ONTARIO POWER AUTHORITY

2007 Final Conservation Results

February 2009

Ontario Power Authority

Contents

Introduction

Ontario has a long-term conservation target to achieve 6,300 megawatts (MW) of peak electricity demand reduction.[1] Aggressive interim targets included a 1,350 MW peak demand reduction by 2007 and an additional 1,350 MW reduction for 2010. The OPA has a leadership role in coordinating the province's electricity conservation efforts and working in partnership with local distribution companies (LDCs) and others to ensure Ontario's conservation targets are met.

The OPA is adopting a long-term planning, market transformation approach to ensure that conservation is sustainable, reliable and cost-effective. In parallel with this long term planning, the OPA is funding conservation programs that encourage immediate conservation actions by consumers and businesses and which will help the province meet its near term targets.

The OPA procures conservation resources through conservation programs that deliver demand reduction, energy savings and conservation awareness. The primary focus for OPA programs in the near term is peak demand reductions. In 2007, the OPA procured energy and demand savings through the delivery of 12[2] programs.

The OPA is committed to being open and transparent on the progress and results of its programs. As outlined in its evaluation, measurement and verification (EM&V) framework, the OPA is also committed to undertaking rigorous independent evaluations of OPA-funded programs in accordance with internationally credible standards.

The primary purpose of program evaluations is to verify and ensure the reliability of demand reduction and energy savings achieved. This is important since it helps determine the amount of generation that must be built to meet provincial energy needs. Evaluations are also used to assess program design performance, to provide information for continuous management improvement and to validate input assumptions made for specific end-use measures. This facilitates the OPA's approach of "learning by doing."

Comprehensive evaluations were undertaken on a subset of the conservation portfolio covering six programs delivered by OPA in 2007, the results of which are summarized in this report. Going forward, every program in the OPA's 2008-2010 portfolio will undergo a full evaluation at least once during the three-year portfolio cycle, with many of the programs being reviewed annually.

The purpose of this report is two-fold. It summarizes Ontario's conservation results against the 2007 provincial target and also presents the results of the comprehensive third party evaluations that were undertaken on six of OPA's programs in 2007. A concise summary of the savings verified through the 2007 EM&V process are included in the body of the report, followed by an appendix which includes a glossary, a description of the OPA's conservation reporting methodology and more detailed summaries of each program evaluation.

[1] On September 17, 2008, the Minister of Energy and Infrastructure issued a directive asking the OPA to review the viability of accelerating the achievement of stated conservation targets.

[2] *The 2007 Progress Report on Electricity Conservation* (April 2008) indicated that the OPA had 14 programs in market in 2007. Two of these programs did not generate energy or demand savings in 2007 (the agricultural program, as it was focused on marketing; and the Demand Response 3 program, as it launched in December).

The OPA does not conduct evaluations of non-OPA funded programs. Please refer to Ontario's Chief Energy Conservation Officer's supplement to the 2007 annual report, *Conservation Results, 2005-2007*, for the full list of program results. Given the importance of the conservation contribution in ensuring the reliability of Ontario's electricity system over the next 20 years, the Chief Energy Conservation Officer is recommending and encouraging all delivery agents in the conservation marketplace to adopt more rigorous and consistent methods of measuring and verifying results.

Provincial results against 2007 target

Preliminary results

Ontario's Chief Energy Conservation Officer (CECO) reported in June 2008 that the province had met the 2007 peak demand reduction target. This conclusion was based upon available "reported"[3] results from the Independent Electricity System Operator (IESO), OPA conservation programs, provincial and federal governments, LDCs, natural gas companies, non-governmental organizations and other participants in the conservation marketplace, as shown in Table 1 below. The June 2008 CECO report did not include results of the OPA's 2006 conservation programs or the results of the OPA's third party evaluation, measurement and verification (EM&V) process on six of its own 2007 programs, as this review was still underway at the time.

Table 1 Ontario conservation reported results (June 2008)

Conservation programs	Demand Reduction (MW)
2007 OPA programs (reported savings)	598
2005-2007 Non-OPA programs (reported savings)	793
Total	**1391**

Final results

Table 2 below provides a final summary of Ontario conservation program results against the 2007 peak demand reduction target. The Chief Energy Conservation Officer's conclusion that Ontario has met its 2007 conservation target remains unchanged.

There are two key differences between the preliminary and final results: the demand savings from OPA's 2006 programs (18 MW) have been added[4]; and the OPA's 2007 program results have been adjusted downward 30 MW based on final "verified" results. In 2007, the OPA procured energy and demand savings through the delivery of 12[5] conservation programs. Comprehensive evaluations, including rigorous measurement and verification, were undertaken on six of these programs. Going forward, every conservation program in the OPA's 2008-2010 program portfolio will undergo a full evaluation at least once during the three-year portfolio cycle, with many of the programs being reviewed annually. Table 3 provides a more detailed accounting of the adjustments made to OPA's 2007 results as a result of EM&V.

[3] The OPA uses two terms -- reported savings and verified savings-- in tracking and reporting on the progress and results of conservation programs. Reported savings are estimates based on program design parameters and reported program participation levels. Verified savings, which have a higher level of certainty, are third-party determinations of savings based on review of program design parameters and confirmation of participation and implementation levels. For example, our reported savings for an energy efficient lighting coupon program would be estimated based on the number of coupons redeemed multiplied by our upfront assumption of energy savings per light bulb. The verified savings for the program, calculated after the program is completed, will be based on the actual number of light bulbs installed by participants (which may be less than the number of coupons redeemed) and the actual energy savings per bulb (which may be higher or lower than our upfront assumption depending on how people are using the bulbs).

