







Re-thinking Energy Conservation in Ontario – Results

Annual Energy Conservation Progress Report – 2009 (Volume Two)

E C O
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Environmental
Commissioner
of Ontario

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of Ontario

Commissaire à
l'environment
de l'Ontario

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November 2010

The Honourable Steve Peters
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 Volume Two of the Annual Energy Conservation Progress Report - 2009 of the Environmental Commissioner of Ontario for your submission to the Legislative Assembly of Ontario.

The Annual Energy Conservation Progress Report - 2009 is my independent review of the Ontario Government's progress in conserving energy, and will be 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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Abbreviations and Acronyms Used in the Report

AC	Air Conditioning
AFV	Alternative Fuel Vehicle
CDM	Conservation and Demand Management
COF	Council of the Federation
CO_2	Carbon Dioxide
DR	Demand Response
DSM	Demand-Side Management
EAC	Evaluation and Audit Committee
EBR	*Environmental Bill of Rights, 1993*
ECO	Environmental Commissioner of Ontario
EDU	Ministry of Education
ENG	Ministry of Energy
EVs	Electric Vehicles
FIT	Feed-in Tariff
GCVP	Green Commercial Vehicle Program
GGTF	Green Government Task Force
GHG	Greenhouse Gas
GJ	gigajoule
GWh	gigawatt-hour
HESP	Home Energy Savings Program
HOV	High Occupancy Vehicle
HST	Harmonized Sales Tax
ICI	Industrial, Commercial and Institutional
IESO	Independent Electricity System Operator
IPSP	Integrated Power System Plan
kW	kilowatt
kWh	kilowatt-hour
LAS	Local Authority Services
LCFS	Low Carbon Fuel Standard
LDC	Local Distribution Company
M	Million
m^2	Square Metre
m^3	Cubic Metre
MDM/R	Meter Data Management and Repository
MECF	Municipal Eco Challenge Fund
MEDT	Ministry of Economic Development and Trade
MEI	Ministry of Energy and Infrastructure
MGS	Ministry of Government Services
microFIT	Micro Feed-in Tariff
MOE	Ministry of the Environment
MOI	Ministry of Infrastructure
MOU	Memorandum of Understanding
MTO	Ministry of Transportation
MW	megawatt
MWh	megawatt-hour
NRCan	Natural Resources Canada
OEB	Ontario Energy Board
OPA	Ontario Power Authority
OPS	Ontario Public Service
ORC	Ontario Realty Corporation
OSTHI	Ontario Solar Thermal Heating Incentive
PV	Photovoltaic
RESOP	Renewable Energy Standard Offer Program
RPP	Regulated Price Plan
RST	Retail Sales Tax
TOU	Time-of-Use
TRC	Total Resource Cost
UCD	Utility Consumption Database
W	watt
WCI	Western Climate Initiative

Guide to Energy Units

International System of Units (SI) Prefixes for Units of Measurement

Prefix	Quantity
kilo (k)	Thousand (1,000 or 10^3)
mega (M)	Million (1,000,000 or 10^6)
giga (G)	Billion (1,000,000,000 or 10^9)
tera (T)	Trillion (1,000,000,000,000 or 10^{12})
peta (P)	Quadrillion (1,000,000,000,000,000 or 10^{15})

Units of Power

Power consumed or produced	Typical Activity
15 W	Compact fluorescent light bulb
1,000 W (1 kW)	Microwave oven
10,000 W (10 kW)	Total household electricity demand
80,000 W (80 kW)	Car traveling at highway speed
2,000,000 W (2 MW)	Large wind turbine
500,000,000 W (500 MW)	Large thermal power plant unit (coal, nuclear, natural gas)
20,000,000,000 W (20,000 MW)	Typical average electricity demand for province of Ontario

The most common unit for measuring power, particularly in the electricity world, is the **watt** (W). One watt is equal to using one joule of energy in one second.

Consumption of energy is a measurement of power supplied over time. This is useful to remember when understanding the difference between a power unit, like a kilowatt (kW) and an energy unit, like a kilowatt-hour (kWh).

To convert from power to energy, multiply an appliance's power consumption by the amount of time it runs (e.g., running a 1.5 kilowatt oven for three hours uses 4.5 kilowatt-hours of electrical energy).

Gigajoule Equivalents

Fuel	Units Fuel is Sold In	Equivalent GJ
Electricity	Kilowatt-hours (kWh)	1 GJ = 277.70 kWh
Natural Gas	Cubic metres (m^3)	1 GJ = 26.86 m^3
Oil (heating)	Litres (L)	1 GJ = 29.76 L
Propane (heating)	Litres (L)	1 GJ = 39.20 L

A gigajoule (GJ) is a metric term used for measuring energy use, and can be used to measure the amount of energy available in a given quantity of different fuels or energy sources. It enables comparisons to be made between the fuels using a single common unit of measurement. It also enables measurement of the total amount of energy used in a given application where several types of fuel are used.

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Executive Summary

This is the second volume of the Annual Energy Conservation Report – 2009. It reviews a representative selection of conservation initiatives, and measures progress on achieving several targets identified by the Environmental Commissioner of Ontario (ECO) as guiding energy conservation in Ontario.

Because the focus of this volume is data and results, the key theme of the report is the importance of conservation program evaluation, including measurement and verification of claimed energy savings. Our report notes the robust evaluation frameworks developed by natural gas utilities and the Ontario Power Authority (OPA) for gas and electricity programs, respectively. The ECO notes the need for the government to evaluate the conservation programs that it delivers. Evaluation of results can be used to assess energy savings, improve program design, and demonstrate the value of conservation to both the public and decision-makers.

We provide an update on progress in meeting government-established targets for energy conservation and conservation targets for natural gas utilities.

Our report notes progress made in achieving the provincial electricity reduction target of 2,700 megawatts (MW) in peak demand by 2010. The OPA cautions that the 2010 target is unlikely to be met mainly because the economic downturn has affected industries' ability to practice conservation. The ECO is concerned that the savings for one of the OPA's demand response programs are overstated, and that savings for some older conservation initiatives will not persist into 2010. Correcting for these issues would lower the amount of electricity savings that the OPA claims to have achieved, making it even more unlikely that the 2010 target will be reached.

In terms of other targets, progress varies. Ontario met its target for installing smart meters and transitioning to time-of-use electricity prices, which is a commendable accomplishment. Work on meeting the government's target of a 20 per cent electricity reduction in its own operations continues, and information on the progress made is expected later this year. There is little identified progress on energy efficiency targets that Ontario committed to with the Council of the Federation, or on meeting the commitment to implement a low carbon fuel standard. The 2007 target for ethanol blended into gasoline was achieved. Meanwhile, efforts toward increasing market penetration of electric vehicles are at an early stage.

Our report also notes that both gas utilities met and exceeded their conservation targets. We urge that conservation spending by gas utilities be expanded, given the very high net benefits per dollar spent and the low level of current spending on conservation by gas utilities in Ontario compared to other jurisdictions.

We selected several initiatives for review from among over 100 programs delivered by agencies, utilities, non-governmental organizations and government.

We analyzed the OPA's industrial demand response programs since they account for the lion's share of demand savings in the province, and because of their considerable potential in avoiding the need for future generation, transmission and distribution. New electricity supply projects are proving increasingly difficult to site and build. Reducing the need for new projects, along with providing environmental benefits, is the key contribution that demand response offers. We find that the OPA has been successful in establishing demand response as a viable alternative to peaking gas plants. However, the high cost of contractual demand response programs suggests that these programs should only be pursued where necessary.

Our report reviews two residential sector programs (conservation and small-scale renewable energy), as this is how most Ontarians directly participate in the government's policy to build a green economy. The microFIT program for renewable generation has attracted great interest. Although it accounts for a small amount of total installed system capacity, participation in the program is growing. The Home Energy Savings Program has also attracted strong homeowner interest;

the program could be improved if claimed savings were verified. We urge that this be done and that a program continue to be offered in Ontario.

Finally, we observed the beginning of interesting programs and initiatives, including: progress being made towards benchmarking energy performance in schools; implementing efficiency measures and alternate fuels in road freight transport; and, greening Ontario government operations. These activities, although recently commenced and at an early stage, hold great promise.

To address our findings, this report makes the following recommendations:

1. **The ECO recommends that the Ministry of Energy establish a formal evaluation framework for its energy conservation programs and publicly report on program performance annually on a going forward basis.**

2. **The ECO recommends that the Ontario Power Authority assess the persistence of pre-2008 peak demand savings and report its conservation results in comparison to the government-established cumulative target of 2,700 MW in peak demand reduction by 2010.**

3. **The ECO recommends that the Ontario Power Authority only expand contractual demand response programs when this will eliminate a demonstrated near-term need for new peaking generation.**

1.0 Introduction

1.1 The ECO's Reporting Mandate

The *Green Energy and Green Economy Act*, *2009*, proclaimed in May 2009,[1] introduced legislative amendments to several existing acts. As part of these legislative changes, the *Environmental Bill of Rights*,*1993* (*EBR*) was amended and the reporting mandate of the Environmental Commissioner of Ontario (ECO) was expanded. The ECO was given a new responsibility to report annually to the Speaker of the Assembly on:

- The progress of activities in Ontario to reduce or make more efficient use of electricity, natural gas, propane, oil and transportation fuels;
- The progress in meeting any government-established targets to reduce energy consumption and increase efficient use of these fuels; and,
- Barriers to conservation and energy efficiency.[2]

1.2 The ECO's Reporting Approach

The purpose of our annual progress report is to respond to our threefold statutory obligation outlined above. By mandate, the 2009 report covers the period January 1, 2009 to December 31, 2009. The ECO relies on data that other organizations are required by regulation and policy direction to collect. Production of the report is to some extent reliant on the timing in which this data is received. To address this, the Annual Energy Conservation Report – 2009 has been issued as two separate documents:

- Volume One was issued May 3, 2010 and covered the broader policy and regulatory framework governing energy conservation in Ontario.
- This report is Volume Two and describes initiatives underway, assesses the energy savings that have been achieved and measures progress on targets.

2.0 Conservation Program Evaluation

The ECO's analysis of progress on government targets (section 3.0) and conservation initiatives (section 4.0) is informed by program-specific evaluations undertaken by (or on behalf of) conservation program administrators.

At its simplest, an energy conservation program evaluation attempts to estimate the energy or peak demand savings attributable to an initiative or program.

Estimating energy savings is a two-part task. First, gross energy savings are calculated. Second, that figure is converted to net energy savings, by estimating the percentage of gross savings that is attributable to the influence of the conservation program. Net savings are almost always lower than gross savings.

Calculating Energy Savings

Estimating gross energy savings requires tracking program participation and estimating the energy saved by each program participant. Methods of estimating energy savings include:

- using standardized energy savings estimates for common measures where expected savings are well known (e.g., comparisons between appliances of different energy efficiencies);
- using billing information to compare before-and-after energy consumption; and,
- undertaking customized measurement and verification for unique projects.

To estimate gross lifetime energy savings, it is necessary to estimate **persistence** (the amount of time a conservation technology or behaviour can be assumed to provide savings).

Converting gross energy savings to net savings is more difficult. It usually requires surveying at least a sample of program participants to understand more about their behaviour and motivation for participation.

The most important element of converting gross savings to net savings is the **free-ridership rate**. The free-ridership rate is the percentage of program participants who would have undertaken the conservation action even in the absence of the program. For example, a program that offers a $5.00 incentive coupon to purchase an expensive, energy-efficient industrial boiler will have a very high free-ridership rate. Almost all of the program participants who redeemed the coupon and purchased the energy-efficient boiler would have bought the boiler anyway, making the net savings attributable to the program very low.

The opposite of free-ridership is **spillover**, where an energy conservation program induces additional energy conservation actions beyond the program's direct scope. For example, a program providing an incentive for the purchase of a programmable thermostat may lead some participants to think more about their energy consumption and undertake additional actions, such as upgrading to a more efficient furnace. **Take back** (leakage of conservation savings because of the tendency of some consumers to use a more efficient piece of equipment more frequently than their previous inefficient model) also has an impact on determining net savings. Understanding the effect of these variables on conservation savings is an evolving science.

Evaluations usually do more than just estimate energy or demand savings. They often include cost-benefit analyses, using one of the tests described in "Measuring Success", as discussed below. Evaluations may also examine the efficiency of the program's processes or its influence on transforming the marketplace to encourage future energy conservation actions.

Depending on the program's goals, evaluators may also be interested in measuring additional impacts, such as jobs created or greenhouse gas emissions reduced.

There is an inherent trade-off between maximizing the value and accuracy of evaluation results and minimizing the cost of evaluation. In the United States, the National Action Plan for Energy Efficiency has suggested that three to six per cent of the total cost of conservation programming should be devoted to program evaluation.[3]

Measuring Success

Most conservation evaluations use one or more quantitative tests that attempt to compare the benefits and costs of the conservation initiative. These tests may be mandated. For example, natural gas utilities[4] in Ontario are required to demonstrate that the benefits of each of their conservation programs are expected to exceed the costs,[5] using the Total Resource Cost test.

The **Total Resource Cost (TRC) Test** compares the net benefits of an energy conservation program (due to avoided costs of energy supply, transmission, and distribution) with the net costs (program administration costs, higher capital costs of energy efficient equipment, etc.) to all parties, including program participants and the program administrator (typically a utility or the government). The TRC test is the most commonly used test in program evaluation.

The **Social Cost Test** is similar to the TRC test but broadens the focus to include externalities – costs or benefits not borne directly by the program administrator or participant that are typically left off the balance sheet. For example, the greenhouse gas emissions avoided through a conservation program could be treated as a benefit. Determining the appropriate value for externalities can be contentious.

Neither of the above tests considers how costs and benefits are distributed. From this perspective, it does not matter whether the incremental capital cost for an energy-efficient piece of equipment is paid for by the utility or the consumer, or by some combination of the two. Other tests view costs and benefits from the perspective of the program administrator, usually a utility or agency charged with delivering conservation (**Program Administrator Cost Test**), a consumer participating in the program (**Participant Test**), or a utility customer (**Ratepayer Impact Measure Test**).

Quantitative tests are of great value in assessing program performance, but they do have limitations. The numerical focus may provide misplaced certainty as to the true value of a program, given that there are inherent difficulties in quantifying some of the variables, such as the appropriate value for social or environmental externalities. Another point of uncertainty is that comparing costs and benefits often requires choosing a **discount rate**, which attempts to value how much a dollar spent (or saved) at some point in the future is worth today. Because the costs of a conservation initiative usually occur immediately and the benefits accrue over a longer timeframe, the choice of discount rate may greatly affect the program evaluation results. An energy efficiency incentive that has a high up-front cost, but provides benefits through reduced energy costs over 20 years, will fare better (using any of the tests above) if a low discount rate is used. Quantitative tests are also less useful for certain types of programs, such as informational programs or market transformation programs, where results are inherently more difficult to measure.

Why Evaluation is Important

Looking backward, the primary purpose of evaluation is accountability. Evaluations can assess whether ratepayer or taxpayer funds were wisely spent and whether program or policy goals were successfully met. Evaluations often have financial consequences, as program administrators (particularly regulated utilities) may receive incentives or penalties that are tied to the amount of energy saved by their programs.

Looking forward, the primary purpose of evaluation is improvement. Evaluations can determine what did or did not work in a program, and may provide information that could be used to improve the program and deliver additional energy savings. They can also be used to determine whether a program should continue at all, or whether the program funding would be better spent elsewhere.

Taking the broader view, evaluation plays an important role in measuring the value of energy conservation as a whole. Can conservation deliver reliable energy savings? Is it more cost-effective than energy supply alternatives? Are conservation programs a good use of public funds? Program evaluations provide the bedrock of information necessary to start addressing these bigger questions. They inform the debate among policymakers regarding the amount of resources that should be devoted to supporting energy conservation.

Evaluation in Ontario

The major conservation actors in Ontario – the Ontario Power Authority, the natural gas utilities, and the Ministry of Energy – have different processes in place to evaluate conservation programs.

Ontario Power Authority – Electricity Conservation Evaluation

The Ontario Power Authority (OPA) has explicit evaluation protocols in place for both conservation[6] and demand response programs,[7] and a dedicated internal evaluation team. The OPA intends to conduct detailed evaluations of each program within the first three years,[8] although partial evaluations may be done more frequently to facilitate timely improvement to program design. Most evaluations are conducted by a third party, which is intended to ensure an independent and unbiased verification of results. The ECO is generally impressed with the level of rigour that has gone into these evaluations, and welcomes the OPA's decision to make the evaluation reports public.

A strength of the OPA's approach is that it publishes detailed measures and assumptions guides[9] listing the estimated energy and demand savings associated with a wide range of energy efficiency measures, along with supporting references. These guides are updated annually by the OPA, and the OPA welcomes submissions (new measures or improved savings information for existing measures) from other parties. The refinement of these measures over time leads to improved estimates of energy savings and improved predictive power. This helps to assess in advance whether a new conservation program under consideration will be worthwhile. This approach to standardizing assumptions of energy savings for common conservation measures has recently been adopted in the natural gas sector as well.[10]

Beginning in 2011, the OPA's evaluation approach will be extended to local electricity utilities. With the exception of province-wide programs co-ordinated by the OPA, utilities will be required to submit independent evaluations of their conservation programs to the Ontario Energy Board (OEB).[11] These evaluations must be performed by OPA-approved evaluators and use OPA's evaluation protocols, cost-effectiveness tests, and lists of measures and assumptions.[12] Given that utilities will be eligible for financial incentives tied to the performance of their conservation programs, there is a need for this type of rigorous evaluation process.

Enbridge and Union Gas - Natural Gas Conservation Evaluation

For natural gas conservation, the two large gas distribution utilities (Enbridge Gas Distribution and Union Gas) are also eligible for performance-based incentives, again requiring a rigorous evaluation framework. The framework for gas evaluation was developed by the OEB in 2006.[13] This new framework has led to an improvement in the quality of gas conservation program evaluation, although some concerns remain, particularly with regard to the evaluation of customized commercial and industrial projects.

Each gas utility is required to develop an evaluation plan, and file an evaluation report annually with the OEB that summarizes the energy savings, budget and supporting evaluation work for the utility's conservation portfolio as a whole. The utility must also submit a third-party audit of the evaluation report to the OEB. The primary purpose of the audit is to review the assumptions that the utility has made in determining conservation program savings (which affect the financial compensation that the utility will receive), and provide an opinion as to whether the proposed compensation to utilities is reasonable. An issue currently under consideration by the OEB is whether the auditor should be selected by the utility (as is the current practice) or the OEB.

A unique feature of conservation evaluation in the natural gas sector is the role of the Evaluation and Audit Committee. This committee is composed of the utility and three stakeholders. It has a role in contributing to the utility's evaluation plan, reviewing and commenting on the utility's evaluation report, recommending priorities for future evaluation subjects, and providing input on evaluation methodology.

Ontario Government - Multi-Fuel Conservation Evaluation

In contrast to the OPA and the gas utilities, the Ministry of Energy lacks a formal evaluation framework document to guide conservation program review,[14] and has made limited efforts at program evaluation. For the Ontario Solar Thermal Heating Incentive (OSTHI) and the Municipal Eco Challenge Fund (MECF), savings are self reported by applicants. For the Home Energy Savings Program (HESP), energy and demand savings are calculated by Natural Resources Canada. For more information on these programs, see section 4.0.

To date, Ontario's role in the OSTHI and HESP programs has been limited to providing additional incentives to complement existing federal programs. Ontario may have determined that there was limited value in devoting resources to evaluation, given the limited opportunities to use the evaluation results to influence and improve program design. However, going forward, the federal government has not indicated that it will provide further funding in these areas. This opens up a greater role for provincial autonomy in program design, and suggests that more resources should be devoted to evaluation. The Ministry of Energy has begun undertaking its own internal analysis of HESP while it considers any future programs post March 31, 2011.[15] This is an encouraging development.

Issues and ECO Comment

A recurring theme of this report is that incomplete evaluation of government conservation programs has made it difficult to assess the benefits and energy savings that these programs are delivering. This is seen in our analyses of the electricity conservation target in government operations (section 3.4), the Home Energy Savings Program (section 4.4), the Ontario Solar Thermal Heating Incentive program (section 4.5) and the Municipal Eco Challenge Fund (section 4.6).

The lack of evaluation and verification of results makes it difficult to convince the public and decision-makers of the value of these programs (which are likely considerable), and introduces a risk that funds for conservation programs will not be made available in the future.

The ECO recommends that the Ministry of Energy establish a formal evaluation framework for its energy conservation programs and publicly report on program performance annually on a going forward basis.

Evaluation, building on the models of the Ontario Power Authority and the gas utilities, would take advantage of lessons learned, and enable meaningful comparisons of results. Ideally, programs offered by other government ministries, where energy conservation is a primary program goal could also be addressed. Through evaluation, the government would increase transparency as to how funds for conservation programs are being used. This is particularly important as the government passed a regulation[16] in 2010 to recover part of the funds for these programs from electricity ratepayers, not from the tax base. The government would also gain knowledge of program successes and failures, facilitating the optimization of future conservation programs.

