Ltd., *Natural Gas Energy Efficiency Potential: Update 2008, Residential, Commercial and Industrial Sectors Synthesis Report* (2009, prepared for Enbridge Gas Distribution), 10, 57. These reports estimate that the residential, commercial and industrial sectors in Union's service territory consumed 10,457 million m^3 of natural gas in 2007, with 5,465 million m^3 of this being consumed by the industrial sector. In Enbridge's service territory, the industrial sector consumed 2,530 million m^3 of natural gas in 2007, out of a total consumption of 11,254 million m^3 by the residential, commercial and industrial sectors. Consumers using natural gas as a feedstock or for power generation are not included in these figures.

68. Canadian Manufacturers and Exporters, *Advancing Opportunities in Energy Management in Ontario Industrial and Manufacturing Sector* (2010).

69. ICF Marbek, *Natural Gas Energy Efficiency Potential, Residential, Commercial and Industrial Sectors. Summary Report – Update 2011* (2011), 28.

70. Union Gas, information provided to the ECO in response to ECO inquiry, September 23, 2011.

71. Distribution Contract customers are customers with annual gas consumption of more than 700,000 m^3 that have entered into a contract with Union Gas for delivery of a specified volume of gas (as opposed to General Service customers, where no contract is required).

72. Based on data (net TRC divided by sectoral program budget) from Union and Enbridge 2009 annual DSM reports. These values are slight overestimates of net benefits, as they do not include fixed overhead costs (which are not reported by utilities on a sectoral basis). Results for Union are for all Distribution Contract customers.

73. Nexant, *Independent Audit of 2010 DSM Program Results, Prepared for Enbridge Gas Distribution* (2011), 41.

74. These measurements of the cost-effectiveness of industrial conservation programs reduce the claimed benefits of a utility program to correct for the fact that some percentage of the energy efficiency investments undertaken by firms and supported by utilities would have been undertaken even in the absence of any utility incentives. These participants are known as free riders. The free-ridership rate used for industrial conservation programs is 50 per cent for Enbridge and 54 per cent for Union Gas.

75. Rate classes classify gas customers based on parameters such as their total gas consumption, their maximum daily demand, and the source of their gas supply. They do not correspond exactly with sectoral classifications (commercial, residential, industrial).

76. Industrial Gas User's Association, *Demand Side Management (DSM) Guidelines for Natural Gas Utilities, Issues for Further Comment, Comments of Industrial Gas User's Association (IGUA)* (2011).

77. Canadian Manufacturers and Exporters, *Re: Demand-Side Management ("DSM") Guidelines for Natural Gas Utilities, Issues for Further Comment, Board File No. EB-2008-0346* (2011).

78. Canadian Manufacturers and Exporters, *Re: Demand-Side Management ("DSM") Guidelines for Natural Gas Utilities, Issues for Further Comment, Board File No. EB-2008-0346* (2011), 3.

79. Ontario Energy Board, *Demand-Side Management Guidelines for Natural Gas Utilities, EB-2008-0346* (2011).

80. Union Gas, information provided to the ECO in response to ECO inquiry, September 23, 2011. Union has 71 T1 and 100 customers, primarily industrial customers, but also some greenhouses, hospitals, and power generators.

81. Enbridge Gas Distribution, Evidence in hearing EB-2011-0008, Exhibit B, Tab 3, Schedule 4 (2011).

82. Union Gas, *Proposed 2012-2014 DSM Plan, EB-2011-0327* (2011).

83. Union Gas, *Proposed 2012-2014 DSM Plan, EB-2011-0327,* Exhibit A, Schedule 1 (2011).

84. Union Gas, "Union Gas Multi-Year DSM Plan Consultative Meeting", last unnumbered slide (presented at Union Gas Multi-Year DSM Plan Consultative Meeting, Toronto, August 11, 2011).