[4] For details on 2006 program results please refer to the Ontario's Chief Energy Conservation Officer's supplement to 2006 annual report, *2006 Results*, available on the OPA website.

[5] *The 2007 Progress Report on Electricity Conservation* (April 2008) indicated that the OPA had 14 programs in market in 2007. Two of these programs did not generate energy or demand savings in 2007 (the agricultural program, as it was focused on marketing; and the Demand Response 3 program, as it launched in December).

Table 2 Ontario conservation final results

Conservation programs	**Demand Reduction (MW)**
2006 OPA programs (reported savings)	18
2007 OPA programs	568
6 evaluated programs (verified savings)	*390*
6 non-evaluated programs (reported savings)	*178*
Non-OPA programs (2005-2007)	793
Total	**1379**

Table 3 Comparison of OPA 2007 program results: reported vs verified results

	Preliminary results (MW) (CECO June 2008 report)	**Final results (MW) (Post EM&V process)**
Programs	Reported savings: 12 programs	Reported savings: 6 programs Verified savings: 6 programs
Mass market	130	87
Commercial/ institutional	150	135
Industrial/ demand response	317	344
Customer based generation	1	2
TOTAL	**598**	**568**

Evaluation of OPA programs

Results for the six evaluated programs, including verified savings, lessons learned and recommendations are discussed in subsequent chapters of this report. The results do not follow any common trend, and each conservation program has unique circumstances and evaluation results. Because of this, the OPA is not able to extrapolate results to the non-evaluated programs.

The 2007 results confirm that overall progress is substantial. Energy and demand savings are expected to continue to grow steadily as programs grow and mature in the marketplace. Observed high levels of participation show a growing awareness of the value of conservation behaviour. In addition, OPA conservation programs are contributing to ancillary benefits such as economic activity, environmental improvement and a growing culture of conservation in Ontario.

Evaluation of non-OPA programs

Ontario's results are encouraging, but it is recognized that more work is required to develop measurement and verification methodologies to better assess the impact of non-OPA funded conservation programs. While the OPA's portfolio of programs is assessed using rigorous independent evaluations in accordance with internationally credible standards, the current mix of results from the various parties is derived from program forecasts or reported results. These results are based on assumptions regarding the activities undertaken and, while they provide an indication of the success at reducing Ontarians' need for electricity, they are not as reliable as verified results based on a comprehensive, independent measurement process.

Given the importance of the conservation contribution in ensuring the reliability of Ontario's electricity system over the next 20 years, the Chief Energy Conservation Officer is recommending and encouraging all delivery agents in the conservation marketplace to adopt more rigorous and consistent methods of measuring and verifying results.

OPA program evaluations

The verified savings for the six evaluated programs are summarized in Table 4 below. Overall, the evaluation results confirm the success of the 2007 conservation program efforts. The results do not follow any common trend, and each conservation program has unique circumstances and evaluation results. Because of this, the OPA is not able to extrapolate these results to the non-evaluated programs.

Table 4 – 2007 Verified Results

Program	Activity measure	Activity units	Net summer peak demand savings (MW)	Net first-year energy eavings (GWh)	Net lifetime energy savings (GWh)
2007 Every Kilowatt Counts	Coupons	2,773,186	4.9	132	1,060
2007 Great Refrigerator Roundup Program	Appliances	49,832	1.7	13.4	117.1
2007 Hot & Cool Savings Rebate Program	Rebates	160,205	19.8	30.2	451.1
2007 Summer Savings	Households	380,000	45	81	145
2007 Toronto Comprehensive – Building Operators & Managers Association (BOMA)	Buildings	12	0.7	5.6	79.3
2007 Demand Response 1 Program	Contracts	10	317.4[6]	--	--

The mass market/residential programs were generally successful in launching on schedule and driving participation rates. There were some significant adjustments to the energy savings assumptions per conservation measure in the evaluations, which led to some programs not reaching their energy or demand savings forecasts.

The commercial and industrial programs have been comparatively slower in rolling out and driving participation rates. However, this is typical for these types of programs, as businesses generally require longer lead times to make energy-efficiency investments. The evaluations of the business market programs indicated that these programs are benefiting from solid program designs that will provide the foundation for increased participation and savings as the programs move forward.

In addition to verifying the savings or conservation resource achieved in these programs, the evaluations provided insights into the effectiveness of the program designs and delivery and made recommendations for improvement where applicable. As seen in the evaluation highlights, many of the process review findings and related recommendations were already identified by program staff and incorporated into 2008 programs prior to the completion of the evaluation process.

The 2007 results confirm that overall progress is substantial. Energy and demand savings are expected to continue to grow steadily as programs mature and new programs enter the

[6] The total amount of curtailment available through contracts signed by participants in demand response programs, also known as the nameplate capacity, was used to report progress against the 2007 demand reduction target.

marketplace. Observed high levels of participation show a growing awareness of the value of conservation behaviour. In addition, OPA conservation programs are contributing to ancillary benefits such as economic activity, environmental improvement and a growing culture of conservation in Ontario.

Conclusion

Ontario's Chief Energy Conservation Officer (CECO) reported in June 2008 that the province had met the 2007 peak demand reduction target, based on preliminary results of OPA programs. This report provides a final summary of Ontario conservation program results against the 2007 peak demand reduction target. The Chief Energy Conservation Officer's conclusion that Ontario has met its 2007 conservation target remains unchanged.