Public reporting and free information sharing will also help improve the design of conservation programs in Ontario. Many of the lessons learned as to what makes for a successful conservation program will be of value to other parties offering conservation programs.

3.0 Government-Established Targets

Definitions

The ECO's mandate requires us to report on Ontario's progress in meeting *government-established* targets to reduce or make more efficient use of energy. The interpretation of the term "target" by government ministries varies. It ranges from targets that are considered to be aspirational or visionary goals to targets that are considered to be serious commitments requiring achievement of the quantitative metric set out in the targets. The ECO believes this is an unproductive debate and has taken a broad approach in evaluating government commitments: in our view, all government-established targets represent a metric (standard of measurement or point of reference) usually expressed against a baseline for the purpose of evaluating performance. Whether the term target, commitment, vision, goal, challenge or benchmark is used, these are all measurable objectives that should be treated as serious commitments.

The debate over definitions is especially pernicious if it undermines efforts to achieve the stated metric. Described below are several objectives which the ECO considers to be the targets currently guiding the activities of government and utilities. We include them and report on progress to meet them because they inform energy conservation in Ontario. There are also embedded energy conservation targets contained in government policies like the Growth Plan for the Greater Golden Horseshoe and the Climate Change Action Plan. Although they implicitly affect energy consumption, these are not addressed in our report.

Tables 1 and 2 provide a summary of each target. Following the tables is a more detailed explanation of each commitment and a discussion of results achieved against the target.

Table 1: Summary of Government-Established Energy Targets

Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
3.1	Premiers' agreement at the 2008 Council of the Federation	Ministry of Energy (ENG)	July 2008	2020	20 per cent energy efficiency improvement in Ontario by 2020.	Little identified progress. With no methodology to measure progress established, progress is undetermined.
3.2	Province-wide electricity conservation set by government	Ministry of Energy	2005	2007	1,350 MW reduction in peak demand.	In 2008, OPA advised Ministry that the target was met.
3.2	Province-wide electricity conservation targets contained in June 2006 Supply Mix Directive (requesting an Integrated Power System Plan [IPSP])	Ontario Power Authority (OPA)	June 2006	2010	2,700 MW reduction in peak demand by 2010 (a cumulative target that includes the 2007 electricity conservation target of 1,350 MW).	Although the proposed IPSP which contains the target is no longer valid, it is assumed this target remains in effect. ECO is awaiting final verified results, due September 2011, but the OPA advises that the target will likely not be met.
				2025	A 6,300 MW reduction in peak demand by 2025 (cumulative includes 2010 target of 2,700 MW).	Date likely to be revised (and possibly the savings quantity). No longer considered a valid target.
3.3	Installation of smart meters	Local Distribution Companies (LDCs) with oversight by the Ontario Energy Board (OEB)	2004	2007 and 2010	A two-step target: 800,000 smart meters installed in homes and small businesses by the end of 2007 and all homes and small businesses by the end of 2010 (estimated 4.5 million meters).	The 2007 target was achieved. The 2010 target is likely to be met.

Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
3.3	Activation of time-of-use (TOU) prices	LDCs with oversight by the OEB	May 2009	Summer 2010 and June 2011	A two-step target: 1 million customers to receive TOU pricing by summer 2010, and 3.6 million by June 2011.	Summer 2010 target was achieved in September 2010.
3.4	Electricity conservation in Ontario government operations	Ministry of Infrastructure (MOI) with assistance from Ontario Realty Corporation (ORC)	April 2004 and August 2007	2007 and 2012	A two-step target measured against a baseline of 2002/2003 electricity use: reduction in government's own electricity use by 10 per cent by 2007, and an additional 10 per cent by 2012.	Achievement of 2007 target and progress on 2012 target is undetermined as MOI is verifying baseline consumption.
3.5	Low Carbon Fuel Standard	Ministry of Energy	May 2007	2020	10 per cent reduction in carbon emissions from transportation fuels by 2020.	Little identified progress. Climate Change Secretariat will report on the target in its next annual report.
3.5	Ethanol in gasoline (Ontario requirement)	Ministry of the Environment (MOE)	October 2005	January 1, 2007	5 per cent ethanol in gasoline by volume.	Achieved.
3.5	Ethanol in gasoline (federal requirement) Federal renewable standard for biodiesel and heating oil	Environment Canada	December 2006	December 15, 2010, and 2011	5 per cent ethanol in gasoline nationwide by December 15, 2010. 2 per cent biodiesel content in distillates pool by 2011.	Ethanol standard likely to be achieved. Achievement of biodiesel standard may be delayed depending on results of cold weather testing.
3.6	Electric vehicle (EV) purchases	Ministries of : Transportation (MTO), Economic Development and Trade (MEDT), Infrastructure, and Energy.	July 2009	2020	1 in 20 vehicles driven in Ontario by 2020 to be an EV.	Little identified progress beyond a plan developed by MTO and limited work on fuelling infrastructure by MEDT, MOI and ENG.
3.7	Education sector energy consumption reduction	School boards assisted by the Ministry of Education (EDU)	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 to be rolled out over two years.
4.7	Ontario Public Service energy consumption reduction	Ministry of Government Services (MGS)	April 2009	March 31, 2014	Annual reduction of 5 per cent for the period 2009-14 in each of vehicle fuel consumption, air travel, and energy used in government buildings.	No results are yet available. The target period began April 1, 2009.

Table 2: Summary of Natural Gas Utility Conservation Targets

Report Section	Initiative	Responsibility to Address	Announced	Completion Date	Description	Progress on Target
4.2	Enbridge Gas Distribution Ltd. demand-side management target	Enbridge with oversight by the OEB	August 2006 through an OEB decision. Targets updated annually based on regulatory formula and past performance.	2007–2009 (separate targets for each year)	2007: $150.0 million net benefits* 2008: $168.3 million net benefits 2009: $210.4 million net benefits	Exceeded forecast targets in all three years: 2007: $199.8 million net benefits (133% of target) 2008: $182.7 million net benefits (109% of target) 2009: $213.4 million net benefits (101% of target)
4.2	Union Gas Ltd. demand-side management target	Union Gas with oversight by the OEB	August 2006 through an OEB decision. Targets updated annually based on regulatory formula and past performance.	2007–2009 (separate targets for each year)	2007: $188.0 million net benefits 2008: $180.2 million net benefits 2009: $220.2 million net benefits	Exceeded forecast targets in all three years: 2007: $215.9 million net benefits (115% of target) 2008: $262.8 million net benefits (146% of target) 2009: $308.3 million net benefits (140% of 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 (see section 2.0 for more information).

3.1 Council of the Federation Energy Efficiency Target

Ontario, as a member of the Council of the Federation (COF), an association of all Canadian provinces and territories, committed to a conservation target that stresses energy efficiency improvements. In July 2008, at the fifth COF meeting, premiers committed to achieving a 20 per cent increase in energy efficiency by 2020. They agreed on a five-point plan for achieving the goal that included action on building codes, expanding the number of appliances and equipment covered by efficiency performance standards, adopting green building policies when governments make capital investments in facilities, and giving homeowners access to home audits and assisting retrofits.[17]

Immediately following the COF gathering, the Premier tasked the Energy Minister with leading implementation of the five-point plan in co-operation with the ministers responsible for housing, environment and research.

Results

Although energy efficiency gains are being realized through stock turnover of appliances and equipment, stricter building codes and conservation initiatives like home retrofits, there is little identified progress in meeting this target. The issue of whether progress will be measured is not decided. Ministry of Energy officials advised the ECO that provincial officials have not agreed on methodological issues required to measure progress, such as the target's baseline year, sectors to which it would apply and the type of target (e.g., absolute or intensity based).

3.2 Province-Wide Electricity Conservation Targets

Several targets for electricity conservation have been established by the Ontario government. The first target, set in 2005, was a reduction in peak electricity demand of 1,350 megawatts (MW) to be achieved by 2007. In 2008, the Ontario Power Authority (OPA) reported that this target had been met, with a total of 1,379 MW of savings achieved.[18]

After considering the advice of the OPA on the future of the electricity system, including the contribution of conservation,[19] the government set short- and long-term targets for electricity conservation. These were contained in a Supply Mix Directive issued in June 2006, which were to be achieved through an Integrated Power System Plan. For a fuller description, see our Annual Energy Conservation Progress Report – 2009 (Volume One). These targets were:

- a further reduction in peak demand of 1,350 MW to be achieved by 2010 (a total of 2,700 MW by 2010); and,
- a further reduction in peak demand of 3,600 MW by 2025 (a total of 6,300 MW by 2025).[20]

The 2025 target is no longer relevant or definitive for electricity planning purposes. The Minister of Energy announced on September 20, 2010 that a new Supply Mix Directive for a new Long-Term Energy Plan would be issued shortly, following public consultation.[21] It may modify the size or the timing of the existing 6,300 MW target.

Additionally, in March 2010, a Conservation and Demand Management (CDM) directive was issued by the Minister to the Ontario Energy Board (OEB) as described below in "Looking Ahead to 2011". It specified a target to be achieved by 2014. It is not yet determined whether this target will be incorporated as an interim target in the new directive for the Long-Term Energy Plan.

Results

The OPA's progress towards meeting the 2010 peak demand reduction target as a result of 2008 and 2009 initiatives is shown in Table 3.

Results are divided into the four categories of conservation used in the Integrated Power System Plan:

- energy efficiency (use of more efficient technology);
- demand management (reducing electricity use during peak hours, including shifting use to off-peak hours);
- customer-based "behind the meter"[22] generation; and,
- fuel switching (changing from electricity to another fuel, such as natural gas).

The estimate of peak demand savings achieved includes savings from OPA initiatives (some of which were undertaken in collaboration with local utilities), and non-OPA actions. Non-OPA initiatives include government improvements to energy efficiency codes and standards, other conservation programs (e.g., those offered independently by utilities or the Ministry of Energy), and the Ontario government's introduction of smart metering and time-of-use pricing.

The OPA estimates that 864.1 MW of peak demand savings had been achieved as of the end of 2009, based on actions in 2008 and 2009. Table 3 shows the significant contribution of the OPA's industrial demand response programs (Demand Response 1, 2, 3). These programs specifically target reducing peak demand, as opposed to reducing energy consumption in general. Due to their importance, the OPA Demand Response programs are discussed in more detail in section 4.1 of this report.

Other OPA programs that have delivered some results to date include the Cool Savings Rebate (a consumer program that offers rebates for energy-efficient residential heating and cooling equipment; 36.2 MW of savings), the Electricity Retrofit Incentive Program (a business program that offers incentives for high-efficiency retrofits of non-residential buildings; 29.5 MW of savings), and Power Savings Blitz (a business program that offers free lighting retrofits for small commercial buildings; 48.3 MW of savings).

Table 3: Peak Demand Savings From 2008 and 2009 Initiatives

Conservation Category	Initiatives	Net Peak Demand Savings, as of year end 2009 (MW)
Energy Efficiency	OPA Consumer Programs	73.4
	OPA Business Programs	100.7
	OPA Low-Income Programs	3.9
	OPA Industrial Programs	0
	Non-OPA Energy Efficiency Programs	34.5
	Codes and Standards	49.0
Demand Management	peakSaver	64.1
	OPA Demand Response 1	187.9
	OPA Demand Response 2	127.5
	OPA Demand Response 3	182.2
	Other OPA Demand Response	31.3
	Smart Meters and Time-of-Use Pricing	0
Customer-based Generation		9.7
Fuel Switching		0
Totals		**864.1**

Source: Ontario Power Authority, letter to ECO, September 9, 2010

Looking forward, the peak demand savings achieved as of 2009 from energy efficiency and customer-based generation initiatives will persist into 2010, as they involve technological changes that will remain in effect. These savings will be augmented in 2010 by savings from new participants in existing programs, new programs (such as the OPA's Industrial Accelerator Program for large industrial companies) and time-of-use pricing, which will be in place for many more customers in 2010. The expected savings from demand response programs are less certain, as savings from these resources do not roll over from year to year, but instead depend on continued program enrolment by participants.[23]

Combining the above factors, peak demand savings at the end of 2010 will likely be greater than at the end of 2009. Whether they will be enough to meet the 2010 target is an open question. The OPA has already suggested that the 2010 target will likely not be met.[24] The primary reason given for this is the economic downturn. The OPA estimates that industrial electricity demand has been reduced by approximately 30 per cent due to facility closures or reductions in production, eliminating opportunities for energy conservation savings (particularly demand response) from these facilities.[25] The downturn has also made it more difficult for companies to raise funding for energy efficiency investments.

Issues and ECO Comment

The ECO acknowledges that the OPA has a robust evaluation, measurement, and verification process in place for its conservation programs (see section 2.0). Therefore, the ECO believes that the results provided for OPA initiatives (which make up the vast majority of estimated peak demand savings) can generally be relied upon. However, the ECO has two specific concerns with the OPA's reporting of progress towards the 2010 peak demand reduction target.

First, the ECO notes that the intent of the Ministry of Energy was for the 2010 peak demand reduction target of 1,350 MW to be "in addition to the 1,350 MW reduction set by the government as a target for achievement in 2007."[26] In other words, Ontario should achieve a cumulative reduction in projected peak demand of 2,700 MW by 2010.

The peak demand savings for some older initiatives will not continue into 2010. This issue is known as **persistence** and is determined by the lifetime of an energy efficiency measure or program (for example, the energy savings due to installation of an energy-efficient appliance would persist for the estimated lifetime of the appliance, e.g., 10 years). Therefore, achieving the 2010 target will actually require **more** than 1,350 MW of new peak demand savings between 2008 and 2010.

To properly measure progress towards the 2010 target, the OPA should review its analysis of savings achieved as of the end of 2007 and assess which of these savings have and have not persisted into 2010. Persistent savings should then be added to any new savings that result from post-2007 initiatives, and assessed against the cumulative target of a 2,700 MW reduction in peak demand.

Using this methodology, the cumulative results to date will be somewhat less than the 2,243 MW calculated by simply adding savings achieved as of the end of 2007 (1,379 MW) and savings achieved in 2008 and 2009 (864 MW), due to this issue of persistence. To use the most obvious example, adding the OPA's estimate of savings as of 2007 to its estimate of post-2007 savings would double-count the contribution of the OPA's demand response programs, overestimating cumulative savings by more than 300 MW.[27]

The ECO recommends that the Ontario Power Authority assess the persistence of pre-2008 peak demand savings and report its conservation results in comparison to the government-established cumulative target of 2,700 MW in peak demand reduction by 2010.

Second, the ECO has an additional concern about the way the OPA has reported peak demand savings at the end of 2009 from the Demand Response 1 (DR1) program. This program (and the OPA's other industrial demand response programs) work by providing financial compensation to participants in exchange for reductions in electricity consumption during periods of high demand.

The OPA reports savings for this program (and its other industrial DR programs) as the amount of demand reduction potential available from participants,[28] and has reported that DR1 contributed 187.9 MW of peak demand savings as of the end of 2009.

However, the DR1 program relies on voluntary action by participants to reduce their electricity demand. An evaluation conducted for the OPA showed that many of the firms currently in DR1 do not actively participate, with the result that the actual peak demand savings the program can deliver is negligible, less than one MW.[29] As a first approximation, the OPA's estimate of net peak demand savings as of the end of 2009 should remove the 187.9 MW attributed to DR1, reducing the estimate of peak demand savings due to 2008 and 2009 initiatives from 864.1 MW to 676.2 MW.

The ECO notes that correcting for the two methodological errors discussed above would leave the OPA even further from achieving the cumulative 2010 peak demand reduction target of 2,700 MW.

Looking Ahead to 2011 — CDM Targets for Electricity Distributors

The *Green Energy and Green Economy Act, 2009* accorded the Minister of Energy a directive power to promote electricity conservation. On March 31, 2010 the Minister exercised this power by issuing a directive (the "CDM Directive") to the Ontario Energy Board (OEB) requiring it to establish conservation and demand management (CDM) targets for Local Distribution Companies (LDCs).

Mandatory LDC CDM targets will be met by each LDC as a condition of distributors' licences and, according to the CDM Directive, the OPA is also responsible for the target's achievement. The target addresses both peak demand and electricity consumption; it is set as a reduction of 1,330 MW peak demand and 6,000 gigawatt-hours (GWh) of reduced consumption province wide. The conservation amounts are to be achieved over a four-year period starting January 1, 2011 and ending December 31, 2014. The OEB has issued a CDM Code[30] to implement many details contained in the CDM Directive to guide LDCs' CDM activities. Each utility will be assigned an individual electricity reduction target and will be compensated for meeting or exceeding its target.

The Minister also issued direction to the OPA in April 2010. This both notified the OPA of the CDM Directive issued to the OEB and directed the OPA to provide advice to the OEB, following consultation with LDCs, on the appropriate allocation of the CDM targets among LDCs. The OPA was also directed by the Minister to undertake a number of facilitating and co-ordinating activities related to LDCs' implementing CDM.

Allocation of each distributor's share of the targets is, as of October 2010, under development and not finalized. The ECO will report further in future reports.

3.3 Targets for Smart Meters and Time-of-Use Electricity Prices

To encourage electricity conservation and reduce peak demand for electricity, the government has established targets for the implementation of smart meters and time-of-use (TOU) rates.

In 2004, the government announced a two-step target for installing smart meters. By the end of 2007, 800,000 smart meters were to be installed in homes and businesses; and, by the end of 2010 all existing conventional meters (some 4.5 million meters) are to be replaced by smart meters.[31]

In mid-2009, another two-step target was announced to implement TOU pricing to achieve the conservation potential that smart meters enable. One million customers were to receive TOU pricing by summer 2010 and 3.6 million customers are to be paying for their electricity use based on TOU rates by June 2011.[32]

There are essentially three actions that an LDC must take to transition from conventional meters and current Regulated Price Plan (RPP)[33] billing practices to the new smart metering hardware and time-differentiated pricing. LDCs must: first, remove the old standard meters and install smart meters and supporting infrastructure; second, enrol and register the smart meters with the Meter Data Management and Repository (MDM/R);[34] and third, activate TOU rates for customers according to a schedule set out by the OEB.

	Conventional Meter	Smart Meter
		
Meter	Analog meters with a spinning dial.	Digital meters with a numerical display.
Measures	Measures the total amount of electricity consumed during the billing period (typically one or two months).	Measures the amount of electricity consumed hourly (with date and time stamp).
Readings	Manual meter reading (typically contracted through a service provider who physically visits the meter and records information).	Automated meter reading (meter will remotely send information electronically).
Data Management	Each electricity utility provider implements its own meter database.	Central management of meter data (IESO's MDM/R) for all meters in the province, includes collecting and storing data, and processing it for TOU billing.
Pricing	A flat rate, set by the OEB, is charged for electricity use up to a certain threshold. A higher rate is charged for consumption above the threshold. The threshold is set lower in the summer and higher in winter.[35] Rates are based on averaging out the more expensive (daytime) and cheaper (night-time) prices of electricity.[36]	Smart meters measure consumption based on when electricity is used. The OEB sets prices to reflect that the cost to provide electricity changes through the day (e.g., during on-peak periods when demand and production costs are highest, prices will be higher).

Results

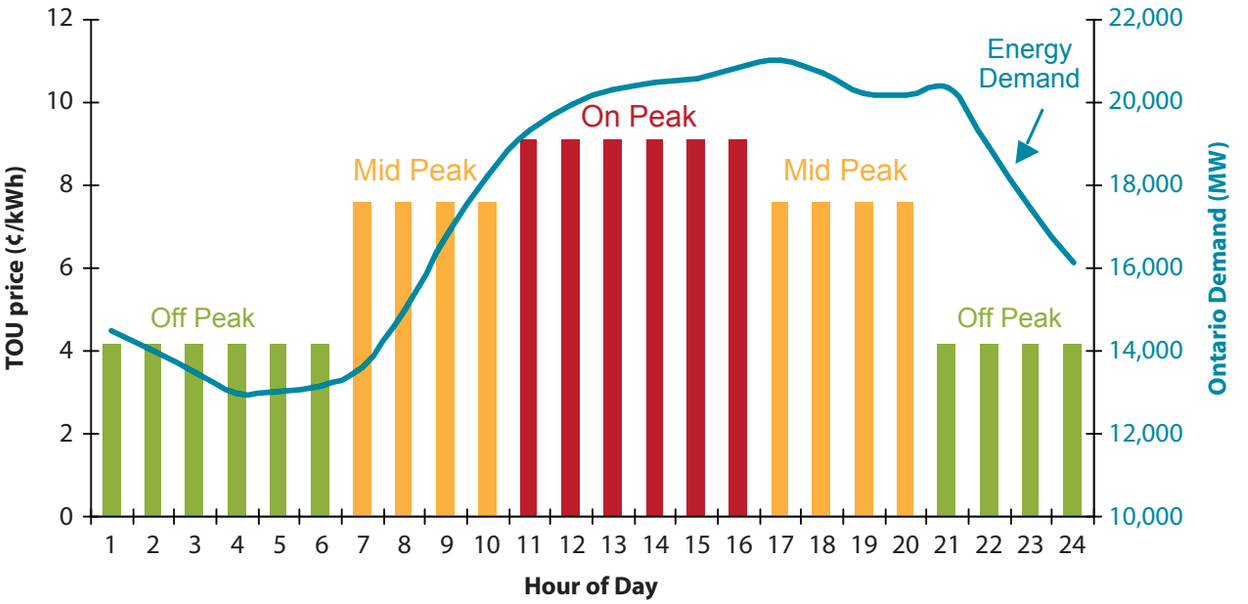
The first smart meter installation target was successfully met. In December 2007, 1,034,833 smart meters had been installed against a target of 800,000. LDCs are on track to have all residential and small business meters replaced for the 2010 target. At the end of September 2010, over 4.3 million smart meters had been installed, almost 95 per cent of the 2010 target.[37] The summer 2010 target for TOU implementation was reached in September 2010 with over 1.1 million customers being billed TOU rates. Currently, 11 utilities have implemented TOU rates. Of these, two have switched all of their eligible residential customers to TOU pricing.[38]

In support of the government's June 2011 target of 3.6 million customers on TOU pricing, the OEB has issued a determination under section 1.2.1 of the Standard Supply Service Code to mandate TOU pricing for all low-volume RPP customers. As a result, more than half of the LDCs must implement TOU rates by June 2011. This means some four million residential and small business customers will be charged TOU rates. And by March 2012, all LDCs will have switched to TOU rates.[39] If the utilities are able to proceed as the OEB has scheduled, the province is well positioned to exceed the June 2011 target for TOU activation.

