2. Making utility conservation more effective

Abstract

After transportation fuels, natural gas and electricity are the second and third largest of Ontario's energy sources. Natural gas, a fossil fuel, is Ontario's second largest source of climate pollution. Electricity is the smallest and cleanest of Ontario's major energy sources.

Conservation of both of these forms of energy can have significant financial, climate and well-being benefits; natural gas conservation has larger climate and air pollution benefits.

For close to a decade, Ontario's electricity and gas utilities have successfully delivered valuable conservation programs for their respective forms of energy, paid for through customers' bills. The government has created uncertainty about continued funding for electricity conservation, but projects that as part of the government's pathway to its 2030 target in the draft Environment Plan, expansion of the utilities' natural gas conservation programs will reduce Ontario's annual greenhouse gas emissions by 3.2 megatonnes of carbon dioxide equivalent (Mt CO_2e) by 2030.

This chapter summarizes the financial, climate and well-being benefits of Ontario's utility conservation programs, and examines the changes needed to achieve a 3.2 Mt CO_2e emission reduction at the least cost. Expanding natural gas conservation is important but cancelling electricity conservation would offset most of its potential benefits. The air and climate pollution benefits of electricity conservation can be improved by focusing on reducing electricity use at times of high demand, when fossil-fuelled electricity generators are running. Conservation of other space heating fossil fuels, such as propane and oil, and switching between energy sources, may help reduce the cost of the 3.2 Mt CO_2e emission reduction.

Ontario's post-2020 conservation framework should consider whether a single administrator model would more efficiently deliver conservation programs for all these energy sources.

Contents

2.1 Introduction

Ontario has recognized that energy conservation is the least costly energy resource for the province. Over the past decade, conservation of natural gas and electricity has helped customers save money on their utility bills, reduced pressure on existing assets, delayed the need for new expensive infrastructure and made living conditions more comfortable for vulnerable customers. In Ontario, energy conservation programs have been designed and delivered mainly by the province's electric local distribution companies (LDCs) (for electricity) and gas utilities (for natural gas).

Energy conservation is the least costly energy resource.

The Ontario Energy Board (OEB) sets the rates and rules for both the natural gas and electricity sectors. The OEB also oversees the natural gas demand-side management (DSM) framework. On the other hand, the delivery of electricity conservation programs is overseen by the Independent Electricity System Operator (IESO). In addition to programs delivered to distribution-connected customers by the LDCs and the IESO, the IESO also delivers conservation programs directly to large customers connected to the transmission system.[1] In all cases, the utilities' customers pay for the conservation program through charges on their respective energy bills.[2] Utility conservation programs have been around consistently for just over a decade for electricity and over two decades for natural gas.[3] Both the LDCs and the gas companies have performed well in achieving significant reductions in electricity and gas use, as detailed in **Appendices C** and **D** of this report (available online).

Ontario should develop a new framework that will make utility conservation more effective.

With the current electricity and natural gas conservation frameworks running out in 2020, Ontario should develop a new framework that will make utility conservation more effective, i.e., how it can continue helping customers save money and improve their well-being while achieving the government's goal of 3.2 megatonnes of carbon dioxide equivalent (Mt CO_2e) of GHG emissions reduction by 2030.

2.2. Natural gas and electricity conservation frameworks

2.2.1 Current conservation programs

Both the electricity and gas utilities are currently over halfway through their respective conservation frameworks that were set for 2015-2020. A range of programs are offered to the main sectors: residential, commercial, industrial and low-income customers. Residential programs range from rebates for energy efficient products sold by retailers to replacing the heating/cooling systems in homes to deep energy retrofits of a home. Commercial and industrial programs under both frameworks range from paying incentives to offering technical support to make businesses and industrial facilities more energy efficient. Initiatives include monitoring and evaluating current energy use and paying for some of the cost of upgrading to more energy efficient equipment. Some programs offer staff training and technical assistance to manage and improve energy use. There are also programs that promote leading-edge equipment and processes that are above and beyond the current market practices to facilitate "market transformation". Both frameworks also offer separate programs for the more vulnerable residents of the province living in single-family homes and multi-unit residential buildings to improve their living conditions and reduce energy use.

There are also opportunities for the LDCs and gas utilities to apply for new programs and pilots. These opportunities, especially on the electricity side, allow LDCs to test the cost-effectiveness and market for a new measure or technology. Under the current frameworks, there have been several local programs and pilots successfully launched that have highlighted LDC innovation and market transformation. Section C.2.3 in **Appendix C** (available online) highlights those programs.