The results of the OPA program evaluations have shown that some programs have performed better than anticipated, while others have provided information for future programs – an essential part of learning – that will help ensure the OPA portfolio approach achieves best practices. Evaluation findings have already guided program staff to make improvements to programs for 2008 and beyond as part of a continuous improvement methodology. In summary, overall, the portfolio is making good progress.

A comprehensive annual report for 2008 that includes the full year's results, including program evaluations, is scheduled to be available in the third quarter of 2009.

Appendix A - Glossary

Average curtailment: the mean curtailment in a given a period of time expressed in megawatts and a percentage of contracted capacity at the time of curtailment.

Contracted capacity: the total amount of curtailment available through contracts signed by participants of a demand response program.

***First-year energy savings*:** electricity savings achieved in the first year of implementation of a conservation program's measures.

Free-ridership: occurs when a number of customers take advantage of rebates or cost savings available through conservation programs even though they would have installed the efficient equipment on their own. Such customers are commonly referred to as "free riders." These customers may already be motivated to purchase energy-efficient equipment even without utility-sponsored incentives. The savings resulting from free riders cannot be attributed to the conservation program and, therefore, should not be counted as resource savings.

***Lifetime energy savings*:** electricity savings achieved during the entire estimated usage life of a conservation program's measures.

Maximum curtailment: the peak curtailment in a given a period of time expressed in megawatts and a percentage of contracted capacity at the time of curtailment.

Net savings: electricity savings achieved that are directly attributable to a conservation and demand management program. Net savings are adjusted for free-ridership, rebound effect, spillover, etc.

***Participation*:** program uptake in terms of program-specific measures (e.g., rebate coupons redeemed for the Every Kilowatt Counts program, refrigerators and freezers retired for the Great Refrigerator Roundup, buildings retrofitted for the Toronto Comprehensive – BOMA program, curtailment events for Demand Response 1).

Rebound effect: occurs when some conservation measures may result in savings during certain periods but induce increased energy use before or after the period in which the savings occur. This is particularly common for demand response programs that, for example, reduce air conditioning loads during peak hours but cause customers to leave their air conditioners on later in the evening.

Spillover: the opposite of the free-rider effect. This refers to consumers who adopt efficiency measures themselves because they are influenced by an efficiency program but do not actually participate in the program.

***Summer peak demand savings*:** the estimated electricity savings that occurred at the time of the summer province-wide electrical system load peak.

Appendix B - Ontario Power Authority's Conservation Reporting Methodology

The Ontario Power Authority uses three different reporting "tracks" to monitor and report on its funded conservation programs -- forecasted, reported and verified savings. Each of these tracks provides estimates of energy and peak demand savings resulting from conservation programs, and each track has a different level of certainty associated with the results.

Forecasted Savings

Planning, designing and developing a conservation program involves developing predictions of the potential energy and demand reductions that could result from it. These forecasted savings are based on a set of input assumptions, including estimated participation rates, energy and demand reductions resulting from program measures, the effective useful life of measures and other factors. The forecasted savings can be used as targets for the program, against which actual performance can be measured. Forecasted savings tend to have the largest bands of uncertainty associated with them.

Reported Savings

Reported savings reflect the preliminary results of conservation programs using the same input assumptions that were used to develop the program. Program activity is tracked using units specific to the program, such as coupons redeemed, appliances retired or control devices installed. These activity units are used to estimate energy and demand savings with the same assumptions used to create the program – allowing for straight comparisons to the forecasted savings.

Reported savings reflect the success of program efforts in driving participation and can be used to gain early insights into a program's effectiveness. These results are more certain than forecasted savings and can help to improve the assumptions used for the further development or refinement of conservation programs.

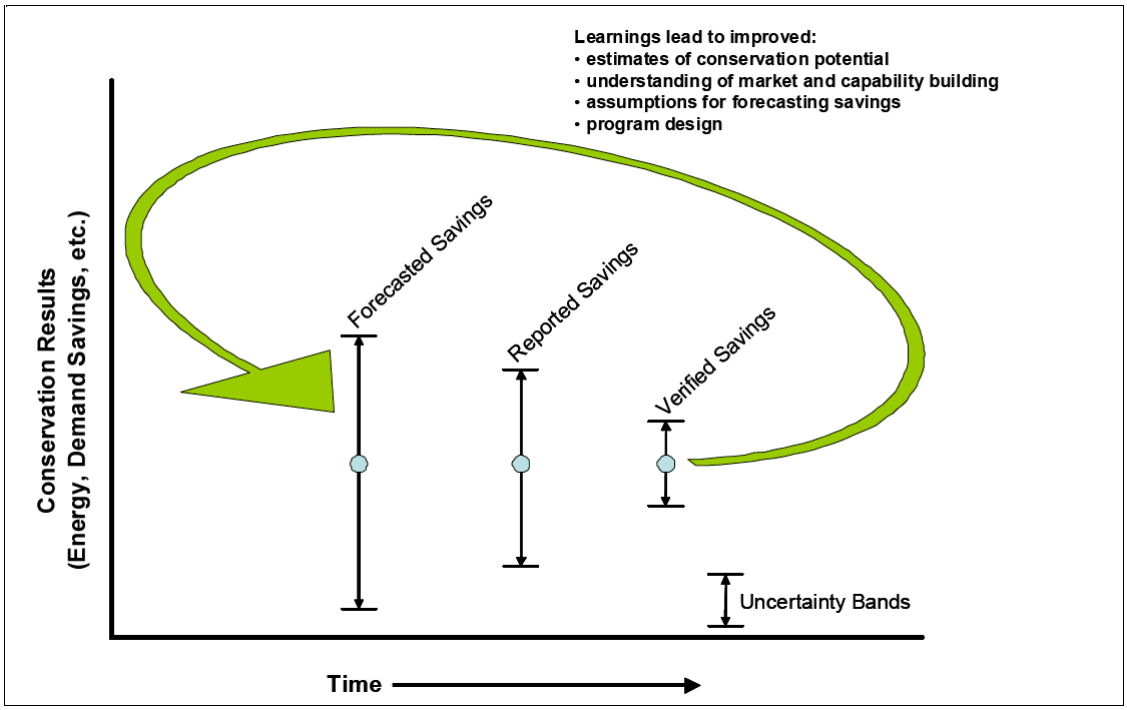
In 2008, the OPA published three quarterly progress reports on its conservation programs, which included reported savings for programs that were currently running. Going forward in 2009, the OPA will only publish verified program savings after program completion, but will continue to monitor, analyze and manage program performance throughout the year based on reported results.