Issues and ECO Comment

Smart meters support a pricing policy mandated by the government. Ontario is making a transition to TOU electricity prices whereby on-peak, mid-peak and off-peak prices are set to reflect the fact that the cost to provide electricity changes throughout the day and week.[40] Because TOU prices are dynamic and time-differentiated, their primary purpose is to encourage peak load shifting of electricity. The prices reflect the fact that, all else being equal, electricity costs more to supply as demand rises; the increase in demand typically follows a predictable pattern over the course of a weekday, and overall demand is comparatively lower on weekends and statutory holidays. Figure 1 shows the energy demand on a typical summer day compared to TOU prices. (Note the two scales on the graph. Demand is typically displayed in *mega*watts and residential electricity prices in cents per *kilo*watt-hour: 5 cents per kilowatt-hour is equivalent to 50 dollars per megawatt-hour.)

Figure 1: Load Curve and TOU Prices in Effect (August 16, 2009)



Sources: Derived from Independent Electricity System Operator market data and OEB Time-of-Use Prices: Historical Snapshot

Introduction of TOU billing is at an early stage. It is still too soon to determine trends with respect to load shifting and bill impacts resulting from TOU prices. Newmarket-Tay Power Distribution has conducted the largest study to date on the effects of TOU rates. The study showed a demand response impact from TOU rates. On average, consumers shifted their electricity use from on-peak periods (decrease of 2.8 per cent) and mid-peak periods (decrease of 1.4 per cent) to off-peak weekend periods (increase of 2.2 per cent).[41] The study also revealed there was not a significant reduction in overall electricity consumption.

To encourage conservation and reduce peak demand, it is critical that TOU prices are set to reward load shifting and penalize unnecessary on-peak use. In particular, the ECO questions whether the current price differential between on-peak and off-peak rates is appropriate and significant enough to incent behavioural change. Electricity prices can be modified, so there are opportunities to optimize prices and incent conservation, while ensuring that rates are still set at a level that recovers operating costs.

The OEB formally reviews electricity prices bi-annually, to determine if an adjustment is required. In October 2010, the OEB announced a change in TOU prices with a decrease in off-peak price and increase in mid-peak price.[42] In addition, the OEB is

undertaking a review of the methodology used to establish TOU prices (e.g., the allocation of peak generation costs to peak prices and other factors). The ECO will continue to monitor the progress of smart meters and developments in TOU pricing for future reports.

3.4 Electricity Conservation Targets in Ontario Government Operations

The Ontario government has committed to reduce electricity use in its own facilities by 20 per cent by 2012. This commitment was made in two stages and the reduction is measured against a baseline of 2002/2003 data. The first stage of the commitment was made on April 1, 2004, when the Chair of Management Board of Cabinet announced the Ontario government would reduce its own electricity use by 10 percent by 2007 in government facilities.[43] The second stage was made in August 2007, when the government announced it would reduce consumption by an additional 10 per cent by 2012 in its *Go Green: Ontario's Action Plan On Climate Change* report.[44]

Results

Responsibility for tracking the progress of the government's electricity reduction commitment lies with the Ministry of Infrastructure (MOI). This is no small task. The Ontario government is one of the province's largest employers, with over 68,000 full-time equivalent employees.

MOI oversees the Ontario Realty Corporation (ORC), an agency that manages, on behalf of many ministries, property occupied by the Ontario government. Five ministries manage their own facilities independently of ORC.[45] MOI is responsible for reporting the aggregated energy use for government-owned facilities.

MOI is currently in the process of verifying its energy reduction amounts and baseline data for ORC-managed buildings as well as facilities managed by the five ministries. The ECO will review this baseline verification and consumption reduction initiative more fully once we receive the information from the ministry.

At this time, the ECO notes that the government encountered several obstacles related to the measurement and validation of electricity reductions. To have avoided such obstacles, Ontario should have implemented an appropriate evaluation, measurement, and verification framework, as outlined in section 2.0 of this report.

For example, in 2007 the government claimed that it reduced its electricity by 12 per cent from 2002/2003, exceeding its target by 2 per cent.[46] However, only recently has the ministry started to validate the baseline electricity amounts and reduction claims.[47] Furthermore, since electricity providers and LDCs do not keep records of electricity bills for more than five years, the electricity providers no longer have data showing the amounts supplied to government facilities. To overcome this obstacle, MOI's baseline data will include estimated amounts in its verification analysis.[48]

Issues and ECO Comment

In hindsight, the government should have started verifying the 2002/2003 electricity baseline when it established its original target to reduce electricity by 10 per cent. It also should have taken proper action to ensure valid ongoing measurements of electricity consumption.

Nevertheless, the ECO commends the government for undertaking the data verification initiative. The ECO also commends a number of other related steps that MOI is undertaking to improve energy conservation and reduce greenhouse gas

emissions in its own operations and the broader public sector. These initiatives include the creation of an Energy Master Plan that is a 10-year formal strategy for energy management in government buildings and the re-commissioning of buildings.

3.5 Transportation Fuels Standards

As shown in our Annual Energy Conservation Progress Report – 2009 (Volume One), transportation fuels represent the greatest energy demand by fuel type for the province, and it is therefore important that the government focuses on this area.

A number of actions have been taken to develop a broader climate change initiative that directly relates to transportation fuels. At the provincial level, Ontario introduced a renewable fuel standard and signed a memorandum of understanding (MOU) with California to establish a low carbon fuel standard (LCFS). At the federal level, the Canadian government announced a renewable fuel standard, which includes proposed renewable content requirements for diesel and heating oil.

Low Carbon Fuel Standard

The Ontario government signed an agreement with California in May 2007 to co-ordinate policy development on an LCFS that would require a 10 per cent reduction in carbon emissions from transportation fuels by 2020.[49] Such a standard is meant to reduce overall carbon emissions by considering not only tailpipe emissions, but also carbon emissions during the production and distribution of the fuel. In theory, an LCFS will reduce the net amount of carbon used per unit of fuel energy.

Ethanol in Gasoline

Ethanol increases the amount of oxygen present during the combustion process. As a result, its addition increases the combustion efficiency of gasoline and, therefore, reduces carbon monoxide emissions.[50]

In October 2005, the Ontario government passed O. Reg. 535/05 under the *Environmental Protection Act*, requiring an average of five per cent ethanol in gasoline sold in the province beginning January 1, 2007.[51] The regulation includes an additional incentive for cellulosic ethanol, which is derived from cellulose in the non-edible parts of plants, such as stalks, forestry materials, and agricultural residue,[52] as well as through fast growing grasses. Cellulosic ethanol is chemically the same as ethanol produced from cornstarch and sugarcane, commonly known as starch- and sugar-based ethanol, respectively. However, the production process is different. The incentive works by treating each litre of cellulosic ethanol as being equivalent to 2.5 litres of conventional ethanol.

On September 1, 2010, the federal government announced that its renewable fuels strategy will take effect December 15, 2010 and will require five per cent ethanol in gasoline nationwide.[53]

Federal Targets for Biodiesel and Heating Oil

When the federal government made its September 1, 2010 announcement for five per cent ethanol in gasoline, it included a statement regarding its intention to regulate a two per cent renewable content requirement in diesel fuel and heating oil by 2011.[54] The federal government has been supporting the production of both ethanol and biodiesel through its ecoEnergy for Biofuels Program since 2008. Through this, Ottawa will invest up to $1.5 billion over nine years towards the production

of biofuels.[55] The renewable fuel content requirements, as proposed for diesel fuel and heating oil, are subject to the successful demonstration of technological feasibility under a range of Canadian conditions.[56]

Results

Low Carbon Fuel Standard

As of October 2010, Ontario has held consultations with industry but has not established an LCFS.

Ethanol in Gasoline

Ontario has achieved its five per cent ethanol in gasoline target.[57] With the implementation of O. Reg. 535/05, Ontario legally requires five per cent ethanol content in gasoline by volume, ensuring that the province's gasoline will contain fuel from this renewable energy source. Furthermore, the September 1, 2010 announcement made by the federal government aligns the federal and provincial ethanol in gasoline requirements.

Issues and ECO Comment

Low Carbon Fuel Standard

As the ECO noted in our Annual Energy Conservation Progress Report – 2009 (Volume One), since signing the MOU, California has moved ahead with legislating its LCFS through regulations that require emissions reductions beginning in 2011. Conversely, Ontario has not yet taken comparable action.

The Ontario government appears to be relying on the development of a cap-and-trade system through the Western Climate Initiative (WCI), which would lead to the use of less carbon-intensive fuels to fulfill its commitment of establishing an LCFS. However, the currently proposed WCI cap-and-trade system would not begin to capture emissions from transportation fuels until January 2015, eight years after Ontario signed the MOU with California.

The ECO plans to examine future details of an LCFS as they become available, and encourages the Ministry of Energy to take timely and appropriate action in developing a policy that is suitable for Ontario.

Ethanol in Gasoline

If cellulosic ethanol production increases, and it supplies most of the ethanol blended into Ontario's gasoline, due to the current cellulosic incentive as written in the regulation, there may be less than five per cent ethanol in Ontario's gasoline. This is not an immediate concern.[58] As time goes on, the commercialization potential is growing and cellulosic ethanol will become more available.

To ensure that Ontario makes progress in reducing or making more efficient use of transportation fuels, the ECO will continue to monitor these policies and will report as necessary in future years.

3.6 Electric Vehicle Goal

In July 2009, the government announced Ontario's objective to become a world leader in building and driving electric cars. The government released an electric vehicle plan with a goal that, by 2020, one out of every 20 vehicles driven in Ontario would be an electric vehicle.

In explaining this goal to the ECO, the Ministry of Transportation (MTO) stressed that this metric is not a target but rather represents a vision or challenge to Ontario residents and businesses to support the introduction of electric vehicles (EVs) through their purchasing and manufacturing decisions. The government also committed to lead the way in building consumer demand by adding 500 EVs to the Ontario Public Service fleet by 2020.

As part of the EV plan, the government established an incentive policy whereby purchasers of plug-in hybrid and battery EVs benefit from two incentives. The first is an incentive ranging from $4,000 to $10,000 for EVs purchased after July 1, 2010. The second is a green vehicle license plate that would allow single occupant vehicles access to High Occupancy Vehicle (HOV) lanes on provincial highways.

In June 2010, shortly before the incentives would have come into effect, the government made another announcement reflecting changes to the policy and providing further details on its application. The scale of the incentive was changed to start at $5,000 and range up to a maximum of $8,500, depending on the battery size of the vehicle. In addition, the number of incentives provided was limited to the first 10,000 qualifying vehicles.[59]

Approximately $84 million has been committed to the Electric Vehicle Incentive Program to be provided for the period July 1, 2010 to March 31, 2015. A mid-program review is scheduled for 2012/2013 to evaluate success.[60]

Results

In response to an information request made by the ECO, the Ministry of Economic Development and Trade (MEDT) advised that the scale of incentives had been adjusted after stakeholder consultations to recognize innovations that could be implemented on vehicles to achieve cost efficiencies in EVs (other than using larger capacity batteries). MEDT further explained that the purpose of the incentive is to provide short-term support to increase consumer adoption of EVs and the 10,000 vehicle cap for incentives acknowledges the temporary nature of the incentive.[61]

In addition to financial incentives, the government committed to building public charging infrastructure in government and GO Transit parking facilities. At the time of writing, a list of government facilities that will provide charging stations has not been made available. In response to an ECO information request, the former Ministry of Energy and Infrastructure informed the ECO that it is "seeking direction" on the location of the charging facilities.[62] There are currently plans to install EV recharging facilities at 10 GO Transit stations with 2 stations expected to be ready for early 2011. MTO has also committed to launching an EV public education campaign in 2011.

Issues and ECO Comment

Since the government has provided incentives ahead of market availability of EVs, the mid-program review may not be effective in determining the success of the rebates. Applications will likely be limited during the first year of the program. Although the incentives became available in July 2010, the only eligible EV in production as of October 2010 is the Tesla Roadster – a luxury electric sports car.[63] The first mainstream EVs are not expected to be available in Canada until 2011 to 2012, and even then in limited numbers.[64]

The ability to achieve the goal of "1 in 20 by 2020" will depend on more than the purchase price of the vehicle and a handful of recharging stations. A combination of variables will affect the future of EVs, including vehicle technology, consumer education and preferences, the market availability of vehicles and charging infrastructure, and the capacity of the electricity distribution system to serve the demand. Also, once an EV is acquired, its effect on energy savings and emissions depends on factors like distance driven, where and when charging occurs, efficiency of the electric drivetrain, and the electricity supply mix. The ECO believes that Ontario will need a more detailed and comprehensive plan to address these multifaceted issues, and urges the Ministry of Transportation to lead the development this plan.

3.7 Education Sector Conservation Benchmarking

With nearly 5,000 school buildings across the province occupying 280 million square feet, the energy bill for Ontario's elementary and secondary schools for the 2008/2009 academic year (September 2008 to August 2009) was $372 million.[65] The potential for energy conservation is considerable.

The Ministry of Education's Energy Conservation Initiative, which started in 2008, launched several projects intended to reduce energy consumption by focusing on building management capacity in the education sector.[66] A key project is the ministry's creation of a Utility Consumption Database (UCD) that will collect and track data for electricity and natural gas use in all schools and board buildings across the province. Starting in August 2009, the UCD is being rolled out over a two-year period.

The ministry intends to analyze the data to identify high- and low-performing facilities, determine a provincial energy use benchmark for the sector based on a common reporting methodology and work with the sector to identify best practices in setting school board conservation targets. The responsibility for setting targets resides with each school board. A notional target of a 10 per cent reduction in energy use in the education sector over five years was considered in 2008.[67] According to the ministry, that target is no longer relevant due to the lack of energy consumption data available. Data from the UCD will help determine any future targets set.

To support school boards in building management capacity, the ministry is also conducting operational reviews for all district school boards. The reviews cover all areas of school board operations, including energy management. One of the leading practices identified by the reviews was for boards to develop a multi-year energy management plan that incorporates measures to be implemented and the tools to monitor and manage the plan. Once operational reviews are completed for all school boards, the ministry plans to issue a final report outlining the key findings and progress made in adopting best practices.[68]

The government has also introduced the Energy Efficient Schools Funding initiative, providing school boards with $550 million in funds over two years. Funding is available for investments in operational efficiency (e.g., energy audits, lighting systems), replacement of major building components (e.g., heating and cooling systems), and renovations and retrofits to replace energy inefficient portables or improve underutilized schools. The ministry intends to examine the energy impact of these investments on conservation by tracking results through the UCD.[69]

Results

The Utility Consumption Database is at an early stage of implementation and is in the process of being rolled out to all school boards. Once the database is established, the ministry expects energy consumption benchmarks for school boards to be developed by the 2011/2012 school year.[70] School boards will be responsible for developing energy management plans, setting energy conservation targets and reporting conservation savings. The ECO will monitor the development of the Energy Conservation Initiative, including the progress on benchmarking and target setting in the education sector, for inclusion in future reports.

Issues and ECO Comment

The ECO commends the Ministry of Education for the steps it has taken towards improving the energy efficiency of Ontario's schools. In particular, the ECO is encouraged to see that the ministry is tracking baseline data and energy consumption for all schools through the Utility Consumption Database from which meaningful targets can then be set.

In response to an information request made by the ECO, the ministry indicated that there is limited and controlled access to the UCD. The ECO believes that Ontario residents should have unrestricted ability to view the performance of school boards and schools. The ECO believes that the ministry should make the database publicly accessible, and urges the ministry to provide annual reports on energy efficiency in schools.

4.0 Progress on Selected Initiatives

There are more than 100 conservation programs currently being delivered in Ontario by government agencies, ministries, non-governmental organizations and the private sector. These cover all sectors and fuels. Some focus on technology improvement, others on behavioural change and still others on education and awareness. Below is a review of progress on a selection of initiatives chosen to reflect the diversity of activities, fuels and sectors addressed.

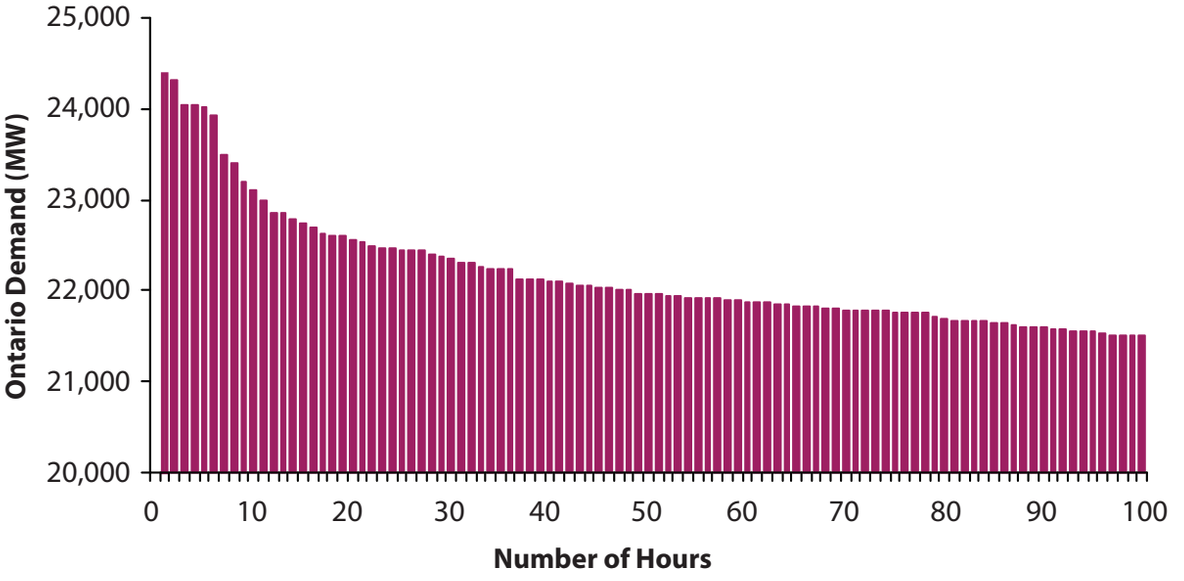
4.1 Ontario Power Authority Demand Response Programs

Demand Management

Unlike most goods, electricity cannot be stored.[71] The electricity system operator must continually ensure that electricity supply is available to meet demand at every moment. For this reason, the time that electricity conservation takes place is very important. Electricity conservation initiatives that place a priority on reducing energy use at specific times (times of high or peak demand) are known as **demand management**. Demand management may or may not reduce the total level of energy consumption – it depends whether the energy use that is curtailed during peak hours is undertaken at another time, or foregone altogether.

The opportunities for demand management can be seen in Figures 2 and 3.