Table 2.1 details the key elements of the Conservation First Framework for electricity and the Demand-Side Management Framework for natural gas.

Table 2.1. Key elements of electricity and natural gas utility conservation frameworks.

Key elements	Conservation First Framework (CFF) for electricity	Demand-side Management (DSM) Framework for natural gas
Duration	January 1 2015-December 31 2020	January 1 2015-December 31 2020
Oversight	Independent Electricity System Operator	Ontario Energy Board
Target	7.4 TWh of persistent energy savings to 2020	Gas targets are set annually based on previous year's results and allocated budget
Budget (averaged over the course of the entire framework)	$400 million[4] for LDC conservation programs and $46 million[5] for the IESO's transmission-connected conservation programs (both per year) roughly 2% of the cost of the province's electricity system[6]	$117 million per year, roughly 2% of the cost of the province's natural gas system[7]
Funding	Funded through the Electricity Charges portion of the bill, based on conservation spending for all customers (approximately 2.5% of the total Global Adjustment[8])	Funded through gas distribution rates, based on conservation spending for that class of customers (e.g., $2/month per residential customer account[9])
Performance metrics[10]	Persistent energy savings	Cumulative energy savings
Eligible incentives for utilities	Eligible for a Mid-term Incentive, Achieving Target Incentive and Exceeding Target Incentive. Joint plan with other LDCs means higher incentive. Also eligible for cost-efficiency incentives. Alternatively, can pursue pay for performance funding[11]	Eligible for scaled incentives based on performance against targets. Natural gas utilities need to achieve 150% of their targets to maximize incentives. Annual incentives are capped at $10.45 million each for Union and Enbridge.[12]
Penalties	Range of remedial actions available to the IESO, including financial remedies[13]	Program delivery is voluntary; the OEB does not have any penalties if gas companies miss their targets
Mid-Term Review	Completed by the IESO and presented to Minister of Energy on June 1, 2018 (the IESO advice is not in public domain)	The completed report was posted on the OEB's website in November 2018

Source: 2015-2020 IESO-LDC Energy Conservation Agreement (2014), various Directives and Directions from the Ontario Minister of Energy to the IESO, OPA and OEB from 2014 to present; "Conservation Delivery and Tools", online: Independent Electricity System Operator www.ieso.ca/en/Sector-Participants/Conservation-Delivery-and-Tools/LDC-Toolkit. [Accessed 13 February 2019]; Ontario Energy Board, EB-2014-0134, Report of the Board: Demand-side Management Framework for Natural Gas Distributors (2015-2020), (Toronto: OEB, December 2014).

2.2.2 The benefits of conservation

Both the electricity and the natural gas industries have successfully designed and delivered energy conservation programs to Ontarians, and have been instrumental in fostering a culture of conservation in the province. Conservation programs delivered by Ontario's gas and electricity utilities and the IESO have saved ratepayers and the province money, have helped reduce the province's GHG emissions and have made homes more liveable and businesses more competitive by making them more energy efficient.

Both the electricity and the natural gas industries have successfully designed and delivered energy conservation programs to Ontarians.

Energy use benefits

Electricity conservation was introduced in Ontario in the early to mid-2000s when the province was facing a threat of inadequate power supply and poor reliability. Public appeals to conserve, especially during the hottest days of the year, were not uncommon.[14] The primary goal of conservation was to reduce system-wide peak demand on these hot days. While reliability was the initial driver for Ontario to invest in electricity conservation, there have been additional financial, system, and environmental benefits for customers and for the province as well.

Since 2006, ratepayer-funded electricity conservation programs have reduced annual electricity consumption by around 9 TWh at the generator level, as presented in Figure 2.1.[15] This is enough electricity to power close to a million homes.[16] Without these conservation programs, electricity use in the province would have been almost 7% higher than what was recorded in 2017.[17]

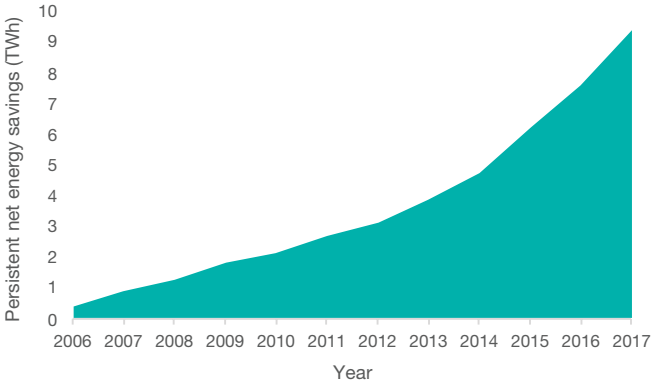


Figure 2.1. 2017 persistent net energy savings from electricity conservation programs 2006-2017.