Verified Savings

Measurement and verification studies are conducted to confirm that reported claims of energy and peak demand reductions have actually occurred. The measurement component involves collecting data from various sources, including site visits, surveys, utility bills, equipment invoices, sensors, occupancy records and/or production reports. The verification component involves using the measured data to verify that anticipated energy and peak demand savings occurred. This means verifying that conservation measures have been implemented to a reasonable standard of quality, are operating as intended and are capable of generating energy and peak demand savings.

Verified results represent the best estimate of a conservation program's actual savings and greatly reduce the level of uncertainty surrounding program results. Verified results can be greater or less than forecasted and reported results, depending on factors beyond the program administrator's control. Although verified savings represent the results with the highest degree of certainty, these factors mean that some level of uncertainty will always be associated with reporting on conservation program results. The credibility of verified results is improved by separating the responsibility for program design and implementation from the responsibility for verification.

The following figure illustrates the uncertainty surrounding the results of the three reporting tracks. The decreasing uncertainty as results move from forecasted and reported to verified indicate that measurement and verification can provide results that are more reliable, predictable and transparent. The verification process can provide regular feedback about program performance, leading to the development of more effective programs and activities. The assessments also assist in refining estimates of conservation potential, improving understanding of market and capability building requirements, and generating better assumptions for forecasting savings. Verified savings, in terms of megawatts or megawatt-hours, can be less than reported savings, but the verified results are more valuable to system planners because the capacity they represent (e.g., demand reduction) can be more consistently equated with capacity of supply resources.



Appendix C - Program Evaluation Highlights

Every Kilowatt Counts Program

Program Description

A retailer-based program that encourages consumers to purchase and install featured energy-saving products by providing them with information and instant discount rebates. The OPA ran spring (April 16-June 17) and fall (Sept. 16-Nov. 30) campaigns in 2007. The fall campaign also included a community-based social marketing initiative, which mobilized volunteers to deliver 500,000 compact fluorescent lightbulbs (CFLs) and coupons door-to-door across 89 communities, as well as organized seasonal light exchange events in 26 communities.

Evaluation Description

Timing: ☒ End of program ☐ Mid-program (timeframe: _____)
EM&V Contractor: Navigant Consulting Inc.

Program Results

Table 5 – Program Participation, Energy and Demand Savings

	Coupons redeemed	CFLs distributed door-to-door	Summer demand savings (MW)	First-year energy savings (GWh)	Lifetime energy savings (GWh)
Forecasted	1,150,000	--	3	128	1,400
Reported	2,762,424	500,000	7.8	197	1,240
Verified	**2,773,186**	**500,000**	**4.9**	**132**	**1,060**

The key drivers of the variance between forecasted and verified savings were:

- **Participation rate** -- redemption of coupons was 141 percent above forecast. Solar lights and CFL sales greatly exceeded targets despite being new in the market in the case of solar lights, and having reduced rebate values in the case of CFLs.
- **Energy savings per coupon** -- less than one-third of forecast, due to significant reductions in assumed energy savings per CFL and because the majority of solar lights were purchased for new applications, rather than replacements (therefore did not generate energy savings).
- **Demand savings per coupon** -- approximately two-thirds of forecast. This variance is less than the driver noted above because summer demand savings assumptions for CFLs increased from 0 to 1.3 watt/unit.

Lessons Learned/Recommendations

Key recommendations from EM&V contractor	Response
The OPA should encourage more uniform sales reporting from retailers to facilitate analysis of units per coupon, average price and other key parameters for program analysis.	The submission of retail sales data has already been incorporated into the 2008 Retailer Participation Agreement. Sales data reporting, using a reporting template, is a contractual requirement for participating retailers.
Do not promote outdoor solar lights unless for specific applications that are highly likely to yield savings. Survey results suggested 85 percent were	Program staff were aware of this issue based on the large number of solar coupon redemptions and decided shortly after the 2007 spring campaign to

Key recommendations from EM&V contractor	Response
purchased for new applications rather than replacement or displacement and, therefore, did not produce electricity savings.	eliminate solar lights from the 2008 program.
Seasonal LEDs may not be cost-effective from a total resource cost perspective, due to market transformation. However, they may help build consumer awareness and commitment to undertake other energy-savings measures, acting as a type of "loss leader."	Rebates on this product have already been eliminated for the 2008 EKC program based on significant market transformation in seasonal lighting market over the past two years. Local distribution companies may also choose to promote seasonal LED exchange events as grassroot initiatives in their communities.
Conduct more detailed analysis/surveying within the GTA in the 2008 program to further explore the local opportunities to cost-effectively promote and increase penetration of CFLs in the GTA, relative to other regions.	The EM&V findings of lower CFL penetration and lower free-ridership in the GTA are not consistent with results from other research that the OPA and Toronto Hydro have conducted. Additional analysis will be conducted in 2008 market research.
Consider further investigation of the differences between online and telephone surveys and their impact on program results (e.g., net-to-gross ratio). Evaluation found that the two techniques can yield different results, but it was not possible to determine whether one technique provides a more representative picture of the market than the other.	The OPA will investigate the impact of different survey techniques through evaluation of this program and others in the mass markets portfolio.