Figure 2: Ontario Demand – Top 100 Hours in 2009

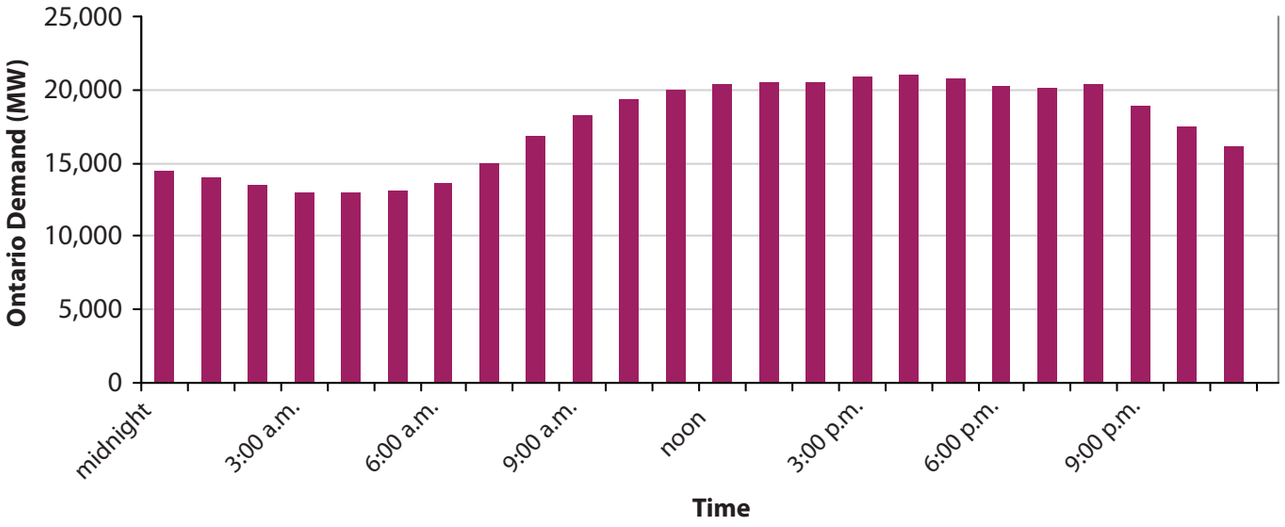


Source: Derived from Independent Electricity System Operator market data

Figure 2 shows the 100 highest hours of demand (about 1 per cent of total hours) in Ontario in all of 2009. Most of these hours would have been during hot summer weekday afternoons. The difference between the single highest hour of demand (24,380 MW) and the 40th highest hour of demand (22,110 MW) is 2, 270 MW – approximately the power generated by three large natural gas plants. In other words, to meet this extreme power demand, Ontario might need three large gas plants that would run for a mere forty hours or less each year.

Opportunities for demand reduction are not limited to a few extreme events during the year. There are even larger demand management opportunities on a daily basis.

Figure 3: Ontario Daily Demand Cycle



Source: Derived from Independent Electricity System Operator market data

Figure 3 shows the daily demand cycle or load profile on a typical summer day (August 16, 2009). Demand is low in the early hours of the day, begins to ramp up around 6:00 a.m., peaks in the late afternoon, and falls off significantly after 9:00 p.m. The difference between the daily peak and the trough is enormous — some 8,000 MW.

If demand management can be used to reduce both the yearly and daily electricity peaks, the economic advantages are obvious. In the near term, the use of peaking resources (i.e., natural gas-fired generators) with high fuel costs is reduced. In the longer term, fewer power plants and transmission and distribution lines need to be built. This will reduce the high cost of meeting demand at peak times. Thrown in to make the case for demand management are environmental and social benefits. Off-peak generation can be supplied primarily by carbon-free nuclear and renewable energy resources, while many peaking plants are fossil-fuel based (natural gas, as well as coal until 2014). The reduction in air pollutants during peak periods is also a benefit, because summer peaks are usually hot days where smog may already be a health concern. Lastly, not having to situate new power plants close to populated areas is also a considerable social benefit, as the intense debate over recently proposed gas peaking plants has shown.

Demand Management Potential in Ontario

The draft Integrated Power System Plan proposed that approximately 20 per cent of the planned reduction in peak demand by 2025 would come from demand management programs[72] (as opposed to conservation actions such as energy efficiency and fuel switching that would reduce electricity consumption at all times).

Ontario has pursued demand management through several avenues. A key policy choice has been mandating time-of-use (TOU) pricing (for residential electricity consumers and small businesses) and real-time market pricing (for larger customers). TOU pricing induces demand management by changing customer behaviour. Customers react to TOU pricing by shifting some electricity consumption away from periods of high prices (and high system demand).

Another form of demand management is targeted **demand response** (DR) programs.

OPA Demand Response (DR) Programs

Directives from the Minister of Energy to the Ontario Power Authority (OPA) in 2005 and 2006 have authorized the OPA to procure up to 500 MW of demand response.[73] The intent was to address reliability concerns in the Greater Toronto Area by acquiring additional supply and demand resources.

The OPA's primary means of achieving this objective has been a suite of DR programs (DR1, DR2, DR3), targeted primarily at large industrial and commercial consumers of energy. DR1 launched in June 2006;[74] DR3 launched in August 2008;[75] and, DR2 started in July 2009.[76] These programs replaced (and greatly expanded upon) pilot demand response programs that had been tested by the Independent Electricity System Operator (IESO).

The intent of the three DR programs is to work together to displace the need for new peaking energy supply resources,[77] which in Ontario usually means single-cycle gas turbines,[78] also known as gas peaker plants.

Objectives of DR Programs

The specific intent of each DR program can be summarized as follows:

DR1 is voluntary load shedding.

It is designed to reduce load (i.e., demand) during the few hundred peak hours of electricity consumption during the year (the peaks in Figure 2). Participants have complete discretion whether or not to reduce electricity consumption during any of these hours.

DR3 is mandatory load shedding.

This program is also designed to reduce load during the few hundred peak hours of consumption during a year, but participants must reduce electricity consumption when called on by the OPA, or face financial penalties.

DR2 is mandatory load shifting.

Participants commit to shifting electricity consumption on a regular basis from the daily peaks shown in Figure 3 to off-peak (night-time) hours through changes to their production processes. The program, therefore, targets a larger number of hours than DR1 and DR3. Likely participants are industries that can regularly perform energy-intensive operations in off-peak hours, such as municipal water pumping and wood pulp production.

Although most participants in the DR programs will provide demand response by simply reducing their electricity consumption, DR1 and DR3 also allow participants to provide demand response through on-site generation. On-site generation has the same effect as load reduction in reducing the imbalance between demand and supply on the electricity grid. On-site generation is typically provided by backup generators (e.g., diesel) that would not otherwise be cost-competitive with electricity from the grid. This raises the concern that air emissions from these generators may compromise air quality, defeating the government's intention to replace coal with conservation and cleaner forms of generation. In response to this concern, the Ministry of the Environment has issued a policy that requires generators used for non-emergency purposes (such as demand response programs) to meet air quality emission standards comparable to modern natural gas combustion turbines.[79]

How the Programs Work

Large industrial and commercial energy consumers are the target participants.
DR1 is open to participants that can reduce electricity consumption by more than 0.5 MW, while DR2 and DR3 are open only to participants that can provide 5 MW or more of demand response. All programs allow participation by **aggregators**,[80] who can combine demand response from multiple smaller commercial and industrial participants in order to achieve the minimum desired level of demand response.

The programs are activated during periods of high value to the electricity system.
DR1 is activated when the wholesale market price (known as the Hourly Ontario Energy Price) is high. During hours of projected high prices,[81] participants may choose to curtail electricity consumption in return for compensation from the OPA.[82]

DR3 is activated when the difference between estimated market supply of electricity and demand (known as the **supply cushion**) is low. The OPA must give participants at least 2.5 hours advance notice of activation, making the IESO's forecasting role in estimating the supply cushion critical.

DR2 does not have variable activation hours based on conditions in the electricity market, but instead makes use of the known difference in demand between night and day. Participants must shift load on a regular basis from peak hours (between 7 a.m. and 7 p.m.) to off-peak hours (between 7 p.m. and 7 a.m.).

Participants are compensated by the OPA for providing demand response during these periods.
Payment from the OPA is in addition to any reduction in direct electricity costs that the participant realizes due to their changed pattern of electricity consumption. Payment for the contractual DR2 and DR3 programs is much higher than for the voluntary DR1 program.

Participation

The DR programs have been quite successful in attracting participants and achieving the goal of acquiring up to 500 MW of demand response as set out in the minister's directive.

Table 4: Amount of Demand Response Capacity at Year-End (MW)[83]

Program	2007	2008	2009
DR1	317	440	175
DR2	-	-	119
DR3	-	84	170
Total	**317**	**525**	**464**

Source: Ontario Power Authority, letter to ECO, September 9, 2010

Until August 2008, DR1 was the only active program. Since then, many DR1 participants have migrated to the contractual DR2 and DR3 programs. Active participation in the DR programs has been dominated by several large firms.[84] However, DR3 also obtains a significant amount of its load reduction capacity (58 per cent or 98 MW) from aggregators. The participation of aggregators, as well as multiple direct participants, is desirable because it improves the program's reliability by reducing dependence on the actions of any individual firm.

Results

Table 5 shows the results for the OPA DR programs in 2007 - 2009.

Table 5: OPA Demand Response Program Results 2007 - 2009

Program	Year	Number of Hours of Operation[85]	Average Load Reduction (Settlement) (MW)	Average Load Reduction (Verified) (MW)
DR1	2007	1365	128.4	Not Available
	2008	1201	139.3	Not Available
	2009	132	151.4	58.6
DR2	2009	Weekdays, 7 a.m.-7 p.m.	53	50.7
DR3	2008 (100 & 200 groups*)	36	35.5	30.6
	2008 (200 group only)	24	52.2	46.8
	2009 (100 & 200 groups)	16	85.7	81.4
	2009 (200 groups only)	8	12.8	11.1

Note: ***The DR3 program allows firms to commit to providing up to 100 hours of demand response ("100 group") or 200 hours ("200 group") per year. Activations during extreme peak events would typically include both groups, while only the 200 group might be activated for more moderate peak events
Source: Ontario Power Authority, letter to ECO, September 9, 2010

The difference between the average load reduction estimated for settlement purposes (i.e., the reduction amount for which participants receive payment) and the verified load reduction (calculated through formal program evaluation) is primarily due to difficulties in correctly determining each participant's **baseline electricity consumption**. Baseline consumption is an estimate of how much electricity the participating facility would have consumed, were it not participating in the demand response program.

Amount of Demand Response (MW) = Baseline Electricity Consumption (MW) – Actual Electricity Consumption (MW)

Estimating the value for baseline electricity consumption is a difficult task, as electricity consumers may alter their patterns of consumption for reasons unrelated to the demand response program, such as plant shutdowns or process changes. In particular, because most of the participants in DR programs are paying the wholesale market price for electricity, their consumption patterns may rise and fall in the opposite direction to the market price.

DR1 proposed a standard method for calculating baselines, but also allowed participants to submit a customized baseline, which the four largest participants did. An evaluation report[86] showed that, while the standard baseline methodology was quite accurate in estimating load, the customized baselines greatly over-estimated participant load (and thus load reduction). Due to the size of the four largest companies, this had a significant impact on program results. In 2008, the average amount of DR paid for by the OPA for a given hour of activation was 102 MW; however, the true amount of load reduction attributable solely to the DR program was just 35 MW – an enormous difference.

The OPA has recognized these problems. As a result, DR2 and DR3 now have more stringent procedures for baseline calculation, and the OPA does not plan to continue to offer customized baselines for DR1 in the future.[87]

Reliability

If demand response is to be treated as a serious alternative to supply resources by system planners and system operators, it needs to deliver reliable results. Table 6 shows the load reduction capacity enrolled in the three OPA DR programs at the end of 2009, and the actual amount of load reduction that the OPA predicts these programs would be able to deliver on an *ex ante* (i.e., expected or going-forward) basis.[88]

Table 6: OPA Demand Response Program Capacity and Load Reduction Potential

Program	Load Reduction Capacity at end of 2009 (MW)	*Ex ante* Load Reduction Estimate (MW)
DR1	175	0.2
DR2	119	94
DR3	170	129

Source: Ontario Power Authority, letter to ECO, September 9, 2010

Table 6 shows that DR2 and DR3 deliver reliable demand response from a system planning perspective, as measured by the fact that the *ex ante* load reduction estimates are a substantial portion of the load reduction capacity. Several program features enable these programs to deliver reliable demand response. They require mandatory load reduction; have low baseline errors; and, impose financial penalties for non-compliance. DR1, in contrast, suffers from its voluntary nature and high baseline errors, and delivers an extremely low amount of reliable demand response. The total amount of demand response capacity currently in DR1 is not an accurate measure of the program's importance since many of the firms remaining in DR1 do not actively participate.[89] DR1 now functions primarily as a risk-free way for firms to experiment with participating in demand response programs, prior to migrating to DR2 or DR3.

On a short-term basis – the relevant time frame for the system operator – the reliability of the contractual DR programs is even greater. In 2009, DR3 delivered 82 per cent of the day-ahead contracted load reduction.[90]

In comparison with natural gas plants, the DR2 and DR3 programs also offer a benefit that could be called "distributed reliability". The availability of a gas plant is an all-or-nothing situation and an unanticipated outage reducing power by some 500 MW could place serious strain on the grid. In contrast, the load reduction provided by demand response is made up of the contributions of multiple firms, reducing variability.

Activation Timing

The above assessment measures how reliable participants are in reducing electricity consumption in response to program requirements. It does not, however, evaluate whether the DR programs are activated when they are needed most, that is, coinciding with times when demand is closest to exceeding available supply.

There is strong evidence that the activation mechanism for DR3 is not optimally hitting the hours of peak system need. Between August 2008 and October 2009, DR3 was activated 21 times by the OPA. If targeted perfectly, these 21 activations would have corresponded with a measure of system need, such as the 21 days with the highest hourly peak demand. Upon examination, only 5 of the DR3 activations occurred on these 21 days.[91]

The OPA has attempted to address this issue by modifying the activation mechanism for DR3 to require both high prices and a tight supply-demand balance. However, additional improvements may be needed.

Cost-effectiveness

There is something that feels economically unsound or even profligate about paying firms not to consume electricity. And in the near term, it is usually true that demand response is more expensive than the marginal cost of obtaining more generation from *existing* plants.[92]

The true value of DR is to offset future costs – to prevent new generators from being built, with their large capital costs that must then be recovered from ratepayers. How does the OPA's DR3 program stack up on a cost basis with its likely alternative – new natural gas single cycle peaker plants?

The OPA has estimated that the total cost of a single cycle gas plant (including associated transmission and distribution costs) that would only run during the top 88 hours of system demand in a year would cost approximately $1,187-$1,642 per MWh ($1.19/kWH-$1.64/kWH).[93]

By comparison, the cost of acquiring the same amount of demand response (88 hours) from a DR3 participant in the Toronto area is roughly comparable at approximately $1,000-$1,700 per MWh ($1.00/kWh-$1.70/kWh) depending on the contract length,[94] at least at first approximation.[95]

Other factors not captured in the market price comparison – avoided emissions of greenhouse gases and other pollutants, and social benefits from avoiding new generation – weigh in favour of demand response over natural gas peaking generators.

It should be noted, however, that the costs for either demand response or peaking generation are extremely high – some 20 times the average price of generation, and many times greater than on-peak rates.[96]

Issues and ECO Comment

Within a few years, the OPA has brought a large amount of demand response under contract. With the shift in enrolment from the voluntary DR1 program to the contractual DR2 and DR3 programs, the reliability of demand response as a system resource has increased dramatically, and the problem of overpaying for demand response due to baseline error has declined. As noted in section 2.0, the OPA has also taken steps to accurately measure the true system impact of demand response, by developing a rigorous evaluation protocol. The ECO commends the OPA for these accomplishments.

At an operational level, the greatest remaining need for improvement is activating DR at the right time. The economic case for DR3 relies on its potential to replace gas peaker plants at times of extreme system need, so it is critical that the OPA is able to target activation to exactly these times. The ECO supports the recommendation of the OEB Market Surveillance Panel[97] that the OPA work with the IESO to improve the advance forecast of supply and demand, which will enable more precise activation of DR3.

Questions also remain as to the appropriate scale of contractual demand response programs. The OPA is close to reaching its authorized capacity for demand response programs (500 MW), and would need to seek additional authority from the

Minister of Energy in order to expand participation in the DR programs. The OPA expects to seek this authority from the Ministry of Energy in the near future.[98] Therefore, it is an appropriate time to consider the role that contractual demand response should play in Ontario's electricity system.

Given the similar cost of DR to new natural gas peaker plants, and the additional advantages of reduced emissions and reduced social tension associated with building new generation, the ECO supports the principle that *additional demand response should be chosen in preference to building new gas peaker plants, wherever possible*. This disciplines the system and prevents unnecessary overbuilding of supply resources.

However, given the high cost of contractual demand response programs per unit of electricity, they should be treated as the "option of second last resort". DR programs should only be expanded if the demonstrated need exists (based on near- to mid-term forecast load growth).

When the Integrated Power System Plan was drafted, plans were on the drawing board for at least three new single cycle peaker plants.[99] However, since then, structural changes to Ontario's economy have reduced demand, perhaps permanently, while a large amount of new gas-fired generation has come on line and the government is rapidly expanding its renewable capacity through the feed-in tariff program. These events have greatly improved the near-term reliability of Ontario's electricity system, and may allow for some breathing room prior to procuring additional demand response (or building new peaking plants).

Since the government is enhancing the role of time-of-use pricing for both wholesale and electricity consumers,[100] this breathing room is helpful. Time-of-use pricing may reduce peak demand at much lower cost than contractual demand response programs.

Given the above points, the ECO believes that the role of contractual demand response programs should be reviewed in the revision of the Integrated Power System Plan (now renamed the Long-Term Energy Plan). A role will certainly remain (particularly for peak shedding programs such as DR3 to provide insurance against extreme weather events or generator outages), but it may be smaller than was originally anticipated. On the other hand, a new role for some form of demand response will emerge – namely balancing fluctuations in supply from renewable energy sources. It is unclear whether the existing contractual demand response programs can respond quickly enough to variations in supply to be useful for this purpose. Updates to the Long Term Energy Plan will allow the OPA to re-assess the need for new contractual demand response on a regular basis, and expand demand response capacity as needed to avoid building additional gas peaker plants, while minimizing cost to ratepayers.

The ECO recommends that the Ontario Power Authority only expand contractual demand response programs when this will eliminate a demonstrated near-term need for new peaking generation.

4.2 Natural Gas Utility Conservation Programs

Natural gas conservation in Ontario has not been as high profile as electricity conservation, perhaps because the Ontario government's role has not been as central in setting policy. However, as Volume One of our report highlighted, final energy consumption of natural gas in Ontario is almost double the consumption of electrical energy,[101] making the conservation potential of natural gas significant. The potential reductions in greenhouse gas emissions are also significant, as natural gas has a greater carbon content per unit of energy than does electricity in Ontario (given Ontario's

electricity supply mix). In addition to the government, the primary delivery agents for natural gas conservation in Ontario have been the two large gas utilities, Enbridge Gas Distribution and Union Gas.

Natural Gas Conservation Framework

Gas utilities have offered conservation programs since the mid-1990s. Their actions are regulated by the Ontario Energy Board (OEB), as funds for conservation programs are recouped through gas rates. The current framework for the regulation of natural gas conservation by the utilities was largely established by a 2006 decision of the OEB (case # EB-2006-0021).

The OEB decision included the following key elements:[102]

- Utility conservation budgets were set at approximately $20 million per utility per year, and would be gradually increased from 2006 levels.[103]
- Conservation planning would be done using use a three-year planning horizon.[104]
- Conservation programs would be required to be offered to all sectors (residential, commercial, industrial) and rate classes. The costs of conservation programs would be allocated to different rate classes in proportion to the amount of conservation spending on each class.
- Utilities would receive financial incentives tied to the performance of their conservation programs, in comparison with a conservation target.[105] Performance of conservation programs would be evaluated using the Total Resource Cost test (see section 2.0 for more information on this test).
- Evaluation of conservation performance would be the joint responsibility of the utility and an Evaluation and Audit Committee (EAC). The evaluation framework for natural gas conservation is described in section 2.0.

Utility Program Offerings

Following the OEB decision, Enbridge and Union filed three-year conservation plans that outlined their proposed conservation programs for 2007 to 2009, which were approved by the OEB. Both utilities proposed a broadly similar set of programs. The actual programs delivered in these years have closely followed the original three-year plans.

For residential consumers, utilities have focused on providing low-cost measures to reduce hot water consumption, such as free energy-efficient showerheads, aerators and pipe insulation. These programs have had a large reach – Union Gas delivered more than 80,000 energy savings kits in 2009 alone.[106] Utilities have also offered small rebates for the purchase of energy-efficient items, such as programmable thermostats and high-efficiency furnaces. Updates to government codes and standards have affected utility programming in the residential sector. For example, both utilities previously offered incentives for high-efficiency furnaces and for building new homes to Energy Star standards. Changes to the Ontario Building Code and product energy efficiency standards have raised minimum efficiency standards and made it difficult for utilities to cost-effectively offer incentives for higher levels of energy efficiency above the minimum standards.[107] As a result, both utilities have cancelled the incentive for high-efficiency furnaces, and Union has also cancelled the Energy Star For Homes incentive.

Conservation programs of other parties (particularly the provincial and federal government's Home Energy Savings Program/ecoENERGY program, discussed in section 4.4) have also competed with the gas utilities in the residential sector by providing incentives for natural gas conservation measures.

Programs for low-income consumers have included free programmable thermostats in addition to the above measures to reduce hot water consumption. Both companies have offered a free weatherization program to improve the building envelope through insulation and air sealing. However, these programs have only been available to a small number of customers in specific geographic areas.