Note: this does not include savings from codes and standards and non-IESO conservation.[18]

Source: Independent Electricity System Operator, information provided to the ECO (15 January 2019).

As mentioned earlier, electricity conservation has helped shave the province's peak demand, which is by far the most expensive power to provide. Without utility conservation, peak demand would have been roughly 10% higher in 2017 than it actually was. Figure 2.2 presents the 2017 persistent net peak demand savings from 2006 to 2017 from ratepayer-funded electricity conservation programs. Given the fact that in Ontario, electricity demand during peak hours is usually met by increasing gas-fired generation, shaving off peak demand has also had environmental benefits for the province in the form of lower GHG emissions.

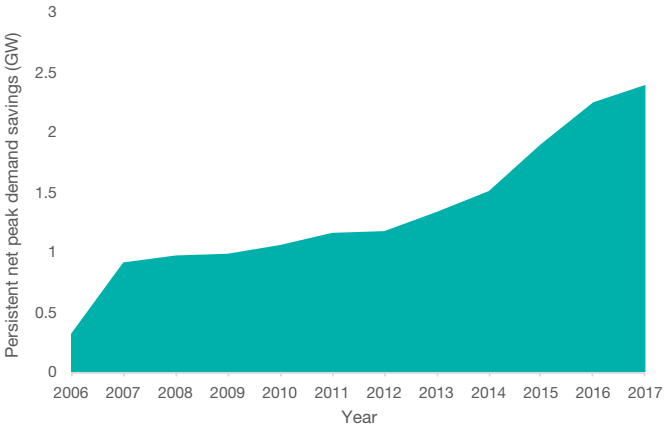


Figure 2.2. 2017 persistent net peak demand savings 2006-2017.

Note: does not include codes and standards, pricing policies and other influenced conservation.[19]

Source: Independent Electricity System Operator, information provided to the ECO (15 January 2019).

Natural gas supplies about 28% of Ontario's energy needs. Reducing natural gas use through conservation reduces customer bills, reduces pressure on the infrastructure (although to a lesser degree than for electricity conservation), acts as a resiliency resource and most importantly, reduces GHG emissions. In 2016, natural gas use was roughly 8% lower for Union Gas customers and 6% lower for Enbridge customers than it would have been without DSM programs, based on conservation results from 2007 onwards.[20] Figure 2.3 presents an estimate of persistent gas savings to date. Since 2007, natural gas conservation programs have reduced annual natural gas consumption by close to 1,700 million m^3. This is enough natural gas to fuel over 700,000 homes.[21]