Implications for Future Programs

The key drivers of the variance between forecasted and verified savings in the 2007 program were all taken into account in the design of the 2008 program.

- The prescriptive input assumptions (PIAs) used to design the 2008 EKC Power Savings Event program were based on the draft PIA review report prepared by Navigant as part of this evaluation, so the significant reductions in energy savings per CFL are already reflected in 2008 forecast.
- The recommendation regarding the removal of rebates from solar lights and seasonal LEDs was already incorporated into the 2008 program.
- Based on the reduced incentive budget allocated to the program for 2008 and the high number of CFL coupon redemptions in 2007, rebates on standard "twisty" CFLs were removed from the 2008 program.

Great Refrigerator Roundup Program

Program Description

A province-wide program that aims to achieve energy and demand savings through the removal and decommissioning of older, working, inefficient secondary and primary refrigerators, freezers and room air conditioners (ACs). Appliances are picked up and removed free of charge and are decommissioned in an environmentally responsible manner. Program is scheduled to run until end of 2010.

Evaluation Description

Timing: ☐ End of program ☒ Mid-program (timeframe: June 18 - December 31, 2007)
EM&V Contractor: Quantec, LLC

Program Results

Table 6 – Program Participation, Energy and Demand Savings

	Refrig-erators collected	Freezers collected	Room ACs collected	Total appli-ances collected	Summer demand savings (MW)	First-year energy savings (GWh)	Lifetime energy savings (GWh)
Forecasted	40,000	1,500	6,000	47,500	10.6	49.2	295.0
Reported	37,940	11,063	765	49,768	11.4	50.5	303.3
Verified	**35,803**	**12,419**	**1,610**	**49,832**	**1.7**	**13.4**	**117.1**

The key drivers of the variance between forecasted and verified savings were:

- **Input assumptions** – the original assumptions for demand and energy savings were based on the Ontario Energy Board's *Total Resource Cost Guide*; new estimates are substantially lower.
- **Energy/demand savings per appliance** -- less than half of the forecasted number of units collected were primary appliances that were later replaced, and a significant number of secondary appliances were only being used part of time, thereby lowering actual energy savings from retirement.
- **Free-ridership** -- EM&V suggests this program's free-ridership is 46 percent, significantly higher than the planning estimate of 10 percent free-ridership.

Lessons Learned/Recommendations

Key recommendations from EM&V contractor	Response
Develop multi-family, small commercial and retailer pilot programs.	A pilot program involving retailers is planned for Q3/Q4 2008. A small commercial pilot program will be considered at a later date.
Focus on marketing (as opposed to incentives).	Truck advertising implemented in June 2008. Also collaborating with the Ministry of Energy and Infrastructure on David Suzuki TV ads.
Create a more dynamic pick-up/appointment system that minimizes the distance travelled between appointments.	The system is relatively new, and its functionality is continually being refined to optimize pick-ups.
Market the environmental impacts of the program.	The effectiveness of the existing marketing materials has already been assessed in a number of consumer

Key recommendations from EM&V contractor	Response
	research studies. This research suggests that the environmental benefits of the program are secondary to messaging on cost savings and convenience. We will continue to monitor customer response to marketing materials.
Further refine website to include pull-down menus for certain fields (e.g., street type) to improve geo-coding customer locations.	This functionality was implemented in August 2008.
Utilize all collected data. Aggregate the savings specific to individual appliance type, size, age and replacement scenarios to yield a more accurate estimate of overall program impacts.	The previous prescriptive input assumptions did not contain this level of detail. Now that this information is available, the calculations of energy savings have been revised commencing in July 2008 (for reporting).
Improve documentation of "small" units. Use the U.S. federal definition of a compact refrigerator and/or freezer as less than 7.75 cubic feet. Determine whether any appliance types other than "single door" are less than 7.75 cubic feet.	As noted below, smaller refrigerators and freezers were removed from the program commencing in July 2008.
Utilize the savings associated with the oldest, appropriately sized "single door" appliance as estimate of savings from sulphur dioxide units. Conduct additional research (e.g., metering studies) if the quantity of these units increases.	This recommendation will be adopted.
Document and use cooling capacity (energy-efficiency rating or BTU/hr) rather than cubic feet to determine room air conditioner savings.	The small proportion of room ACs collected (one to two percent of all appliances) may not warrant this change. This will be further investigated in the Conservation Fund pilot project noted below.