Program offerings for commercial and industrial customers have been broader in scope. For small commercial customers, the focus has been on incentives for prescriptive technology improvements, such as energy recovery ventilators and pre-rinse spray valves for commercial kitchens. For larger customers, customized solutions have been more important, particularly for the industrial sector, given the process-specific nature of much of its energy use. Programs have included subsidized audits and performance testing of energy-intensive equipment such as boilers, in addition to financial incentives for purchasing energy-efficient equipment. Design assistance and incentives for energy-saving measures have been provided for new commercial buildings.

The 2006 OEB decision required the utilities to set aside $1 million per year from their conservation budgets for long-term market transformation initiatives. The goal of market transformation programs is not necessarily to deliver near-term energy savings, but to change the market in a way that will lead to long-term conservation benefits after the original program is discontinued. Examples include programs to boost customer awareness of specific energy efficient products or to build training to deliver energy efficiency services. In 2009, both utilities directed the bulk of their market transformation funds to promoting drain water heat recovery[108] to home builders and water heater providers, through information and financial incentives.

Program Results and Performance Against Targets

The conservation performance of Enbridge and Union Gas through the years 2007 - 2009 are shown in Tables 7 and 8, respectively. The 2009 results for Enbridge (in Tables 7 and 9) are based on draft results, as final results had not been filed with the OEB, as of October 2010.

Table 7: Performance of Enbridge Gas Conservation Portfolio 2007 - 2009

Year	Gas Savings[109]	Net Benefits – Target	Net Benefits – Actual	% of Target Achieved	Net Benefits ($) Per Utility Dollar Spent[110]
2007	85.1 million m^3	$150.0 M	$199.8 M	133%	9.7
2008	77.3 million m^3	$168.3 M	$182.7 M	109%	7.9
2009	74.4 million m^3	$210.4 M	$213.4 M	101%	8.4

Sources: Enbridge Gas Distribution, 2008, *Demand Side Management F2007 DSM Draft Annual Report*; Enbridge Gas Distribution DSM Evaluation & Audit Committee, 2008, *Enbridge Gas Distribution's 2007 DSM Audit Summary Report*; Enbridge Gas Distribution, 2009, *Demand Side Management F2008 DSM Draft Annual Report*; Enbridge Gas Distribution DSM Evaluation & Audit Committee, 2009, *Enbridge Gas Distribution's 2008 DSM Audit Summary Report*; Enbridge Gas Distribution, 2010, *Demand Side Management 2009 DSM Draft Annual Report*

Table 8: Performance of Union Gas Conservation Portfolio 2007 - 2009

Year	Gas Savings	Net Benefits – Target	Net Benefits – Actual	% of Target Achieved	Net Benefits ($) Per Utility Dollar Spent
2007	55.9 million m^3	$188.0 M	$215.9 M	115%	13.4
2008	62.9 million m^3	$180.2 M	$262.8 M	146%	13.0
2009	92.6 million m^3	$220.2 M	$308.3 M	140%	13.9

Sources: Union Gas, 2008, *Demand Side Management 2007 Evaluation Report (Final Audited Report)*; Union Gas, 2010, *Audited Demand Side Management 2009 Annual Report*

The gas savings reported are only the first year savings achieved from programs undertaken in the year in question (lifetime savings would be approximately 10 to 15 times this amount). To put this in perspective, the amount of reduction in gas consumption achieved by Enbridge from its 2009 conservation programs is approximately one-half of one per cent of the total volume of gas distributed by Enbridge in the same year.[111] This amount would be in addition to persistent savings achieved by programs delivered in earlier years.

As Tables 7 and 8 show, both utilities have exceeded their performance targets in all three years. However, Enbridge has not obtained its maximum financial incentive (recall that incentives to utilities are capped when the utility has reached 137.5% of the performance target) in any of the three years, while Union has obtained the maximum incentive in two of the three years.

The ECO notes with interest the very high values of net benefits per utility dollar spent. The difference in these values between Union Gas and Enbridge may reflect the difference in their customer base – Enbridge has a larger percentage of residential consumers, and the residential sector has delivered lower levels of net benefits than the commercial and industrial sectors. These values are shown in Tables 9 and 10, which break down conservation spending and results in 2009 by customer segment.

Table 9: 2009 Enbridge Conservation Results Divided By Customer Segment

Sector	Spending (% of total)	Gas Savings (% of total)	Net Benefits (% of total)
Residential Low-Income	$1.5 M (6%)	1.0 million m^3 (1%)	$3.0M (1%)
Other Residential	$10.5 M (41%)	16.2 million m^3 (22%)	$58.1M (27%)
Commercial, Industrial, Institutional, and Multi-Residential	$7.8 M (31%)	57.2 million m^3 (77%)	$157.0M (74%)
Market Transformation	$0.9 M (4%)	Not Applicable	Not Applicable
Evaluation & Administration[112]	$4.7 M (19%)	Not Applicable	-$4.7M (-2%)
Totals	**$25.4 M (100%)**	**74.4 million m^3 (100%)**	**$213.4M (100%)**

Source: Enbridge Gas Distribution, 2010, *Demand Side Management 2009 DSM Draft Annual Report*

Table 10: 2009 Union Gas Conservation Results Divided By Customer Segment

Sector	Spending (% of total)	Gas Savings (% of total)	Net Benefits (% of total)
Residential Low-Income	$2.2 M (10%)	2.7 million m^3 (3%)	$13.5 M (4%)
Other Residential	$2.8 M (13%)	4.5 million m^3 (5%)	$26.1 M (8%)
Commercial, Industrial, Institutional, and Multi-Residential	$9.7 M (44%)	85.3 million m^3 (92%)	$275.1 M (89%)
Market Transformation	$1.2 M (5%)	Not Applicable	Not Applicable
Evaluation & Administration	$6.3 M (28%)	Not Applicable	-$6.4 M (-2%)
Totals	**$22.2 M (100%)**	**92.6 million m^3 (100%)**	**$308.3 M (100%)**

Source: Union Gas, 2010, *Audited Demand Side Management 2009 Annual Report*

Tables 9 and 10 reveal that the commercial and industrial sector provides the lion's share of gas savings for both Union and Enbridge. In addition, program offerings in this sector deliver high gas savings and net benefits in proportion to the amount of money spent, whereas programs in the residential sector (especially programs for low-income consumers) deliver less

savings per dollar spent, reflecting the relatively higher proportional cost to deliver these programs. Given the incentive structure in place, this means that utilities are motivated to maximize the amount of conservation funds spent in the commercial and industrial sector.

Continuation of the Framework through 2010-2011

As noted in Volume One of the ECO's 2009 Energy Conservation Report, anticipated regulatory changes related to the *Green Energy and Green Economy Act, 2009* led the OEB to direct the gas utilities to use the existing gas conservation framework to develop their conservation plans for 2010 and 2011. The utilities' plans for these years have been quite conservative, changing little from the 2007-2009 plans in their program offerings. However, Enbridge did add a new industrial pilot program in 2010 to subsidize industrial metering and data collection equipment and fund on-site energy engineers for industrial firms. Enbridge has also adjusted its budget for 2011 to devote a larger share of its budget to market transformation initiatives ($3.8 million proposed, compared to $1.1 million for 2010).[113]

Issues and ECO Comment

As the OEB has now resumed its work in updating the regulatory framework for natural gas conservation (case # EB-2008-0346), the ECO will examine the framework in more detail in future reports.

At this time, the ECO limits our comments. The ECO notes that both gas utilities have been successful in achieving the conservation goals set out for them in 2007 through 2009 and makes two points that arise from its review of 2007 to 2009 program results: (1) the desirability of higher conservation budgets, and (2) the need to develop innovative conservation programming for the residential sector.

The very high values of net benefits per utility dollar spent in 2007 - 2009 indicate that natural gas conservation is delivering incredible benefits to the province, and is far from the point where additional spending on conservation would no longer be cost-effective. The ECO believes that higher conservation budgets would enable the capture of additional cost-effective conservation opportunities. These higher utility conservation budgets would likely result in additional investment in commercial and industrial conservation, perhaps through higher incentive levels that would attract additional participants. A report prepared for the OEB noted that the leading gas utilities in the United States spend substantially more on conservation (measured as a percentage of utility revenues minus the cost of gas) than do Enbridge and Union Gas.[114] The Minister of Energy has also expressed support for increasing conservation spending, in a directive to the Ontario Energy Board:

> I also urge the OEB to consider expanding both low-income and general natural gas DSM [Demand-Side Management, another term for conservation] efforts relative to previous years. While mindful of the OEB's responsibility to ensure the balancing of ratepayers' interests, I would support efforts by the

> OEB to expand DSM efforts in general, considering the scale of investments being made on electricity CDM [conservation and demand management] and the natural gas DSM experience and funding levels of other leading jurisdictions.[115]

The ECO also believes that the existing regulatory framework has served to limit the breadth and scope of residential conservation programs. Programming by gas utilities in this sector has stagnated and focused almost exclusively on low-cost hot water conservation measures. This is a consequence in part of the financial incentive structure (and the cost-benefit tests used), which encourages utilities to focus primarily on the commercial and industrial sector, and also to focus on "low-hanging fruit" – quick hits that deliver savings through cheap and simple technology change-outs.[116] Changes to the incentive structure may be required in order to drive innovative conservation programming in the residential sector.

The ECO also notes that the government, electric and gas utilities, and the Ontario Power Authority are all active in the residential sector. Given the high delivery costs associated with delivering conservation programs in this sector, there is a need for a coordinated approach that can address both gas and electricity savings. Co-operation has been fairly limited to date with gas utilities including compact fluorescent light bulbs in one of their residential programs. The ECO makes no conclusion as to whether the appropriate program lead is the gas or electric utility, the Ontario Power Authority or the government.

4.3 MicroFIT

Feed-in tariffs are an important tool that can be used to develop renewable energy sources. Quite simply, they are a guaranteed payment to renewable energy generators for every kilowatt-hour of electricity produced. Through these payments, they make renewable energy competitively priced with non-renewable energy sources.

The original form of a feed-in tariff is often attributed to the United States' *Public Utility Regulatory Policies Act*, enacted in 1978.[117] Since then, the policy surrounding FIT programs has evolved and over 75 jurisdictions worldwide have or are considering some type of feed-in tariff.[118]

Ontario has been a North American leader in developing a comprehensive feed-in tariff program. It has developed a tariff program with payment amounts differentiated by factors such as size, technology, and application. This current system has evolved from a more straightforward approach.

In 2005, the Minister of Energy requested that the OEB and OPA collaborate and develop a standard offer program that would remove barriers (e.g., financial and administrative) to small generators of renewable energy.[119] As a result, in March 2006 the OPA and OEB announced a Renewable Energy Standard Offer Program (RESOP).[120] The program was designed to help Ontario increase its renewable energy supply, while providing a streamlined pricing process for smaller generators (under 10 MW in capacity) using clean and renewable resources such as wind, water, solar photovoltaic (PV), and biomass.[121] The program offered stable pricing for a 20-year term and it had some success: over 1,400 MW of renewable energy was contracted under the program between November 2006 and March 2009.[122]

As of October 1, 2009, the RESOP was replaced by the Feed-in Tariff (FIT) Program, as introduced under the *Green Energy and Green Economy Act, 2009*. The Act facilitated the introduction of the feed-in tariff program by allowing the then Minister of Energy and Infrastructure to direct the Ontario Power Authority to develop an advanced renewable tariff program for biomass, biogas, waterpower, landfill gas, solar photovoltaic, and wind power. The program has two separate streams. One is called microFIT and applies to projects that are 10 kW or less in size, which is intended to attract small business,

organizational, and residential participation in Ontario's green energy sector. The FIT program applies to projects greater than 10 kW in size. For the FIT program, no size limit is placed on projects, except for hydroelectric facilities, unlike the 10 MW project size limit that existed under RESOP. Both FIT and microFIT are forms of advanced renewable tariffs because they pay different tariffs based on the technology and size of a generation installation. Our report addresses the microFIT portion of the Ontario program. The primary difference between the RESOP and microFIT programs is that microFIT contract prices are differentiated by size and technology and the microFIT pricing is generally higher than what was offered through RESOP. Existing RESOP contracts with a capacity of 10 kW or less that had all of the equipment purchased before October 1, 2009 were eligible for transition to the microFIT program and the corresponding tariffs.[123]

The tariffs paid for the program are designed to provide a renewable energy project developer with a reasonable rate of return on investment while covering the cost of purchasing, building, and maintaining the project. Prices are set so that each technology would receive the same rate of return on investment. However, the tariff amounts provided are different because each type of technology has different capital and maintenance costs.[124]

The increase in renewable energy resources in the province through RESOP and now through microFIT will help Ontario phase out coal-fired electricity. Ontario currently has 4,484 MW of coal-fired capacity and is in the process of phasing out coal-fired electricity by the end of 2014.[125] It is also intended to spur job creation in the province through domestic content requirements.

Table 11 provides information on progress made for the first three months of the microFIT program.

Table 11: 2009 Performance of microFIT Program

Energy Source	Number of Applications	Capacity of Applications Submitted kW (MW)	Number of Conditional Offers	Number of Contracts Connected to Grid	Capacity Connected to Grid kW (MW)
Solar Photovoltaic	1,745	13,403 (13.4)	866	43	191 (0.191)
Wind	13	70 (0.07)	5	0	0
Renewable Biomass	4	40 (0.04)	4	0	0
Landfill Gas	0	0	0	0	0
Water	1	1.5 (0.0015)	1	0	0
Biogas	0	0	0	0	0
Total	**1,763**	**13,514 (13.5)**	**876**	**43**	**191 (0.191)**

Note: In 2009, the application form did not distinguish between rooftop and ground-mounted applications
Source: Ontario Power Authority, letter to the ECO, September 24, 2010.

The microFIT program has sparked interest in the province: homeowners, farmers, small businesses, First Nations and community groups are investing in Ontario's green energy production.

Table 12: 2009 Tariffs for microFIT Projects

Renewable Technology	Price (¢/kWh)**	Contract Term (years)
Solar PV		
• *Rooftop*	80.2	20
• *Ground-mounted**	64.2	20
Wind	13.5	20
Waterpower	13.1	40
Biomass	13.8	20
Biogas	16.0	20
Landfill gas	11.1	20

Note: *This new price category was proposed on July 2, 2010 and finalized on August 13, 2010. Although this was not applicable during the ECO's reporting year, it is shown above for completeness. Please note that successful applications made prior to July 2, 2010 for eligible solar PV installations will fall under the 'Rooftop' category regardless of installation location.
** Prices are shown in ¢/kWh units, 80.2 ¢/kWh is equivalent to 802 $/MWh.
Source: Ontario Power Authority, microFIT Price Schedule – revised August 13, 2010

Issues and ECO Comment

The microFIT program, although growing rapidly, is still in its infancy and its true effectiveness cannot be measured until the program has fully established itself.

The ECO commends the OPA on its decision in August 2010 to establish a microFIT program advisory panel that will provide advice on program development. The ECO suggests there are two priorities that the panel should address and provide advice to the OPA: (1) public education of the contribution that microFIT in particular and renewable generation in general makes to Ontario's total province-wide electricity bill; and (2) the evolution of microFIT tariffs. For the latter, the panel could review the experience of other jurisdictions' feed-in tariffs. For example, some include a degression factor in the tariff, whereby rates are reduced to reflect declining costs of the technology over periods of time. The panel could also examine the role of time-differentiated pricing to help align renewable energy generation to system-wide and localized peak demand.

4.4 Home Energy Savings Program (HESP)

HESP's Performance

The Ontario government introduced a home energy audit and retrofit program, the Home Energy Savings Program (HESP), in April 2007. HESP rebates homeowners one-half of the cost of undertaking an energy audit (about $150). The audit recommends energy conserving retrofit measures to install (e.g, insulation, a new high efficiency furnace or windows). Homeowners then decide whether they will undertake a retrofit and choose which recommended retrofit measures they want to do. Depending on the measure selected, provincial grants of less than $100 to several thousand dollars are paid; the amount is matched by the federal government's ecoENERGY – Retrofit Homes program. By March 2010, HESP had improved the energy efficiency of nearly four per cent of Ontario's stock of existing homes. The $537 million program,[126] which has been popular with Ontarians, is set to expire in 2011. The federal government's ecoENERGY program will sunset in March 2011. The federal government stopped accepting applications to the program in March 2010.

Table 13 shows Ontarians' response to the program. Energy savings are shown as "in-year" savings, that is, the amount of energy conserved in that year as a result of home retrofits undertaken in that year. Like many conservation programs, energy reductions resulting from HESP persist for a number of years after a retrofit is completed, and the program pays continuing conservation dividends year-after-year for many years. Thus the cumulative lifetime energy savings resulting from the program would be higher than shown here.

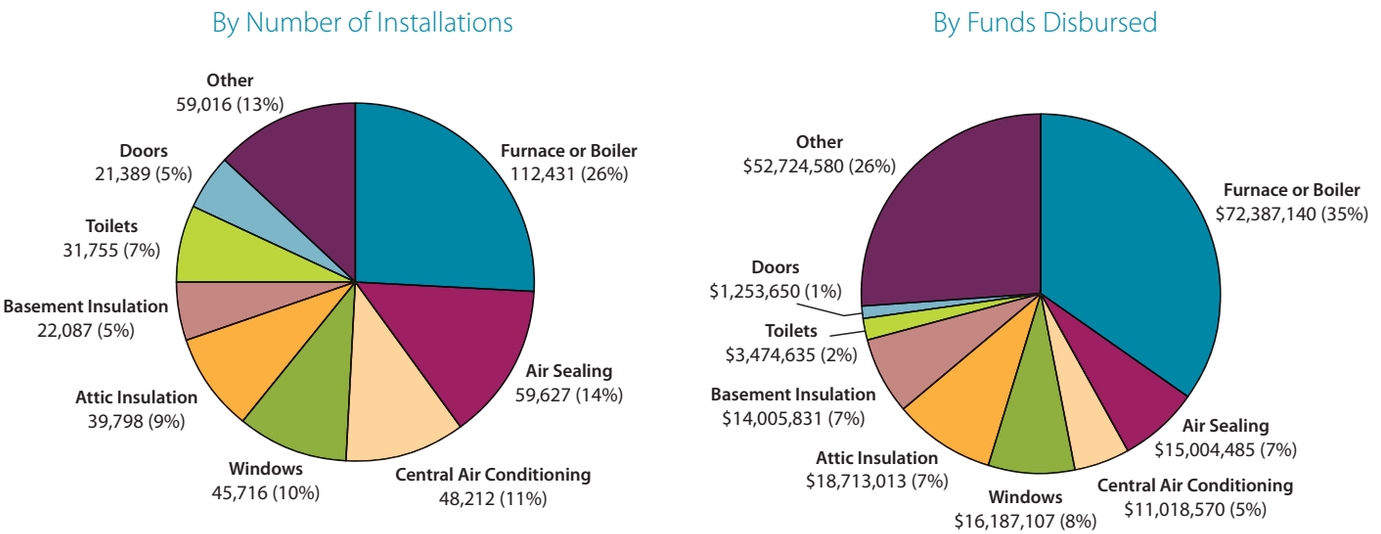
Table 13: HESP Performance and Annual Energy Savings

Fiscal Year[127]	Audits (000s)	Retrofits* (000s)	Grants Disbursed Audits ($ million)	Grants Disbursed Retrofits ($ million)	Energy Saved (million GJ)
2009/2010	207	107	31.0	150	4.1
2008/2009	97	42	14.5	45	1.9
2007/2008	39	9	5.9	9.8	0.39
Total	**343**	**158**	**51.4**	**204.8**	**6.39**

Note: * Retrofits represents the number of households that participated and completed a home retrofit. The total number of installations, as shown in Figure 4 below, is higher because some retrofits involve multiple measure installations.

Over the first three years that HESP has operated, the most common retrofit that has been undertaken is the installation of a new heating system – replacing an old furnace or boiler with a more efficient model. Some 112,000 have been installed (one-quarter of all HESP installations), accounting for 35 per cent of the total $204.8 million paid for retrofits in the first three years of delivery of HESP. The most common retrofits are shown in Figure 4. As it shows, one of the HESP's strengths is that a broad range of key retrofit measures to improve a home's energy efficiency has resulted from the program.

Figure 4: HESP Common Retrofit Measures, April 2007 - March 2010



The program has enjoyed only partial success in encouraging deeper or multiple measure retrofits. As Table 14 shows, nearly one-quarter of households participating in the program install only one measure when retrofitting their home.[128] Slightly less than 30 per cent install two measures, and nearly 20 per cent of households participating in HESP install three measures.

Table 14: Retrofit Measures Done by HESP Participants, April 2007 - March 2010

Number of Retrofit Measures	Number of Participants	Per Cent
1	37,066	23.5
2	46,302	29.3
3	31,341	19.8
4	19,000	12.0
5	11,251	7.1
6 or more	13,040	8.3
Total	**158,000**	**100**

For households that undertake multiple-measure retrofits, the most typical combinations involve installation of a new furnace and air conditioner or replacing a furnace and air sealing the home (e.g., caulking and weather stripping around doors, windows and sealing other gaps in the home's envelope). It is not typical for multiple-measure retrofits to install insulation as one of the measures.