85. Enbridge Gas Distribution, *2012-2014 Plan Overview, EB-2011-0295* (2011).

86. For example, Puget Sound Energy's self-direct program for industrial electricity consumers. See American Council For an Energy-Efficient Economy, *Follow the Leaders: Improving Large Customer Self-Direct Programs* (2011), 14.

87. Union Gas, *Proposed 2012-2014 DSM Plan, EB-2011-0327,* Exhibit A, Schedule 1, estimates the rate impact of 2012 Union Gas conservation programs (including performance incentives paid to Union Gas) on T1 and 100 customers to be 0.07 cents/cubic metre of natural gas consumed. British Columbia's carbon tax as of July 1, 2011 is 124.7 cents/gigajoule (4.8 cents/cubic metre of natural gas).

88. Ontario Power Authority, *Supply Mix Analysis Report, Volume 2* (2005), 153-154.

89. Ontario Power Authority, *Integrated Power System Plan, EB-2007-0707,* Exhibit D-4-1 (2007), 10.

90. Ontario Power Authority, "2011-2014 Commercial & Institutional Province-Wide Program", 17 (presented on April 21, 2010).

91. The two directives were *Re: Toronto Reliability Supply and Conservation Initiative* (February 10, 2006) and *Re: Conservation and Demand-Side Management Initiatives (Commercial Buildings and MUSH Sector)* (March 10, 2006). These directed the OPA to seek up to 300 MW of demand-side management in the Toronto area by 2010, and up to 150 MW of conservation through initiatives for the commercial and institutional sector (C&I), respectively. The former directive did not explicitly mention the C&I sector, however, all three Toronto-area C&I retrofit programs (BOMA, BBP-EB, and BIP) were procured under the authority of this directive.

92. Beginning in 2008, the OPA also offered the Power Savings Blitz program to small businesses (those with less than 50 kW demand). This program provided up to $1,000 in energy efficient lighting retrofits at no cost to the customer.

93. Research Into Action, *Cross-Cutting Commercial and Institutional (C&I) Retrofit Incentive Initiatives 2009-2010 Evaluation Report* (2011), 2; Summit Blue Consulting LLC, *Impact & Process Evaluation: Cross-Cutting Commercial & Institutional Retrofit Incentive Programs* (2010), 7.

94. Summit Blue Consulting LLC, *Impact & Process Evaluation: Cross-Cutting Commercial & Institutional Retrofit Incentive Programs* (2010), 123.

95. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, October 11, 2011. Data for the 2007 savings from the Business Incentive Program comes from Toronto Hydro-Electric System Limited, *Conservation and Demand Management Annual Report 2007* (2008), 10. Gross savings for the BIP in 2007 are not known, so net savings are used in Figures 7 and 8.

96. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, October 11, 2011.

97. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, October 11, 2011.

    For levelized costs of generation resources, see Ontario Power Authority, "2011 IPSP Stakeholder Consultation Supply Presentation", 38-39 (presented on May 31, 2011). The levelized cost is the average cost per unit of energy generated (or saved) over the lifetime of an energy supply source or conservation measure. The levelized costs for the commercial and institutional retrofit programs are calculated from the program administrator's perspective, and include program administration costs and incentives to participants, but not the additional incremental costs paid by a customer for an energy efficiency measure. An alternative approach would be to measure the cost from a societal perspective, including incremental customer costs (but not incentive costs, as these are seen in this view as a transfer between parties with no net cost).

    There is no consensus as to which perspective is more appropriate to take when comparing the cost of supply and conservation resources. This issue often appears in a related form - debate over which cost-effectiveness test is most appropriate for a utility to use when assessing whether or not to deliver a conservation program. For a recent view that argues in favour of using the program administrator perspective, see Chris Neme and Marty Kushler, "Is it Time to Ditch the TRC? Examining Concerns with Current Practice in Benefit-Cost Analysis" (paper presented at 2010 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, California, August 15-20, 2010).

98. Ontario Power Authority, *2011-2014 OPA-Contracted Province-Wide Programs: Commercial and Institutional Program Summary Guide* (2011).

99. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 23, 2011.

100. Changes to regulations made under Canada's *Energy Efficiency Act* have restricted the sale of inefficient T12 magnetic ballasts, and proposed future changes would restrict the sale of most T12 lamps, essentially forcing building owners to convert to higher efficiency fixtures as lamps fail (typically within a few years). Source: Research Into Action, *Cross-Cutting Commercial and Institutional (C&I) Retrofit Incentive Initiatives 2009-2010 Evaluation Report* (2011), 44.

101. American Council for an Energy-Efficient Economy, *Comprehensive Commercial Retrofit Programs: a Review of Activity and Opportunities* (2005), 4.

102. Ontario Energy Board, *EB-2011-0011, Decision and Order* (2011).

103. *Master Program Agreement Between the Ontario Power Authority and City of Toronto* (2007), Article 6.1.

104. Research Into Action, *Cross-Cutting Commercial and Institutional (C&I) Retrofit Incentive Initiatives 2009-2010 Evaluation Report* (2011), 58.

105. *Master CDM Program Agreement Between the Ontario Power Authority and {LDC}* (2011), Article 6.1.

106. Ontario Power Authority, *The Conservation Fund Program Rules* (2011).

107. Costs that are eligible for project support by the Conservation Fund are those directly related to the design, development, demonstration, installation, implementation, testing, measurement and performance verification of the project.

108. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, October 11, 2011.

109. Colleges spend $48 million annually and universities spent an average of $188 million from 2005/06 – 2009/10.

    Spencer Wood, Humber College, "Colleges Ontario: A province wide approach to energy management" (presented at Energy Conservation Initiatives in the Broader Public Sector webinar hosted by the Ontario Power Authority, February 2, 2010).

    Council of Financial Officers – Universities of Ontario, COFO-UO Financial Report of Ontario Universities, 2005/06 to 2008/09 Fiscal Year, http://couprod.tgtsolutions.com:94/customized-reports.aspx (accessed September 12, 2011).

110. Ontario Power Authority, information provided to the ECO in response to ECO inquiry, September 23, 2011.

111. Colleges Ontario, *Colleges Driving a Sustainable Future: New Careers for a Clean Economy* (2010).

112. Ontario Power Authority, "February 2, 2010 - Energy Conservation Initiatives in the Broader Public Sector" http://www.powerauthority.on.ca/cfund/february-2-2010-energy-conservation-initiatives-broader-public-sector (accessed October 12, 2011).

113. Minister of Energy and Infrastructure Brad Duguid, Directive to the Ontario Power Authority, April 23, 2010. http://www.powerauthority.on.ca/sites/default/files/page/16600_MEI_Directive_CDM_Initiatives_under_GEA_Apr_23_10.pdf (accessed September 12, 2011).

114. Ontario Power Authority, "IPSP 2011 Stakeholder Consultation: Conservation", 61 (presented May 26, 2011).

115. If the OPA turns down the request for funding, the LDC may then apply to the OEB, asking the OEB to approve recovery of funds for the program. Several stakeholders opposed the requirement to first seek funding approval from the OPA for pilot programs.

116. Within the City of Toronto, the Toronto Atmospheric Fund can serve as another possible funding source for conservation initiatives involving other fuels, as it has recently determined to focus its incubation initiatives on projects that will reduce emissions from transportation fuels and natural gas, instead of electricity (Toronto Atmospheric Fund, *Unleashing the Power of Efficiency: TAF Strategic Plan 2011-2014*, 3).

117. Independent Electricity System Operator, "18-Month Outlook: An Assessment of the Reliability of the Ontario Electricity System From July 2008 to December 2009," June 27, 2008, 9. Available from: http://www.ieso.ca/imoweb/pubs/marketReports/18MonthOutlook_2008jun.pdf

118. A major appliance is considered a: refrigerator, freezer, dishwasher, clothes washer, clothes dryer, or range.

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