Additional actions under consideration by the OPA:

- **Ensure data captured on appliance size and age is *accurate***. In some cases, pick-up crews were not accurately recording the age/size of appliances, but using the "default" selection (10 yrs old; < 10 cu. ft.). ARCA has already taken steps to address this matter with pick-up crews and to remove the "default" setting in the database. In addition, an independent third party has been secured to conduct periodic audits and inspections of the ARCA operations. **Timing: July 2008**.
- **Consider reducing LDC local marketing budgets**. Based on the findings and recommendations of this study, reductions in marketing expenditures will be explored. **Timing: January 2009**.
- **Remove smaller refrigerators and freezers from the program**. It has been determined that it is not cost-effective to collect smaller appliances (i.e., those less than 10 cubic feet). **Timing: July 2008.**
- **Seek opportunities to increase proportion of room ACs being picked up. Also include dehumidifiers.** A pilot test, funded through the Conservation Fund, will provide consumers the opportunity to turn-in an older room air conditioner or dehumidifier and receive an incentive coupon for the purchase of a new ENERGY STAR qualified unit. **Timing: Pilot test in May-June 2008, roll-out in Q3/Q4 2008.**

- **Adjust program eligibility requirements so that refrigerators and freezers must have been manufactured in 1993 or earlier** (versus current requirement of 10 years old or older). This will help preserve the peak demand and annual energy savings being achieved. **Timing: January 2009** (changes prior to then would directionally impact on LDC targets under Schedule A-2.)
- **Conduct additional research to fully understand the market for used appliances, and consumer behaviour on replacing and retiring appliances**. Such information will directly impact on free-ridership estimates. **Timing: Q3/Q4 2008**.

Implications for Future Programs

With no changes to the program design, an estimated 11 MW could be attained during the 2008-10 period based on current demand projections. With the changes discussed above, the peak demand savings that can be attained by 2010 would be 16 MW. Additional means to improve the peak demand and energy savings and/or reduce program costs will be investigated.

The GRRP also provides other intangible benefits to the OPA portfolio of conservation programs. For example, the program is highly visible, and it is easy for the public to understand the reductions in energy savings it offers. Participants have been highly satisfied with the program and have offered that their positive experience with the GRRP makes it highly likely that they will take part in other programs offered by the OPA.

Hot Savings Rebate Program & Cool Savings Rebate Program

Program Description

The province-wide programs, delivered through the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), provided incentives to Ontario residential electricity consumers to increase the efficiency of their existing cooling and heating systems through the following measures: ENERGY STAR central air conditioners (CACs), CAC tune-ups, programmable thermostats and variable speed furnace motors (ECMs). The Hot Savings Rebate Program ran from October 1, 2006, to March 31, 2007. The Cool Savings Rebate Program ran from April 1, 2007, to March 31, 2008.

Evaluation Description

Timing: ☒ End of program ☐ Mid-program (Timeframe: October 1, 2006 - March 31, 2008)
EM&V Contractor: Navigant Consulting Inc.

Program Results

Table 7 – Program Participation, Energy and Demand Savings

	Number of rebates (Both programs)							
	E-STAR CAC	Progr. Themo-stats	ECM	CAC tune-up	Total rebates	Summer demand savings (MW)	First-year energy savings (GWh)	Lifetime energy savings (GWh)
Forecasted	32,141	29,370	42,807	25,311	129,629	38.3*	n/a	470*
Reported	n/a	n/a	n/a	n/a	128,454	35.6**	42**	562**
Verified	**33,178**	**46,989**	**51,990**	**28,048**	**160,205**	**19.8**	**30.2**	**451.1**

*As presented to the Board of Directors for program approval. These are gross estimates.
**As published in 2006, 2007 and 2008 reports. These are a mix of net and gross savings, based on changing reporting practices.

The key drivers of the variance between forecasted and verified savings were:

- **Reporting practices** -- Gross savings forecasts were provided to the Board, while a mix of gross and net savings have been reported in three reports that span the 18-month timeframe of these programs.
- **Net-to-gross (NTG) adjustments** -- The forecasted NTG adjustments ranged from 0.7 to 0.9 for different measures and were based solely on free-ridership estimates. The NTG adjustments assessed in the evaluation were significantly lower, ranging from 0.16 to 0.59, due to both higher free-ridership values as well as the exclusion of 40 percent of programmable thermostat rebates and 62.5 percent of CAC tune-up rebates to reflect customers who already had these measures installed prior to participating in the program.

Lessons Learned/Recommendations

Key recommendations from EM&V contractor	Response
Better define governance and accountability structure between each of the key stakeholders, in particular between the OPA and HRAI. Suggestions include: ❑ Establish a clear mission statement that identifies the key objectives of the program ❑ Define roles and responsibilities ❑ Involve senior management in regular executive review	Steps have already been taken commencing in May 2008 to improve the governance and accountability structure. Roles and responsibilities have been clarified in the contract with HRAI. A monthly executive review meeting, involving the

Key recommendations from EM&V contractor	Response
meetings.	president of the HRAI and the OPA's director, mass market and conservation awareness, has been instituted.
❑ Retain control over the auditing of installed measures and hold HRAI accountable for addressing any anomalies that are observed. ❑ Perform frequent spot investigations of rebate applications that raise "red flags" by the rebate processor. ❑ Adjust the rules of rebate eligibility to ensure that recipients agree to a home visit (in principal) to qualify for their rebate. Verify between one and three percent of installed measures (skewed towards CACs and ECM-equipped furnaces).	The OPA agrees that audit and control measures should reside with a third party other than HRAI. Eligibility rules will be adjusted as appropriate to allow for spot-checks of installations. An independent third party will be secured to conduct periodic audits and inspections of installations. Timing: Q4 2008.
Enhance contractor enrolment and training ❑ Current online training module provides an acceptable level of information and instruction but is too susceptible to completion by peripheral contracting company personnel and should not be relied upon as the sole vehicle for program training. ❑ HRAI should develop an outreach program to educate non-participant contractors on the merits of enrolling in the program. ❑ Contractor non-compliance with program rules should be addressed quickly and with an appropriate response, ranging from additional training to, if absolutely necessary, dismissal from the program. ❑ HRAI should conduct an annual contractor eligibility review.	An automated rebate submission process is being explored for the 2009 version of the program. New training materials will be developed in accordance with the automated process. Improved contractor eligibility standards and monitoring processes will also be developed. Timing: Q3/Q4 2008.