The most common combinations of technologies in retrofits undertaken by Ontarians participating in HESP are shown in Table 15.

Table 15: Common Multiple Measure Retrofits, April 2007 - March 2010

Top 3 – Single Measure Retrofits	Number of Occurences	Per cent of Total Retrofits	Average Rebate Incentive ($)
Furnace	26,546	17	670
Windows	2,788	2	360
Attic Insulation	2,212	1	474
Top 3 – Two Measure Combinations	**Number of Occurences**	**Per cent of Total Retrofits**	**Average Rebate Incentive ($)**
Air Conditioning (AC) and Furnace	17,984	12	233+670 = 903
Air Sealing and Furnace	6,875	4	260+670 = 930
Toilet and Furnace	2,723	2	114+670 = 784
Top 3 – Three Measure Combinations	**Number of Occurences**	**Per cent of Total Retrofits**	**Average Rebate Incentive ($)**
Air Sealing / AC / Furnace	4,952	3	260+670+233 = 1,163
AC / Furnace / Attic Insulation	1,553	1	233+670+474 = 1,377
Windows / AC / Furnace	1,499	1	360+233+670 = 1,263

Issues and ECO Comment

After three years of operation, the picture of HESP that emerges is that of a popular program[129] leveraging federal government, OPA and gas utility programs with consumers' own investments. As Table 13 shows, participation has more than doubled each year. Without a major marketing campaign, it has raised awareness of conservation. About 63 per cent of the energy savings resulting from HESP are related to heating homes with natural gas; HESP thus complements natural gas utilities' demand-side management activities since gas distributors offer limited assistance (see section 4.2).

Overall, the program performs adequately and is particularly effective for improving the performance of older vintage homes, that is, houses constructed prior to 1970. It has also helped stimulate market penetration of higher cost efficient equipment like ground source heat pumps[130] that currently have a low market share. The claimed energy savings are encouraging but are less than the maximum savings possible if all recommended retrofit measures were completed. The Ministry of Energy should report the actual achieved energy savings compared to the maximum potential savings.

Despite the solid performance of HESP, the ECO notes several concerns. First, the program's fairly high level of lost opportunities – a key cause is single measure retrofits – lowers the program's effectiveness. To date, about one-quarter of households participating in the program install only one measure when retrofitting their home.

Second, as with other programs reviewed, HESP provides another example of the need for measurement of results, especially now that Ontario may be the sole program provider. There are concerns related to verification of the claimed energy savings. The ministry has been evaluating and analyzing various elements of the program, but does not have a formal evaluation protocol (see section 2.0). It relies on the federal government's calculation of household savings from estimates produced by the modeling software used in the audit. No sample bill analysis, metering or other verification is done to confirm the accuracy of the estimates. The ECO believes the ministry should survey a sample of retrofitted homes to determine the accuracy of the calculations.

Third, although the ministry has conducted some cost-benefit analyses, the program's cost-effectiveness is unknown since factors like free ridership, spillover and persistence effects, which are under development, are not yet available.[131] Considering the large amount that will be spent on the program ($537 million), information should be provided to judge whether HESP has produced acceptable per household savings at a reasonable cost.

A final ECO concern is the program's reach. In the first three years that the program has been operating, it has retrofitted four per cent of Ontario's existing housing stock. Accordingly, it will take decades to upgrade the entire housing stock. To build a robust conservation culture, the program would have to be scaled up (or the market somehow otherwise transformed) to achieve large energy savings and contribute meaningful emissions reductions to Ontario's climate change targets.

HESP is ending in March 2011, however, eligible program participants have until March 2012 to complete the retrofits. Currently, Ontario is forecasting large budget deficits for coming years, and it is therefore possible that the program will not be renewed because of pressure to reduce spending.[132] Facing these financial pressures, the government has perhaps three options: let the program end (encouraging its adoption by a third party like gas utilities); renew the program with its current design (using tax or ratepayer money); launch a redesigned successor program (e.g., providing only audits, or lowering grant amounts, or targeting older high consumption homes).

The ECO believes that some form of home energy retrofit program should continue to be offered in Ontario. Since much of the existing housing stock was built before there were energy performance standards in the Building Code, great opportunity exists to improve the efficiency of the residential sector. Uncertainty about the program's future will negatively

affect conservation capacity in the province – the existence of companies that perform audits and retrofits. The ECO urges the Minister of Finance to inform Ontarians as soon as possible whether the government will continue to deliver a program.

Currently, there is no publicly available data about the program. A report on the HESP's performance should be made public, detailing its operation and cost-effectiveness, and providing independently verified energy savings and GHG reductions. If the government decides to continue HESP or offer a renewed program, going forward the ministry should issue an annual report. This report should use a methodology compatible with those used by the OPA and distribution utilities to report savings, and the report should show how the program accounts for adjustment factors like free ridership. If the program is ratepayer funded, the report should demonstrate the system-wide benefits achieved, as well as the balance (over or under spent ratepayer contributions) held in special fund accounts established to pay for the program.

If the government decides to withdraw from delivering a home retrofit program, the ECO believes that it should assist third parties (private sector, utility or non-governmental sector) with direction on administration of the program. There is a large amount of existing program data. The Ministry of Energy should make this data available (after ensuring confidentiality of program participants) and assist these parties to establish a program design. An "open source" approach to data could lead to program innovation and effective design.[133]

The ECO urges the ministry to assist third parties to scale up the program by enacting supportive policies, for example, passing a regulation to require the *Green Energy Act, 2009* provision for mandatory energy ratings at time-of-sale of a property.[134] This would equip some 213,000 resale homes[135] annually with information to undertake a retrofit, and is the sort of value added policy support that government should provide to build capacity and assist market transformation to a high efficiency residential sector.

4.5 Ontario Solar Thermal Heating Incentive (OSTHI)

The Ministry of Energy is promoting growth in clean and renewable sources of energy for space and water heating through the Ontario Solar Thermal Heating Incentive (OSTHI). The government has allocated $14.4 million to be available via rebates under the OSTHI program from June 20, 2007 to March 31, 2011.[136] The fund was established to encourage entities in the industrial, commercial and institutional (ICI) sectors to install solar thermal heating equipment in Ontario.

The OSTHI program matches funding provided by the federal government's ecoENERGY for Renewable Heat program - providing up to $400,000 per solar water installation and $80,000 per solar air installation.[137] Through funding from both the federal and provincial governments, participants can receive as much as $800,000 per solar water installation and $160,000 per solar air installation. The total corporate maximum incentive for multiple installations from these programs is $2 million.

To be eligible for this funding, an applicant to OSTHI must be an ICI entity situated in Ontario and have submitted an application to Natural Resources Canada (NRCan) for the ecoENERGY for Renewable Heat program on or after June 20, 2007. October 1, 2010 was the last date to submit an application to either program.[138]

Since this initiative focuses on space and water heating, it targets energy reductions for multiple fuels that are currently used for these purposes. These fuels can include natural gas, propane, electricity, and heating oil. The application of solar thermal technology is economic for larger energy users. Targeting the ICI entities, which often have open areas for installations and/or require large amounts of heated water, has the potential for large reductions of energy generated from conventional sources. Solar heating systems are also typically more cost-effective for larger buildings, so the incentives needed to induce a switch to solar heating may be smaller for entities in this sector, when measured as a percentage of the solar heating system's total cost.

To facilitate the application process, NRCan has the primary responsibility for administering this program.

What is solar thermal heat?

Solar thermal collectors are different from solar photovoltaic cells. Solar photovoltaic cells transform the solar energy into electricity, which is then used as an energy source. By comparison, solar thermal collectors absorb the sun's energy and transform it into usable heat by transferring the heat either directly to air or to a heat-transfer fluid. The use of fans or pumps is needed to transport the heated air or fluid either to a storage device or for direct use.[139] For most buildings, a traditional heating system would still be needed to supplement the solar heating system, particularly during periods of extreme weather.

In 2007, it was estimated that 544,000 square metres (m^2) of solar collectors existed in Canada. Of these, 71 per cent were for pool heating and 26 per cent were for commercial building heating.[140] This installation capacity delivers about 627,000 gigajoules (GJ) of energy.[141]

As of February 2010, the former Ministry of Energy and Infrastructure reported the following progress for the implementation of the program:[142]

Table 16: Progress of OSTHI from June 2007 – February 2010

Category	Quantity
Funds Committed	$ 6.3 million
Projects Installed	332 (158 solar water and 174 solar air)
Total Energy Savings (estimated)	120,730 GJ/year
Total GHG Savings (estimated)	8,253 tonnes/year

The ministry has committed over 40 per cent of the program's funding towards hundreds of solar thermal projects.[143] Of the solar thermal systems installed, there have been at least 5 in hospitals, 6 in seniors' homes, 7 in non-profit housing, and 15 in recreational buildings.[144]

Issues and ECO Comment

The Ministry of Energy estimated the amount of fossil fuel-based energy saved by a typical OSTHI participant to be as much as 25 to 50 per cent.[145] The ECO notes that these savings are only estimates, as the ministry does not audit systems to verify the claimed savings. However, approximately 10 per cent of the systems are audited by Natural Resources Canada.[146] The Ministry of Energy has indicated that it is performing an internal review of the economic impact, cost effectiveness and energy savings – the results of which are not yet known. The ECO acknowledges that an extended sampling period may be needed to accurately measure results, given the variation in system performance due to weather conditions.

The ECO believes that the ministry should use an appropriate evaluation framework, as discussed in section 2.0 of this report, to verify data, assess the program's results in a timely manner, and optimize future program implementation.

4.6 Municipal Eco Challenge Fund (MECF)

Ontario's municipalities can play a significant role in reducing Ontario's energy demand. In providing basic services, municipalities annually spend approximately $680 million for electricity, more than four per cent of the total provincial consumption, and $275 million on natural gas.[147]

In June 2007, the government announced the Municipal Eco Challenge Fund (MECF) to help municipalities reduce energy consumption and GHG emissions.[148] The MECF was to provide $20 million to audit and retrofit municipal buildings. The program had two components: $14 million for infrastructure projects; and, $6 million to support municipal capacity building.[149] Municipalities could apply for up to $10,000 for an energy audit, $100,000 for a standard retrofit project and up to $500,000 for a showcase retrofit project demonstrating emerging technologies.[150] As part of the MECF, the Association of Municipalities of Ontario's Local Authority Services (LAS) received a $3.9 million funding agreement for municipal capacity building programs.

In March 2009, the former Ministry of Energy and Infrastructure (MEI) notified applicants that the program was cancelled and no further grants would be awarded.[151] In response to an information request from the ECO, the ministry indicated that funding for the MECF was removed from the ministry's 2009/2010 budget as part of the government's saving strategy.[152]

Municipal applications were solicited in two rounds. In the first round of funding, 30 energy audits, 63 standard retrofit projects and 5 showcase projects received funding.[153] Due to the program's cancellation, none of the 58 applications from the second round received funding. In total, the MECF provided $2.6 million of the $14 million to 53 municipalities.

MECF's Capacity Building – Measure to Manage

The Association of Municipalities of Ontario's Local Authority Services undertook an energy benchmarking project using $720,000 from the Municipal Eco Challenge Fund's (MECF) capacity building component. The Municipal Energy Performance Benchmarking Project enabled municipalities to compare the energy performance of their facilities to various benchmarks and provided an overview of how the sector performs in managing energy. Four performance metrics (energy use, technical, organizational and management best practices) were examined in 393 facilities (e.g., offices, social housing, sports complexes) from 120 municipalities.

Results showed significant unrealized energy savings potential: the average facility in each building category had an energy intensity 21 per cent greater than its best-in-class benchmark target. The project showed the need for program and policy support from senior levels of government, as most municipalities have little capacity to address energy efficiency. With the government's abrupt cancellation of the MECF without a program evaluation, it remains to be seen whether this support will be forthcoming and the identified conservation benefits will be realized.

Program Results

Of the 63 standard retrofit projects funded, approximately 10,527 MWh of annual electricity consumption savings, and 463,380 m^3 of natural gas savings were reported by municipalities to the ministry.[154] The ministry calculates these retrofits will result in annual carbon dioxide (CO_2) reductions of approximately 7,497 tonnes based on projected energy savings reported by the municipalities.

Issues and ECO Comment

The ECO disagrees with the ministry's decision to cancel the MECF program without a program evaluation. Based on the rapid uptake and initial results, the program seemed to be meeting its objectives. In the 2007 *Go Green: Ontario's Action Plan On Climate Change* report, the government expected eight per cent of the 2014 emissions reductions target would be achieved through the "Municipal Eco Challenge and other actions."[155] The municipal sector remains a significant source for potential energy and GHG reductions.

The ECO urges the Ministry of Energy to provide municipalities with support to improve their energy efficiency. The ECO suggests, given budgetary constraints, that policy and regulation to assist capacity building be provided. The government has the authority to require municipalities to prepare conservation plans and meet targets under the *Green Energy Act, 2009*. The ECO believes the government should proceed immediately with such a regulation, and add any amendments, for example related to water conservation, at a later date.[156]

4.7 The OPS Green Transformation Strategy

The Ministry of Government Services (MGS) created the OPS Green Office in September 2008 to help reduce the government's internal environmental footprint.[157] The office works with the Climate Change Secretariat, the Premier's Parliamentary Assistant and ministries to promote an integrated approach to environmental sustainability within the Ontario Public Service (OPS).[158] Its goal is to reduce energy consumption across the OPS, transform the OPS into a green consumer, and develop a green culture among employees.

On April 22, 2009, the OPS Green Transformation Strategy (the "Strategy"), as developed and led by the OPS Green Office, received approval from the Cabinet Committee on Ontario's Economic Future.[159] The Strategy sets a multi-year consumption reduction plan and is focused on the following areas: energy efficiency; greening buildings; waste diversion; print and paper; transportation; and, reduced travel through virtual meetings.[160]

The Strategy commits the Ontario government to greenhouse gas reduction targets aligned with the province's Climate Change Action Plan. Specifically, the OPS Green Transformation Strategy has an annual reduction target for vehicle fuel consumption, air travel, and energy in facilities of five per cent for each category from 2009/2010 to 2013/2014. (Progress in these areas is already being made. Although it falls outside of our 2009 reporting year, between 2009/2010 and 2010/2011, the number of hybrid vehicles in the OPS fleet increased by 46 per cent, from 513 to 748, and the number of non-hybrid vehicles decreased by 3 per cent, from 7,628 to 7,377.)[161] The OPS is also currently testing anti-idling technology on selected vehicles that maintain power for critical operational equipment without needing to be powered by the idling vehicle's battery. This technology could significantly reduce fuel consumption in enforcement and monitoring type vehicles.

Under the OPS Green Office, and to support the OPS Green Transformation Strategy, the government established a Green Government Task Force (GGTF).[162] The task force is meant to provide strategic support in a variety of areas, such as: fleet management, facilities, procurement, information technology, and environmental protection.

For the purposes of our report, the ECO has examined two energy efficiency programs under the OPS Green Transformation Strategy. These are a power management strategy and an environmental awareness campaign.

OPS Power Management Strategy

In July 2009, MGS implemented an OPS-wide policy to conserve electricity consumption in offices through adjusted power settings for all OPS computers.[163] The settings were adjusted such that computer monitors and central processing units would transition into standby mode after 5 and 15 minutes of idle time, respectively.

Under this program, about 83 per cent of desktops in the OPS had their power management settings adjusted between July 2009 and March 2010.[164] The remaining 17 per cent of devices were exempt because they provide critical services and business operations. Effectively, all existing eligible computers within the OPS had their desktop settings adjusted under the Power Management Strategy. Furthermore, all new computers will use these settings as required by GO-ITS 93, a Government of Ontario Information Technology Standard. Under GO-ITS 93, all computer clusters and ministries are to report annually, by September 30, on the status of Green I&IT improvement.[165] Reporting includes outlining the date of each computer installation, and the power settings that are and are not implemented.[166] MGS will record, verify, and report on power management implementation and the resultant energy savings annually.[167] The ministry estimates that this initiative could result in 19 million kWh per year of saved energy, which is enough energy to power about 1,700 homes for one year. It should be noted that this initiative supports the government's commitment to reduce electricity in its facilities by 20 per cent by 2012, as discussed in section 3.4 of this report.

OPS Unplugged

The first annual OPS Unplugged information campaign ran from late August until November 2009.[168] Its purpose was to promote energy conservation in the workplace while reducing standby power consumption in non-networked office devices. The campaign specifically targeted electricity reduction, since unplugging the equipment would reduce electricity demand. Targeted devices included televisions, DVDs, VCRs, projectors, stand-alone printers and scanners, fax machines, and paper shredders.[169] Similar to the OPS Power Management Strategy, this initiative also supports the government's commitment to reduce electricity in its facilities by 20 per cent by 2012, as discussed in section 3.4 of this report.

A two-week inter-ministerial challenge took place from September 28 – October 9, 2009.[170] During that time, 2,000 devices were unplugged permanently. The estimated electricity saved from the 2009 campaign was 47,200 kWh per year.[171] The fall 2010 campaign will be the last year this program is offered as an inter-ministerial challenge through MGS. For each year beyond 2010, individual ministries are expected to develop and implement their own programs for non-network office devices.

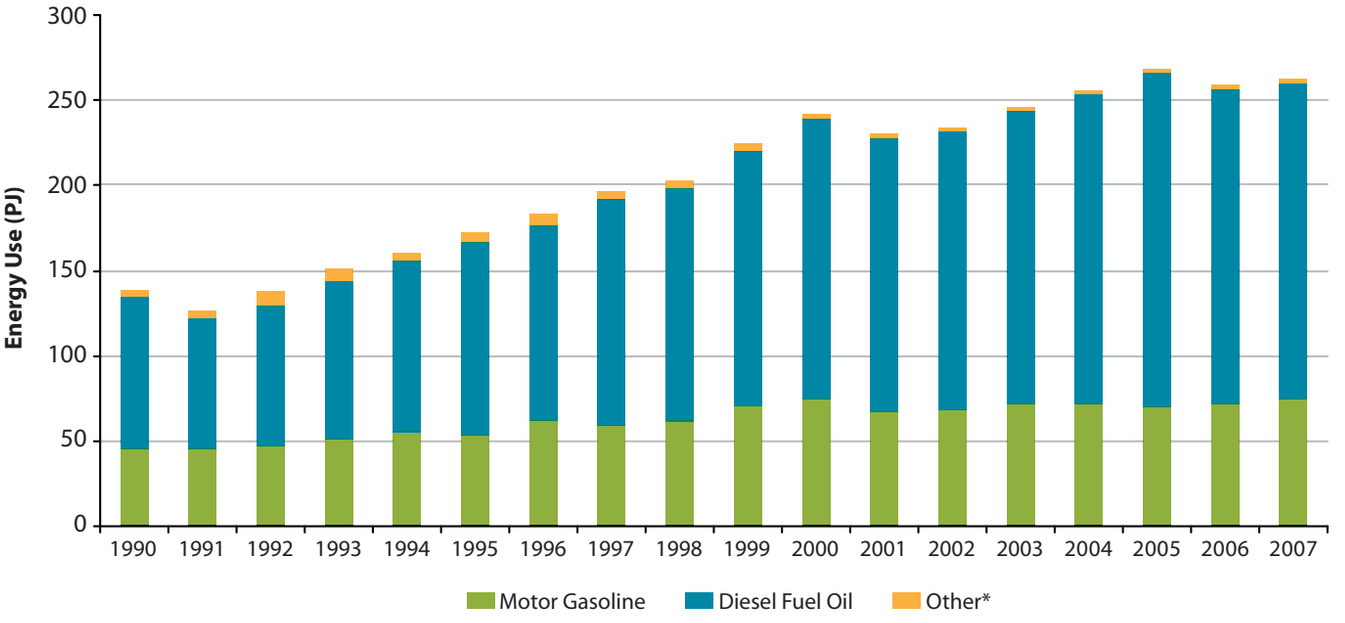
4.8 Green Commercial Vehicle Program

Transportation accounts for the highest energy demand in Ontario, of which freight transportation is a significant component. In Ontario, trucking is the dominant mode of transport for goods movement.

Within the transportation sector, freight trucks alone account for a third of both energy use and greenhouse gas (GHG) emissions, and are the fastest growing users of energy.[172] From 1990 to 2007, freight trucking experienced a 90 per cent increase in both energy use and in GHG emissions. The increased use of freight trucks during this period is partly explained by many companies adopting a just-in-time delivery system that demands expedited shipping to minimize the amount of excess inventory.

Fuel consumption and GHG emissions are intimately connected in the transportation sector. Since the combustion of petroleum-based transportation fuels releases GHG emissions, decreasing their consumption would result in decreased GHG emissions. As shown in Figure 5, the trend in trucking for Ontario has been a significant increase in diesel fuel. The primary fuel type for freight trucks is diesel, followed by gasoline. The share of alternative fuel use for commercial vehicles is negligible, representing about one per cent.