Additional actions under consideration by the OPA:

- **Re-examine eligible products and services**. HRAI and the OPA will reconsider the inclusion of programmable thermostats in future versions of the program, given the substantial incidents of replacement of existing programmable thermostats. Other program changes and enhancements will also be explored. Timing: Q3 2008. It is intended that a proposal for the 2009 version of the program will be submitted for Board approval in Fall 2008.

Implications for Future Programs

In the justification for the 2008 version of the program (from April 1 to December 31), it was predicted that total demand savings of 14.5 MW would be achieved. With the revised PIAs and assuming no change in the number of rebates processed, the expected demand savings would be 14.1 MW.

Summer Savings Program

Program Description

The Summer Savings program was designed to build awareness of Ontario's growing summer electricity requirements and the need for conservation during the summer months when air conditioning use dramatically increases the demand for electricity. The program offered a financial incentive for consumers to reduce electricity consumption by 10 percent compared with their consumption in 2006, between July 1 and August 31, 2007. If this reduction was achieved, consumers received a credit of 10 percent of their summer electricity bill costs on their utility bill.

Evaluation Description

Timing: ☒ End of program ☐ Mid-program (Timeframe: _____)
EM&V Contractor: Navigant Consulting Inc.

Program Results

Table 8 – Program Participation, Energy and Demand Savings

	Participants	Summer demand savings (MW)	First-year energy savings (GWh)	Lifetime energy savings (GWh)
Forecasted	720,000	46	146	146
Reported	823,622	65	217.5	217.5
Verified	**380,000***	**45**	**81**	**145**

*Note that 858,093 customers qualified and received the bill credit; however, only 12 percent of those customers were considered participants based on awareness of the program and taking action to conserve. Overall 9.2 percent (380,000) of residential customers were aware of the program and actively tried to reach 10-percent target -- including those that were ineligible for the program and those that were eligible but did not reach 10-percent target.

The verified demand savings and lifetime energy savings for the program are almost exactly as forecasted; however, the savings were not achieved in the manner in which the program design had intended. Specifically, only 12 percent of customers that received a bill credit were actually found to be participants in the program (i.e., they knew about the program and actively tried to reduce their consumption). Additionally, only 30 percent of participants actually qualified for the bill credit. The total savings attributed to the program in Table 1 on page 3 includes savings from these participants who failed to qualify.

Lessons Learned/Implications for Future Programs

1. The 2007 Summer Savings program was redesigned in 2008 to address the high free-ridership rate (88 percent according to the Navigant report) and to drive active customer participation. In the redesigned program, renamed Summer Sweepstakes, customers were required to register to be eligible to win various prizes. Tier One prizes, of lesser market value, were offered simply for registering to participate. Tier Two prizes, of much greater value, were offered to customers who achieved a minimum 10-percent e1ectricity consumption reduction from the same period last year.
2. We expect the volume of customers who signed up to participate in Summer Sweepstakes will be considerably less than the total number of eligible participants last year. Customers who registered for the 2008 program will most likely be much more predisposed to actively reduce their electricity consumption. During the program period, participants who registered were sent reminders of the

program along with suggestions on ways to conserve electricity to achieve a minimum 10-percent reduction.

3. The Summer Sweepstakes program has been redesigned to focus more on conservation awareness vs. MW savings. The main focus now is to affect behavioural change through education and through cross-promotion of other conservation programs.
4. While the 2007 Summer Savings program achieved 45 MW savings, this should be regarded as a one-time MW savings driven primarily by reduction in AC use. The MW savings are attributed to the huge participation rate (i.e., 4.5 million eligible households). The vast majority of households did not knowingly participate in the program but still received a 10-percent credit on their electricity bill. This is why the program was redesigned in 2008.

BOMA Toronto Program

Program Description

The OPA has entered into an agreement with Toronto Building Owners and Managers Association (BOMA) for delivery of 150 MW of peak demand savings over a three-year period. The program provides incentives for retrofits that provide sustainable electrical demand and energy reductions in existing, privately owned commercial buildings larger than 25,000 square feet within the City of Toronto. Multi-residential buildings, municipalities, schools, universities and hospitals are excluded from the program. Applicants are eligible for incentives up to 40 percent of the capital cost of the investment. Rebates are estimated based on summer demand savings ($400/kW) or reduction in energy use ($0.05/kWh).

Evaluation Description

Timing: ☐ End of program ☒ Mid-program (Timeframe: March 1, 2007 - February 29, 2008)
EM&V Contractor: SeeLine Group & Quantec LLC
The program includes specific, rigorous, project-level measurement and verification requirements (including following *International Performance Monitoring and Verification Protocols* and using third-party M&V advisors). This evaluation focused primarily on process elements. A variety of techniques were employed to evaluate the program, including both primary and secondary research. The primary research focused on interviews with the various stakeholders, participants and non-participants, while the secondary research focused on detailed reviews of data and processes and aggregation of the results.

Program Results

Table 9 – Program Participation, Energy and Demand Savings

	Participants	Summer demand savings (MW)	First-year energy savings (GWh)	Lifetime energy savings (GWh)
Forecasted	100	15	N/A	N/A
Projects in progress -- submitted applications	34	2.1	25.6	N/A
Projects in progress -- approved applications	27	4.4	20.4	N/A
Verified (completed projects)	**12**	**0.7**	**5.6**	**79.3**

The two key drivers of the variance between forecasted and verified savings were:

- **Participation rate** -- number of completed projects was only 12 percent of forecast.
- **Savings per project** -- the average kilowatt savings per project to date (100 kW/project) was significantly lower than the 150 kW savings/project forecasted during program design. It is possible that future projects will have larger demand savings than the first projects, as larger projects take longer to "ramp up," and some participants may have been testing the program with smaller projects before participating with larger undertakings.

Lessons Learned/Recommendations

Key findings and recommendations from the evaluation contractor were:

- Simplicity is a major strength of the program.
- The program tracking system is a solid program feature and an excellent foundation for meeting reporting requirements.

- The business-to-business marketing strategy is sound. Program communications should be developed that target both individuals and departments responsible for capital investment decisions as well as those responsible for building operations (often not the same department). Strategic program communication via senior asset managers and more continuous marketing of the program are advised.
- The BOMA Toronto label presents a strong opportunity for leverage.
- The M&V component is one of the strongest components of the program. Independent third-party, project-level M&V generates solid savings estimates and provides a quality "paper trail" that simplifies checking and verifying calculations.
- Current program staffing level is inadequate. There should be more "presence" in the market by senior program resources.
- Survey respondents indicated they would recommend the program – a participant referral initiative should be considered.
- The program may be "saddled" with unrealistic targets. Program targets were developed using simple rules of thumb rather than detailed potential studies, and the participant scope has changed since the original targets were developed (e.g., multi-residential buildings were originally included within the program). At the current kW/project rate, 60 participants a month would be required to meet program target of 150 MW.

Response to lesson learned/recommendations

As an overview, the program design is sound and has particularly rigorous M&V processes embedded in the program. The lower-than-anticipated results are largely due to slow take-up – this is a result of year-one efforts being focused on development of robust, scalable business infrastructure. Additional resources have been retained (BOMA Toronto has added a program director and the OPA has assigned an OPA employee to provide sales support on an interim basis) and, with systems in place, resources will increasingly focus on marketing. The project pipeline is expanding as is the number of larger projects. Larger projects also have a longer lead time and are expected to materialize in year two of the program. Participants surveyed reported positive experience. This program provides a solid foundation to build on.

Demand Response 1 Program

Program Description

The Demand Response 1 (DR1) program's objective is to encourage short-term demand response capacity in response to the Independent Electricity System Operator's three-hour ahead pre-dispatch price signal in the electricity market. The DR1 program is a "market-based," voluntary program, designed for participation by consumers who can curtail load in response to economic signals, primarily using existing equipment and processes.

Evaluation Description

Timing: ☐ End of program ☒ Mid-program (Timeframe: January 1 - November 30, 2007)
EM&V Contractor: Price Waterhouse Coopers

Third-party measurement and verification of energy savings and demand reduction achieved is built into the demand response contracts.

Program Results

Table 10 – Program Participation, Energy and Demand Savings

	Number of participants	Nameplate capacity (MW)	Energy curtailed (GWh)	Max curtailment (% of capacity)	Average curtailment (% of capacity)	Curtailment on 2007 peak hour
Forecasted	20	200	36	200 (100%)	60 (30%)	200 (100%)
Reported	10	317.4	--	225.9 (81%)	113 (41%)	141.9 (52%)
Verified	**10**	**317.4**	**175**	**225.9 (81%)**	**113 (41%)**	**141.9 (52%)**

The key drivers of the variance between forecasted and verified savings were:

- The number of participants was lower than forecasted, reflecting the amount of education required by participants and the usual long-term nature of implementing initiatives within industrial operations.
- With respect to nameplate MW, the larger-than-expected number was the result of three very large loads participating in the program, with each load having greater than 50 MW of demand response capability.
- Curtailment on the 2007 peak hour was less than anticipated, illustrating that market price is not a perfect indicator of when demand might be the highest in Ontario.

Lessons Learned/Recommendations

The conventional evaluation of conservation and demand management resources based on avoided cost of generation, transmission and distribution does not entirely capture the benefits of demand resources, especially the insurance or option value and time value.

DR resources are capacity resources. Since there is no capacity market operating in Ontario, the ex-post evaluation of DR resources is limited by the energy-only market, which does not capture the value of capacity offered by DR resources. In addition, the ex-post evaluation based on energy prices does not capture the reliability, market power mitigation and option values of DR resources.

The OPA EM&V team is developing a DR-specific evaluation framework that could capture and value the market surplus, option and insurance value provided by DR resources, but the details are still under consideration.

- **Measures and Assumptions –** There are no standard measures and assumptions for DR resources. The measurement and verification of energy savings and demand reduction is based on metering information and standard measurement and verification protocol, as per the provisions of DR contracts.

- **Adjustment Factors (free-rider rates, net-to-gross, etc.) –** The free-rider rate is zero and net-to-gross ratio is one for the DR programs if the pre-program elasticity in the electricity market or the participant is taken into account while doing cost-effectiveness analysis.

- **Program Participation –** Program process evaluation was done in 2007 for 2006 DR1 program.

Implications for Future Programs

It is apparent that a single program to pursue demand response objectives is not sufficient. Given that the correlation between peak prices and peak demand is not perfect, the need to develop other demand response initiatives that are enabled based upon other types of triggers is necessary to ensure a fully effective capability in reducing system peak demand.