Figure 5: Road Freight Transportation Energy Use by Fuel Type



Note: *Other category includes natural gas and propane.
Source: Natural Resources Canada, Comprehensive Energy Use Database, 1990 to 2007.

In August 2007, as part of the province's *Go Green: Ontario's Action Plan On Climate Change*, the government announced the Green Commercial Vehicle Program (GCVP) with the goal of reducing greenhouse gas emissions through reduced fuel consumption from the commercial vehicle sector. The province originally committed $13.9 million in grants over four years to this program to encourage the sector to purchase dedicated alternative fuel vehicles (AFV) and retrofit heavy-duty vehicles with anti-idling devices.[173]

The funding allotted for the GCVP is divided into two types of grants: $11 million for purchasing an alternative fuel vehicle; and, $2.9 million for the purchase of an anti-idling device for heavy-duty trucks.[174] Companies can apply for up to a third of the incremental cost (over a conventional vehicle) of purchasing a hybrid or alternative fuel vehicle. Eligible alternative fuel vehicles are hybrid engine, dedicated natural gas, propane, or other dedicated alternative fuel engines at the discretion of the ministry.

Companies can also apply for a third of the cost to purchase an anti-idling device for heavy-duty trucks. Also, until June 30, 2010, the GCVP complemented the Retail Sales Tax (RST) rebate for dedicated alternative fuel vehicles (the RST rebate for AFVs was terminated with the introduction of the Harmonized Sales Tax (HST) on July 1, 2010).

Programs like the GCVP are important in helping fleets overcome financial barriers affecting adoption of technologies that contribute to reducing energy intensity and lowering emissions in freight movement. As a condition of receiving a grant,

companies must allow the Ministry of Transportation to collect data for one year to measure the fuel and GHG savings from alternative fuel vehicles and anti-idling devices.[175] Once all of the data have been collected, validated and analyzed, the ministry intends to publish the results of the fuel and GHG savings on its website.

Program Results

As of September 2010, the ministry had issued 183 grants for AFV purchases and 1,108 retrofit grants for anti-idling devices. The GCVP has awarded approximately $3.2 million in grants (of the $13.9 million available).

The program has not been as successful as anticipated. Grants sought for AFVs have been much lower than the ministry expected. Of the $11 million allotted for AFV grants, the ministry has issued about $1.3 million. Among the reasons for this, according to the ministry, are that fleet managers remain cautious about adopting alternative fuel commercial vehicles, and the impact of the 2008/2009 recession on businesses capital expenditures. As well, limited market availability of commercial AFVs has also resulted in some applications being postponed or rejected. Hybrid electric vehicles represented almost 90 per cent of the grants issued for AFVs.

The uptake of grants for anti-idling devices, on the other hand, has been more successful. More than 1,100 grants have been issued totalling approximately $1.9 million – almost two-thirds of the available $2.9 million. With industry adoption being low and grants targeted at the first years of the program, MTO is no longer providing funding to any new applicants. MTO is now focusing its attention on analyzing data received from grant recipients so that it can provide results to government and the commercial sector.

Issues and ECO Comment

The most basic tool needed to address energy and emissions reductions is measurement. The more fleet managers track and understand their fuel use, the more likely that fuel consumption can be managed. Considering the lack of data on freight transportation, and in particular on fuel consumption, the ECO is encouraged that the ministry has taken steps to incorporate measurement and reporting of results in the GCVP. Fleet owners and operators have taken steps to improve fuel efficiencies so they can reduce operating costs, stay competitive and cut emissions.[176]

Once the results are compiled, the ECO believes that the ministry should provide a report in 2011 that analyzes the program's effectiveness, and make recommendations on whether and how the program should be expanded. If the program is continued or expanded, the ECO will monitor the results for possible inclusion in future reports.

Endnotes

[1] For a description of the amendments to existing legislation see Bill 150, schedules A to K, information is available from the Ontario Legislature at www.ontla.on.ca.

[2] For a full description of the amendments, see the *Environmental Bill of Rights,1993* Section 58.1 at www.e-laws.on.ca, and: Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume One): Rethinking Energy Conservation in Ontario* (Toronto, Ontario: 2010).

[3] National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. <www.epa.gov/eeactionplan>

[4] A similar rule will apply to electric utilities for OEB-approved programs under the new electricity conservation framework.

[5] Ontario Energy Board, *Natural Gas Demand Side Management Generic Issues Proceeding (EB-2006-0021) Decision With Reasons*, 2006. This rule does not apply to pilot programs or market transformation programs.

[6] Ontario Power Authority, *Evaluation, Measurement & Verification Framework for Ontario Power Authority Conservation Programs Final Version 1.0*, 2008.

[7] Ontario Power Authority, *Protocols for Estimating Load Impacts Associated with Demand Response Resources in Ontario*, 2009.

[8] Ontario Power Authority, *2008 Final Conservation Results*, 2010, 2.

[9] Ontario Power Authority, *2010 Prescriptive Measures and Assumptions; 2010 Quasi-Prescriptive Measures and Assumptions*, 2010. A copy of the detailed measures and assumption guidelines is available online at: Ontario Power Authority, "Conservation: Measures and Assumptions," http://www.powerauthority.on.ca/Page.asp?PageID=1224&SiteNodeID=483 (accessed November 2, 2010).

[10] Navigant Consulting Inc, *Measures and Assumptions for Demand Side Management (DSM) Planning*, prepared for the Ontario Energy Board, 2009.

[11] Province-wide programs co-ordinated by the Ontario Power Authority will not be subject to Ontario Energy Board oversight.

[12] Ontario Energy Board, *Conservation and Demand Management Code for Electricity Distributors (EB-2010-0215), Conservation and Demand Management Code for Electricity Distributors*, September 16, 2010.

[13] See supra 5.

[14] Ministry of Energy and Infrastructure, e-mail message to ECO staff, August 4, 2010. *Questions for MEI for ECO 2009 Report, Volume 2, 4*.

[15] Ibid.

[16] Ontario Regulation 66/10, Assessments For *Ministry of Energy and Infrastructure Conservation and Renewable Energy Program Costs*, made under the *Ontario Energy Board Act*, *1998*.

[17] Premiers committed to achieving a 20% increase in energy efficiency by 2020 in their respective jurisdictions. They agreed on a five-point plan for achieving this: enhance the Model National Energy Code for Buildings by 25% by 2011; add energy efficiency as the fifth core objective to the National Building Code of Canada; increase the numbers of energy-using products covered by minimum energy performance standards; adopt green building policies for new construction of government-funded facilities, including sustainable procurement guidelines for energy and water use; and, implement a public or private mechanism in each jurisdiction so that individual homeowners have access to energy efficiency home audits and assistance with energy efficiency retrofits.
Council of the Federation, "Successful Fifth Annual Summer Meeting for the Council of the Federation," News Release, 18 July 2008.
Council of the Federation, "Climate Change: Fulfilling Council of the Federation Commitments," News Release, 18 July 2008.

[18] Ontario Power Authority, *2007 Final Conservation Results*, 2009, 3.

[19] Minister of Energy Dwight Duncan, letter to Mr. Jan Carr, CEO of Ontario Power Authority and Members of the OPA Board of Directors, Regarding the commencement of long-term planning exercise and request for recommendation on supply mix, May 2, 2005.

Minister Duncan requested a report that would make recommendations with respect to conservation targets for 2015, 2020 and 2025. The Minister indicated that the OPA, when making recommendations, should take into account the electricity conservation target of 1,350 MW already set for 2007. In December 2005, the OPA reported with the five-volume *Supply Mix Advice Report* containing recommendations for options on the future development of the electricity system.
See *Supply Mix Advice Report*:
Ontario Power Authority, *Supply Mix Advice Report Volume 1 – December 2005, Part 1-3 Compendium of Recommendations*. http://www.powerauthority.on.ca/Report_Static/1140.htm (accessed September 29, 2010).

The Minister considered the report and in June 2006 directed the OPA to create an Integrated Power System Plan (IPSP) to reduce projected peak demand by 1,350 MW by 2010 and by an additional 3,600 MW by 2025. No mention was made of other targets specified in the Minister's May letter.
See Minister's Directive to the OPA:
Minister of Energy Dwight Duncan, letter to Dr. Jan Carr, CEO of Ontario Power Authority, Regarding the Integrated Power System Plan, June 13, 2006.

[20] The 2025 target was to be achieved from a baseline year of 2005. It is part of the Integrated Power System Plan's 20-year planning horizon of 2007-2027 taking into account conservation after 2005. The OPA's estimated reduction in peak use expected by 2025 ranged from a low of 1,800 MW to a high of 4,300 MW achievable from conservation. This amount was in addition to the 1,350 MW conservation savings that had already been targeted by the government for 2007. Because of uncertainties in the forecast (e.g., the baseline used for the demand forecast already included assumptions about savings from conservation, and the ability to estimate conservation gains), the OPA chose the lower range expected for conservation. For the purposes of long-term planning, the 1,800 MW estimate (five per cent of requirements) was considered reasonable and prudent because of the high level of certainty that it will be achieved.
See *Supply Mix Advice Report*:
Ontario Power Authority, *Supply Mix Advice Report Volume 1 – December 2005, Part 1-3 Compendium of Recommendations*. http://www.powerauthority.on.ca/Report_Static/1140.htm (accessed September 29, 2010).

[21] Ontario Ministry of Energy. "Seeking Ontarians' Views on Our Energy Future", News Release, 20 September 2010.

[22] The OPA's definition of "behind-the-meter" generation is customer-based generation resources that are less than or equal to10 MW and serve the purpose of load displacement (i.e., customer-based generation resources which do not have their electricity output separately metered and which reduce demand from the grid). This is slightly different from the original definition in the Integrated Power System Plan. The new definition does not include renewable resources procured through the Feed-in Tariff (FIT) and microFIT programs, as these are metered separately and considered to be supply resources. However, somewhat confusingly, it does include renewable energy projects less than or equal to 500 kW contracted through the Renewable Energy Standard Offer Program (RESOP) prior to 2009, before the definition was revised.

[23] PeakSaver, a demand response program targeted at residences and small businesses that directly controls loads like air conditioners and water heaters, is an exception since these savings are due to technology installations that are not reacquired each year and persist year after year.

[24] Chief Executive Officer of the Ontario Power Authority Colin Anderson, letter to the ECO in response to ECO inquiry, September 9, 2010. *OPA Response to ECO Request for Information, 2*.

[25] Of course, facility closures and reductions in production lead to reductions in electricity demand. However, these reductions in demand are not due to conservation action and cannot be counted towards the 2010 demand reduction target.

[26] Minister of Energy Dwight Duncan, letter to Dr. Jan Carr, CEO of Ontario Power Authority Regarding the Integrated Power System Plan, June 13, 2006.

[27] The OPA's analysis of peak demand savings as of 2007 included 317 MW of demand response. None of this should be considered to persist towards the 2010 target, as demand response capacity needs to be re-acquired each year. The OPA's analysis of post-2007 savings (towards the 2010 target) already includes all demand response capacity under contract as of the end of 2009.

[28] The OPA's rationale for this is contracted capacity is similar to the nameplate capacity that is used to plan and track peaking type supply resources. This is a defensible assumption for the contractual DR2 and DR3 programs, which have much higher levels of reliability than DR1, as discussed in section 4.1.

[29] Freeman, Sullivan & Company, "2009 Impact Evaluation of Ontario Power Authority's Commercial & Industrial Demand Response Programs", prepared for the Ontario Power Authority, September 9, 2010.

[30] See supra 12.

[31] The *Energy Conservation Responsibility Act*, *2006* established the legislative framework for the installation of smart metering in Ontario homes and small businesses.
Ontario Ministry of Energy, "Building a Culture of Conservation in Ontario," News Release 28 March 2006

[32] Ontario Energy Board, "Quarterly Monitoring Report on Smart Meter Deployment and TOU Pricing," November 20, 2009 report.

[33] The Regulated Price Plan is an electricity pricing plan where prices (tiered and time-of-use) are set by the OEB for residential and certain designated consumers. Consumers that are directly connected to the high-voltage transmission grid (e.g., large industrial companies) are not subject to the RPP. For tiered prices, a threshold is set to define lower and higher prices. Electricity amounts acquired up to a certain threshold are billed at a certain price, and amounts consumed over the threshold are billed at a higher price. The threshold level changes seasonally (summer May 1-October 31 and winter November 1-April 30) for residential consumers; the threshold does not change for non-residential RPP consumers. The OEB reviews prices every six months and adjusts them as required.

[34] The MDM/R is a database operated by a third party for the IESO's Smart Meter Entity which processes data showing the time and quantities of electricity used.

[35] In 2009, the summer threshold was 600 kWh per month and the winter threshold was 1,000 kWh per month for residential consumers. For non-residential consumers the threshold was 750 kWh.

[36] Ontario Ministry of Energy "Smart Meters and Time of Use Pricing," http://www.mei.gov.on.ca/en/energy/conservation/smartmeters/ (accessed September 15, 2010).

[37] Ontario Energy Board, e-mail message to ECO staff, October 20, 2010.

[38] The LDCs charging TOU rates are: Toronto Hydro, Hydro One, PowerStream, Horizon Utilities, Newmarket-Tay Power Distribution, Milton Hydro, Veridian Connections, Hydro Ottawa, Oakville Hydro, Chatham-Kent Hydro, Peterborough Distribution. All Newmarket and Milton residential customers are receiving TOU billing.

[39] The OEB has assigned a mandatory date when each LDC must begin charging TOU rates. Dates are dependent on the distributor's progress on MDM/R enrolment and billing cycle.

[40] Independent Electricity System Operator, "Time-of-Use Prices," http://www.ieso.ca/imoweb/siteshared/tou_rates.asp?sid=ic (accessed September 29, 2010).

[41] Navigant Consulting Incorporated, "The Effects of Time-of-Use Rates on Residential Electricity Consumption," prepared for Newmarket Tay Power Distribution, April 9, 2010.

[42] New electricity prices are to take effect November 1, 2010. Time-of-use prices for off-peak periods have decreased by two cents, and mid-peak prices have increased by one cent. No changes were made for on-peak prices.

Ontario Energy Board, "OEB Announces New Electricity Price," News Release, 18 October, 2010.

[43] 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, 1 April, 2004.

[44] Government of Ontario, *Go Green: Ontario's Action Plan on Climate Change August 2007* (Toronto, Queen's Printer for Ontario: 2009), 31

[45] The ministries of Children and Youth Services, Community Safety and Correctional Services, Education , Natural Resources and Transportation.

[46] See supra 44.

[47] Deputy Minister of Energy and Infrastructure Fareed Amin, letter to the ECO in response to ECO inquiry, February 24, 2010, 29

[48] Ibid, 30.

[49] Office of the Governor (California, USA), "Governor Schwarzenegger Joins Ontario Premier McGuinty in Signing Pact to Fight Greenhouse Gases", News Release, 30 May 2007.

[50] Ministry of the Environment, "Frequently Asked Questions: Ethanol-Blended Gasoline," http://www.ene.gov.on.ca/envision/ethanol/ethanolblendedgasoline.htm (accessed September 13, 2010).

[51] As the regulation calls for an average of five per cent ethanol, the marketplace will determine where and how much ethanol is distributed to achieve the average five percent amounts.

[52] Pew Center on Global Climate Change, "Cellulosic Ethanol," http://www.pewclimate.org/technology/factsheet/CellulosicEthanol (accessed September 14, 2010).

[53] Government of Canada, "Government of Canada releases final regulations for renewable fuel content in gasoline," News Release, 1 September 2010.

[54] Ibid.

[55] Natural Resources Canada, "ecoENERGY for Biofuels: About the Program," Office of Energy Efficiency, http://oee.nrcan.gc.ca/transportation/ecoenergy-biofuels/about.cfm?attr=16 (accessed on September 14, 2010).

[56] Natural Resources Canada, "Background," http://www.oee.nrcan.gc.ca/transportation/fuels/biodiesel/NRDDI/background.cfm?attr=16 (accessed on September 14, 2010).

[57] The ethanol content in Ontario's gasoline pool was five per cent in 2007 and six per cent in both 2008 and 2009.
Ministry of Energy, e-mail message to ECO staff, September 20, 2010.

[58] In 2009, the first cellulosic ethanol available commercially at an Ottawa service station for one month.

Iogen Corporation, "Iogen's Cellulosic Ethanol Demonstration Plant," http://www.iogen.ca/company/demo_plant/index.html (accessed on September 15, 2010).

[59] Government of Ontario, "Ontario Paves the Way for Electric Vehicles", News Release, 18 June 2010.

[60] Deputy Minister of Transportation Bruce McCuaig, letter to the ECO in response to ECO inquiry, August 13, 2010, 9.

[61] Ibid.

[62] Responsibility for public charging facilities is now with the Ministry of Infrastructure.

[63] Ontario Ministry of Transportation, "Electric Vehicles Incentive Program," http://www.mto.gov.on.ca/english/dandv/vehicle/electric/electric-vehicles.shtml (accessed October 1, 2010)

The program has received applications and dispersed eight grants, as of October 2010.

[64] For example, the Chevrolet Volt is expected to go on sale in Canada in mid-2011 and the Nissan Leaf in early 2012.

[65] Ministry of Education, e-mail message to ECO staff, November 2, 2010.

[66] Includes: Operation reviews of all 72 district school boards, including identifying leading practices in energy management; Creating an Energy Conservation Officer; Utility Consumption Database; Incentive Programs Advisor (through the OPAs Conservation Fund), Sector consultation on energy issues; MOU with the OPA; Energy Efficient Schools Funding.

[67] Director of School Business Support Branch at the Ministry of Education Sheri Hayward, letter to Senior Business Officials regarding Energy Conservation Initiative, Incentive Programs Advisor, Utility Consumption Database, July 10, 2009. http://faab.edu.gov.on.ca/Memos/SB2009/SB_27.pdf

Ontario Power Authority, "2009 – York Catholic District School Board," http://www.powerauthority.on.ca/CFund/Page.asp?PageID=122&ContentID=7121&SiteNodeID=386;
(accessed October 27, 2010).

[68] Deputy Minister of Education Kevin Costante, letter to the ECO in response to ECO inquiry, August 20, 2010, 4.

[69] Deputy Minister of Education Kevin Costante, letter to the ECO in response to ECO inquiry, February 19, 2010, 4.

[70] Assistant Deputy Minister of the Elementary/Secondary Business and Finance Division at the Ministry of Education Gabriel Sekaly, letter to the ECO in response to ECO inquiry, October 7, 2010, 6.

[71] It can be converted to and from other forms of energy but there is a cost for this. The role of energy storage in Ontario's electricity system may play a larger role in the future.

[72] Ontario Power Authority, *Draft Integrated Power System Plan, Section D-4-1 Conservation Resources, 2007*.

[73] Minister of Energy Dwight Duncan, letter to Dr. Jan Carr, CEO of Ontario Power Authority Regarding the Immediate Launch of Procurement Processes to address needs in Downtown Toronto, Western Greater Toronto Area, and to develop additional Demand Management, Demand Response and High Efficiency Combined Heat and Power Supply, June 15, 2005.

Minister of Energy Donna Cansfield, letter to Dr. Jan Carr, CEO of Ontario Power Authority Regarding Addendum #1 to Procurement Processes Directive of June 15, 2005, February 9, 2006.

[74] Ontario Power Authority, *Laying the foundation for a sustainable electricity future - 2006 Annual Report*, 2007, 6.

[75] Freeman, Sullivan & Company, "2007-2008 Impact Evaluation for Ontario Power Authority's DR-1 and DR-3 Program Final Report", prepared for the Ontario Power Authority, November 1, 2009, 38.

[76] Ontario Power Authority. "DR2 Program Launch Announcement," http://www.powerauthority.on.ca/Storage/90/8610_DR2_Program_Launch_Announcement.pdf (accessed October 15, 2010).

[77] See supra 24, 4.

[78] Ontario is also building combined-cycle gas plants. The choice between the two usually comes down to how often the plant is expected to be needed – if it is only needed for a small number of hours, single-cycle plants are more economical.

[79] Ontario Ministry of the Environment, "Emission Limits for Internal Combustion Engines used for Non-Emergency Power Generation", Ontario Environmental Registry Posting 010-2463, 2009

[80] DR3 requires aggregators to be able to provide at least 25 MW of demand response.

[81] Based on the IESO Three Hour Ahead Pre-Dispatch Price.

[82] Participants in the program choose their own strike price (which must be above the minimum activation price set by the Ontario Power Authority). Participants will choose different strike prices, based on the firm-specific and process-specific economic loss associated with reducing their consumption. The payment to participants will equal their strike price multiplied by the number of hours of participation.

Thus, a high strike price will reduce the number of hours that a firm is able to participate, but will increase their payment during their hours of participation.

[83] These values are slightly smaller than the peak demand savings reported in Table 3 in section 3.2. The values reported in section 3.2 include a factor to account for transmission & distribution line loss, which is approximately 6.7% of energy generated. The rationale is that 1 MW saved at the customer end reduces the need for slightly more than 1 MW of generation.

[84] Although 29 participants were enrolled in DR1 in 2008, more than 95 per cent of the load reduction was delivered by the four largest participants (source: See supra 75, 31). All four of these participants have now migrated to DR2 or DR3. DR2 currently has only three participants, all large industrial consumers. DR3 also has three large direct participants, making up 42% of its load reduction capacity.

[85] A point of interest is the number of hours of operation for DR1 and DR3. Recall that both of these programs were intended to target approximately the highest 100-200 hours of system need. However, the low minimum activation price allowed by OPA for DR1 in 2007 and 2008 meant that companies were eligible to participate during a much larger number of hours, when their demand reductions were not really needed by the electricity system. The OPA addressed this problem for 2009 by raising the minimum activation price, thereby reducing the number of hours of eligibility for activation. Also of note is the fact that DR3 was rarely activated in 2009, likely due to milder weather conditions.

[86] See supra 75.

[87] Chief Executive Officer of the Ontario Power Authority Colin Anderson, letter to the ECO in response to ECO inquiry, September 1, 2010. *OPA Response to ECO Request for Information*, 9.

[88] The difference between load reduction capacity and the ex ante load reduction estimate can be attributed to several factors: the voluntary nature of load reduction (this applies only to DR1); scheduled non-performance days allowed under the DR contractual terms (whereby a participant may inform the OPA that it is unable to deliver the contracted amount of DR, e.g. due to a plant shutdown); baseline error; participant non-compliance for DR2 and DR3 (which is subject to financial penalties).

[89] Freeman, Sullivan & Company, "2009 Impact Evaluation of Ontario Power Authority's Commercial & Industrial Demand Response Programs", prepared for the Ontario Power Authority, September 9, 2010, 42.

[90] Ibid, 67.

The shortfall is explained entirely by baseline error, indicating that participant non-compliance was negligible.

[91] The Ontario Energy Board Market Surveillance Panel performed a similar analysis and concluded that only 3 of the 21 DR3 activations between August 2008 and October 2009 corresponded with the 21 highest hours of Ontario electricity demand. However, the Panel's analysis does not account for the fact that the 21 highest hours of demand do not occur on 21 separate days, making it impossible for each of the 21 DR activations to match one of the 21 hours of highest demand. (Under the DR3 program rules, the OPA calls for a maximum 4 hours of demand reduction per DR activation and could achieve activation during the 21 highest hours of demand with fewer than 21 activations, e.g., 9 activations of 2 hours and 1 activation of 3 hours). A fairer comparison, in terms of the way the program rules operate, is to look at the 21 days with the highest hourly peak demand, and compare the 21 DR activations against these days, which is what is done in our report.

Source: Ontario Energy Board Market Surveillance Panel, *Market Surveillance Panel Monitoring Report on the IESO-Administered Electricity Markets for the period from May 2009 to October 2009*, 2010.

[92] While use of demand response may reduce the wholesale electricity price during peak periods, the fact that most Ontario generation receives contractual payments means that the savings to consumers from a reduced wholesale price will be largely offset by an increased Global Adjustment charge.

[93] Miriam Heinz, Regulatory Coordinator, Ontario Power Authority, letter to Kirsten Walli, Board Secretary, Ontario Energy Board Regarding Ontario Power Authority 2007 Expenditure and Revenue Requirements Submission; Ontario Energy Board File No. EB-2006-0233, March 16, 2007.

[94] Based on DR3 payment schedule, as per:
Ontario Power Authority, "DR 3 Program Operational Information and Rates," http://www.powerauthority.on.ca/Page.asp?PageID=924&ContentID=6780 (accessed October 15, 2010).

This calculation ignores program administration costs, which are assumed to be minor relative to payments to participants, and assumes the participant is signed up for 100 hours of demand response and receives premium availability rate due to location. DR3 participants receive a utilization payment ($200 per MWh) whenever the program is activated, in addition to an availability payment that is essentially an insurance payment to ensure that the DR resource is there when needed. Availability payments vary based on geographic area, length of contract, and number of DR hours committed, ranging from approximately $28,000-$160,000 per MW per year. The variation in payment by geographic area is a way to incent demand response in areas where local need is the greatest, such as the cities mentioned in the Minister of Energy's original demand response directive.

[95] A cost-effectiveness evaluation conducted for the OPA reached a similar conclusion, that from the program administrator's perspective, the benefits of DR3 slightly exceed the costs. This study also finds that if the true opportunity costs to companies to participate are much less than what they are being paid by the OPA, then DR is very cost-effective from a TRC perspective. However, these extra benefits as seen from the TRC perspective flow only to the small number of firms participating in the program.

Freeman, Sullivan & Company, "Ontario Power Authority Cost-Effectiveness Analysis for 2009 DR Program and Portfolio", prepared for Ontario Power Authority, November 2, 2010.

[96] The cost of DR2 is lower, estimated by the OPA at $184/MWh (18.4¢/kWH), but this is still triple the average price of generation.

Ontario Power Authority, *Results of OPA Programs Evaluated by EM&V*, date unknown (document provided to the ECO in September 2010).

[97] Ontario Energy Board Market Surveillance Panel, *Market Surveillance Panel Monitoring Report on the IESO-Administered Electricity Markets for the period from May 2008 to Oct 2008*, 2009, 213.

Specific recommendations of the Panel were that: the IESO, with input from the OPA, should improve the supply cushion calculation; and/or the OPA should develop other triggers such as a pre-dispatch price threshold that could be better indicators of tight supply/demand conditions. The OPA has acted on the second recommendation.

[98] See supra 87, 7.

[99] Potential future single-cycle gas plants are listed in Ontario Power Authority, 2007. *Draft Integrated Power System Plan, section D-8-1, Natural Gas-Fired Resources*, p. 16. One (in York Region) is under development, while the Ministry of Energy has not yet directed the OPA to procure other two (one in the Kitchener-Waterloo area, one in the GTA).

[100] Time-of-use pricing will be in place for almost all residential customers by the end of 2011, and the government is considering a regulation that would increase the difference between peak and off-peak prices for wholesale customers.

Ontario Ministry of Energy, "Proposal to Make a Regulation Under the Electricity Act to Amend O. Reg. 429/04," Ontario Environmental Registry Posting 011-0973, 2010.

[101] Environmental Commissioner of Ontario, *Annual Energy Conservation Progress Report – 2009 (Volume One): Rethinking Energy Conservation in Ontario* (Toronto, Ontario: 2010), 7.

[102] See supra 5.

[103] Enbridge's 2007 budget was set at $22 million (16 per cent higher than 2006), increasing by 5 per cent per year for 2008 and 2009. Union's 2007 budget was set at $17 million (22% higher than 2006), increasing by 10 per cent per year for 2008 and 2009. These budgets act as both a floor and a cap – utilities are obligated to spend up to this amount on cost-effective conservation programs. The utilities were required to spend at least $1 million per year of their budgets on long-term market transformation initiatives, and at least $1.3 million per year or 14 per cent of their residential conservation budget on programs for low-income consumers.

[104] Utilities were required to submit a three-year conservation plan (covering the years 2007-2009) to the OEB for approval. Each utility's plan was required to describe its proposed conservation programs, list the budget for each program, and demonstrate the likely cost-effectiveness of the program. Utilities were required to use the Total Resource Cost test to assess the cost-effectiveness of programs.

[105] Each utility was assigned a conservation performance target, defined not in terms of absolute gas savings, but in terms of the net financial benefits provided by the utility's conservation programs, using the Total Resource Cost test. These benefits result from conservation programs reducing gas supply and delivery costs. Performance targets were set based on the utility's conservation performance in the previous three years, and would increase over the three year period from 2007 to 2009, at a rate 50 per cent higher than the conservation budget increase. Utilities would be compensated based on the performance of their conservation programs relative to this target, using a formula called the Shared Savings Mechanism. Utilities would receive an incentive for each unit of net savings, but the amount of the incentive would be low at low levels of achievement, increasing steeply as utilities approached their performance target. Compensation would be capped at a value of $8.5 million per utility, which would be reached when the utility achieved approximately 137.5 per cent of the performance target. Utilities would also be protected from unexpected erosion in revenues because of lower volumes of gas distributed as a result of conservation.

[106] Union Gas, *Audited Demand Side Management 2009 Annual Report*, 2010, 12.

[107] Ibid, 17.

[108] Drainwater heat recovery captures the heat from hot water going down the drain (primarily from showers) and uses it to help heat the next batch of hot water produced. Union Gas offered only this program, while Enbridge also spent small amounts of funds on promoting the EnerGuide label for fireplaces, and building energy efficiency knowledge among general contractors in the renovation market. However, Enbridge cancelled these other two programs at the end of 2009.

[109] Gas savings are based on Lost Revenue Adjustment Mechanism calculations, not Shared Savings Mechanism calculations. Savings are only the first year savings from programs undertaken in the year in question.

[110] Calculated by dividing net TRC value (based on Shared Savings Mechanism calculations) by utility conservation budget.

[111] Enbridge Gas Distribution distributed approximately 11.5 billion cubic metres of natural gas in 2009.

Source: Enbridge Gas Distribution Inc, *2009 Annual Report*, 2010, 16.

[112] Includes the costs of program administration (including salaries), evaluation, and forward-looking conservation research.

[113] Enbridge Gas Distribution Inc, 2010. Evidence in hearing EB-2010-0175, Exhibit B, Tab 1, Schedule 2

[114] Concentric Energy Advisors. Review of *Demand-Side Management (DSM) Framework for Natural Gas Distributors*, prepared for the Ontario Energy Board, 2010.

[115] Minister of Energy Brad Duguid, letter (untitled) to Chair of the Ontario Energy Board Howard Wetston, July 5, 2010.

[116] The Ontario Energy Board's choice of a relatively high discount rate (the utility's after-tax cost of capital) in comparing program benefits and costs over time prioritizes conservation measures that deliver near-term energy savings with low upfront cost (see section 2 for more information on the discount rate).

[117] National Renewable Energy Laboratory, *A Policymaker's Guide to Feed-in Tariff Policy Design* (National Renewable Energy Laboratory, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, NREL/TP-6A2-44849: July 2010), viii.

[118] Paul Gipe, comment on "NREL Releases Feed-in Tariff Guide," EnergyWorld.com, comment posted August 10, 2010, http://www.renewableenergyworld.com/rea/news/article/2010/08/nrel-releases-feed-in-tariff-guide (accessed August 24, 2010)

[119] Minister of Energy Dwight Duncan, letter to Mr. Howard Weston, Chair of Ontario Energy Board and Mr. Jan Carr, CEO of Ontario Power Authority Regarding the Standard Offer Program *(EB-2005-0463 / EB-2006-0226)*, August 18, 2005.

[120] Ontario Power Authority, "OEB and OPA Issue Joint Report On Standard Offer Program," News Release, 21 March 2006.

[121] Ontario Power Authority, "Standard Offer Program – Renewable Energy for Small Electricity Generators, An Introductory Guide," http://www.powerauthority.on.ca/sop/Storage/44/3985_SOPInformationBrochure.pdf (accessed July 27, 2010).

[122] Ontario Power Authority, "RESOP Program Update – March 12, 2009," http://www.powerauthority.on.ca/sop/Page.asp?PageID=122&ContentID=6856&SiteNodeID=412&BL_ExpandID=190 (accessed July 26, 2010).

[123] Ontario Power Authority, "New Transition Opportunities for Existing Small Renewable Energy Projects 500 kW and less," http://fit.powerauthority.on.ca/Storage/98/10768_FIT_Transition_Options_FINAL.pdf , (accessed July 27, 2010).

[124] Ontario Power Authority, "OPA Feed-in Tariff Program: Pricing and Payment," http://fit.powerauthority.on.ca/Page.asp?PageID=834&ContentID=10511&SiteNodeID=1126#Q3 (accessed July 28, 2010).

[125] Government of Ontario, "Phasing Out Coal Power in Ontario," News Release, 1 October 2010.

[126] Ministry of Energy, e-mail message to ECO staff, October 26, 2010.
The $537 million is the budget for the Ontario program only and does not include money spent by the federal government's ecoENERGY program.

[127] Program reporting is on a fiscal year basis (April 1 to March 31).

[128] Ideally, multiple measures should be undertaken (as much as the homeowner can afford and expect to have returned in a lower annual energy bill). This is important for maximizing the program's effectiveness because under the program rules, homeowners are allowed to participate in the program once, that is, undertake an audit and complete a retrofit – there is no going "back to the well" more than one time.

[129] Some might argue the program's success lies with the fact that the financial grants are generous (a homeowner can receive a maximum of $10,000 combined from the provincial and federal governments) but the grants paid for retrofit measures generally reflect the incremental cost to purchase the higher efficiency product compared to a minimum or standard efficiency product. Taxpayer funded grants are also well levered, approximately 7 to 1, that is a homeowner receiving a typical retrofit grant of $800 would have paid roughly $5,000 of his or her money and could expect to recover this over a number of years based on an annual savings of approximately 30 per cent on their energy bill. The program makes concrete the government's vision to create a conservation culture and exemplifies how individual residents can participate in the building of a conserver culture. Ontario has relied on the federal government for program administration and thus reduced its program delivery costs. In the future should HESP be renewed, this may no longer be possible as it is uncertain whether the federal government will continue to offer the ecoENERGy – Retrofit Homes program.

[130] For example, in 2009/2010, HESP paid out some $10.6 million to install 2,923 ground source heat pumps.

[131] Ministry of Energy, e-mail message to ECO staff, August 10, 2010. *MEI Response to ECO CDM Questions (REE Response)*, 6. See also Toronto Star, September 27, 2010 B1 Eco-grants helped homes most. The ministry assumes a rate of 10 per cent for free-ridership, based on information from Natural Resources Canada (NRCan). NRCan is conducting a free ridership study but it was not completed at the time of writing our report.

[132] The government could fund the program using new provisions created when the *Green Energy Act, 2009* was passed. *The Green Energy and Green Economy Act, 2009* amended the *Ontario Energy Board Act, 1998* to allow the government to recover costs of government-delivered conservation programs, like HESP, from ratepayers. The government has already received some $44 million from electricity ratepayers, and could recover funds from natural gas ratepayers. A court challenge was launched in 2009 challenging the ability of the government to pay for programs in this way; the court has not ruled yet.

[133] Based on HESP experience, the ministry should provide advice on the program design. For example, advice on selection of measures funded, grant or loan amounts, audit protocols or other participation pre-requisites. Particularly, program design refinements to target energy issues specific to Ontario like addressing summer peak system demand from air conditioner load, rather than simply increasing the total amount of grant funding available to match additional funding made available by the federal government's ecoENERGY program.

[134] Ministry of Energy, e-mail message to ECO staff, September 3, 2010.
In response to an information request made by the ECO on August 13, 2010, the Ministry of Energy advised that the federal government's cancellation of the ecoEnergy for homes program and activity to revise the EnerGuide Rating System has created uncertainties about the rating method and the support required to implement it which need to be confirmed prior to the ministry passing a regulation.
Natural Resources Canada (NRCan), telephone discussion with ECO staff, October 1, 2010.
NRCan advised that the main elements of the revised EnerGuide Rating System will be complete by March 31, 2010 and the revision will be 100 per cent complete by September 2011.NRCan also advised the it has communicated to a federal-provincial committee of Assistant Deputy Ministers overseeing the revisions that NRCan is fully committeed to on-going support of the rating system and the policy, regulatory and technical support will be provided.

[135] The Oakville, Milton and District Real Estate Board, "Mandatory Home Energy Audits," *The Real News*, Volume 281, May 2009

[136] Deputy Minister of Energy and Infrastructure Fareed Amin, letter to the ECO in response to ECO inquiry, February 24, 2010, 5.

[137] Government of Canada, "ecoENERGY for Renewable Heat – Commercial Deployment Incentive Terms and Conditions," ecoENERGY, http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/heat-chauffage/v2008/conditions-eng.cfm#a2 (accessed June 10 2010).

[138] See supra 14, 13.

[139] Government of Canada, "Solar Thermal Energy and How Solar Thermal Collectors Work," Natural Resources Canada, http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/renewables/solar_thermal/how_it_works.html (accessed September 8, 2010).

[140] Government of Canada, "Solar Thermal Energy: Solar Thermal Collectors and Solar Thermal Water Heaters," Natural Resources Canada, http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/renewables/solar_thermal.html (accessed September 8, 2010).

[141] Ibid.

[142] See supra 136, 6.

[143] Ibid, 5 - 6.

[144] Government of Ontario, "Solar Technologies Help Build Ontario's Green Economy," News Release, 7 December 2009.

[145] See supra 136, 5.

[146] See supra 14, 14.

[147] Local Authority Services, "Audit ++ Binder" http://www.amo.on.ca/Content/las/EnergyServices/Audit/AuditBinder/default.htm (accessed August 16, 2010).

[148] As part of this announcement, the government also announced a $200 million in low interest loans for municipal projects offered through Infrastructure Ontario. Ontario Government "McGuinty Government Investing in Green Communities," News Release, 13 June 2007.

[149] Municipal capacity building programs, including training, tools and technical support, were to be provided in collaboration with the Local Authority Services and the Canada Green Building Council.

[150] Funding for retrofit projects were limited to up at 25 per cent of the eligible cost and a maximum of $100,000 per municipality for standard retrofits (e.g., retrofit from T12 to T8 lights). For showcase retrofit projects (e.g., induction street lighting) up to 50 per cent of the eligible cost and a maximum of $500,000 per municipality.

[151] See supra 14, 8.

As noted on the ministry's website when the MECF program cancellation notice was posted on March 27, 2009. Note although the unspent funds from MECF were not redirected to other ministry programs, funds available for Ontario Solar Thermal Incentive Program was increased during that fiscal year to match the increase in federal grants.

[152] See supra 14, 9

[153] Applications were received until October 10, 2008. Total retrofits includes both standard and showcase projects.

[154] Other fuels reported were 7,174 litres of propane fuel savings and a cumulative increase of 28,880 litres in oil. (South Glengarry reported a 29,380 litres increase in oil for their Town Hall retrofit.)

[155] See supra 44, 8.

The government has since revised its targets in the *Climate Change Action Plan Annual Report 2008-09*.

[156] The ministry has noted the energy conservation plans regulation will be synchronized with water conservation requirements under the *Water Opportunities Act*. A regulation is anticipated for the spring of 2011, with first plans by July 2012.

[157] Assistant Deputy Minister, Ministry of Government Services Neil Sentance "Greening Government – OPS Green Office," OPS Green Office Presentation, 27 April 2010.

[158] Assistant Deputy Minister, Ministry of Government Services Neil Sentance, "OPS Green Transformation," OPS Green Office Presentation, 6 April 2009.

[159] Government of Ontario, *Government of Ontario IT Standard (GO-ITS) Number 93 - Power Management, Version 1.0*, (Toronto, Queen's Printer for Ontario: 2010), 5.

[160] Deputy Minister of Government Services Ron McKerlie, information provided to the ECO in response to ECO inquiry, February 22, 2010, 2.

[161] Ministry of Government Services, email message to ECO staff, September 22, 2010, 4.

[162] See supra 160, 1.

[163] Ibid, 3.

[164] Ministry of Government Services, email message to ECO staff, August 20, 2010, 2.

[165] See supra 159, 11.

[166] Ibid, 11, 21.

[167] See supra 164, 2.

[168] Ibid, 1.

[169] See supra 161, 1.

[170] See supra 164,1.

[171] See supra 161, 1.

[172] "Freight Trucks" includes freight light trucks, medium trucks and heavy trucks. Classification of freight truck is determined by vehicle gross weight. (The gross vehicle weight is the weight of the empty vehicle plus the maximum anticipated load weight.) Light freight trucks are up to 3,855 kg, medium trucks between 3,856 kg to 14,969 kg, and heavy trucks from 14,970 kg and over.

Natural Resources Canada, *Comprehensive Energy Use Database*, 1990 to 2007, http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/comprehensive_tables/index.cfm?attr=0 (accessed October 8, 2010).

[173] Ontario Ministry of Transportation. *Ontario Green Commercial Vehicle Program Guide* (Toronto, Queen's Printer at Ontario: 2009).

[174] Truck operators often use the vehicle engines to provide an inefficient source of heat and power during extended periods when the vehicle is stationary (e.g. during overnight stops). Anti-idling devices save energy by providing a more efficient supplementary source of heat and/or power for these periods. Only class 8 trucks (trucks weighing 14,790 kg or over) are eligible for anti-idling devices (auxiliary power unit (APU), cab heater, cab cooler.) There is a funding cap of $2.35 million for any corporate entity.

[175] Ontario Ministry of Transportation, "Commercial Vehicle Program – Introduction," http://www.mto.gov.on.ca/english/trucks/programs/grants-trucks/part1.shtml (accessed July 12, 2010).

[176] Natural Resources Canada, "Fuel Efficiency Benchmarking In Canada's Trucking Industry," http://oee.nrcan.gc.ca/transportation/business/documents/case-studies/fuel-effic-benchm.cfm?attr=16 (accessed July 12, 2010).

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