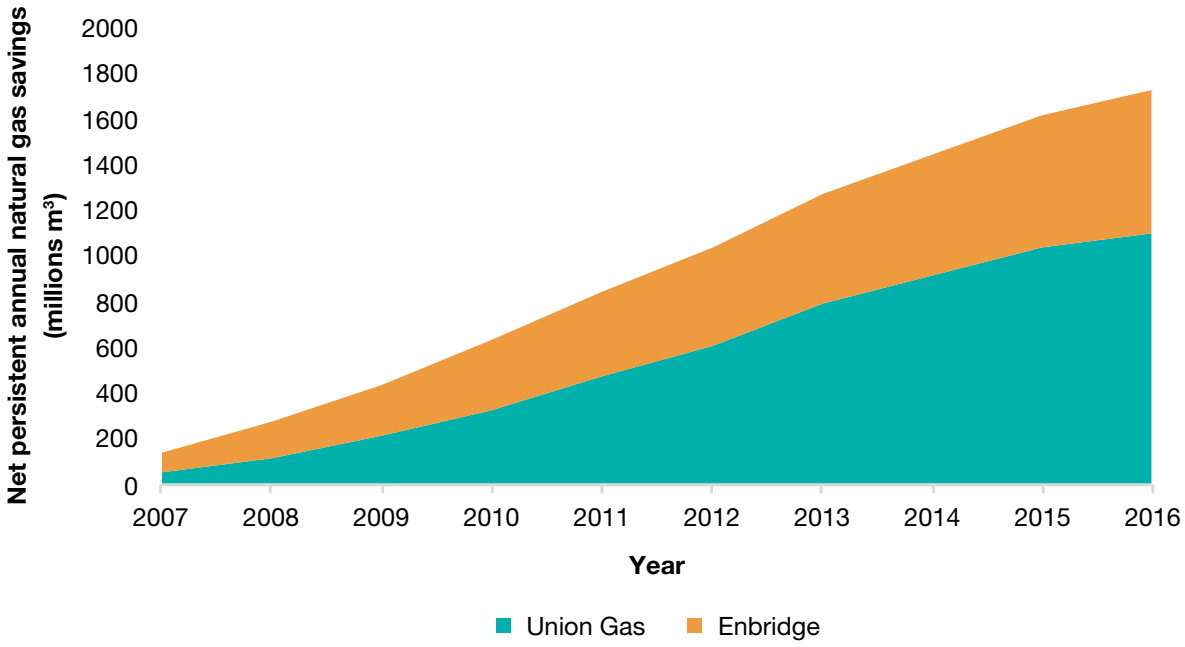


Figure 2.3. Persistent net energy savings from natural gas conservation programs 2007-2016.

Source: Enbridge Gas Distribution Inc., 2016 Demand Side Management Annual Report; Union Gas, 2016 Demand Side Management Final Annual Report.

Overall economic benefits

In order to ensure that utility conservation is adding value to society and to the energy system and its customers, most utility conservation programs must pass cost-benefit tests before they are delivered. In Ontario, energy conservation programs are primarily assessed using the Total Resource Cost (TRC) test. This test quite accurately measures the financial costs and benefits of conservation and its impact on the energy system, but does a less complete job of measuring non-energy benefits, such as improved customer comfort and reduced greenhouse gas emissions. Therefore, both conservation frameworks use a 15% adder to the TRC test to account for non-energy benefits, including GHG emissions.[22] Later in this chapter, we discuss improvements to cost-effectiveness testing to more accurately quantify the emissions reductions from conservation, value these reductions, and prioritize programs that can deliver emissions reductions.

To date, both natural gas and electricity programs have performed well in terms of cost-effectiveness. In 2017, LDC-delivered programs had a TRC of 2.54.[23] This means that for every dollar spent on electricity conservation, there was a benefit of $2.54 to society as a whole.[24] For natural gas conservation, 2016

2

For every dollar spent on electricity conservation, there was a benefit of $2.54.

verified results have shown than Enbridge and Union programs have TRCs of 2.6 and 2.9 respectively, a benefit of close to $3 to society for every $1 spent on natural gas conservation.[25] Therefore, utility conservation continues to be beneficial to Ontario as a whole.

Energy system benefits

Most of the benefits from conservation captured in the TRC test (described above) are from reduced costs in building, fuelling, and operating the electricity and natural gas systems.

There are short-term and long-term benefits to the electricity grid from conservation. In the short term, conservation reduces the use of existing electricity assets, especially during peak hours, when gas-fired generators need to come online and there is also increased pressure on transmission and distribution assets. The province saves on operational and fuel costs and sees less stress on existing assets because of conservation.

Since conservation efforts put in place now will save electricity over multiple years, they may postpone or nullify the need for capital investments in new generation, transmission and distribution assets. The textbox "Using conservation and demand response to postpone/avoid new infrastructure spending" on regional conservation details an example of LDC-led conservation and demand response to postpone new asset construction. With the IESO projecting that the province may be facing a supply shortage by as early as 2023, this long-term benefit of conservation can be crucial in ensuring that the province does not run into reliability issues and face expensive infrastructure spending.

Using conservation and demand response to postpone/avoid new infrastructure spending

Toronto Hydro is currently piloting a rate-funded conservation/demand response (DR) program that is expected to contract close to 12 MW of demand response by its completion in mid-2019.[26] In its current application, the LDC is asking for another $4.6 million over 4 years for more local demand response programs that would defer distribution infrastructure as part of its Station Expansions Program.[27] These investments include installing battery storage and implementing targeted DR programs to reduce peak demand by 10 MW and defer an estimated $135 million of expansion investments in two transformer stations for 5 to 6 years.[28] These investments will allow Toronto Hydro to address capacity constraints with local DR, maintain and enhance reliability of power, expand the planning toolbox to non-wires solutions and allow for more flexibility in future asset planning. Both transformer stations are expected to reach 85% capacity by early 2022 and therefore local DR can help maintain reliability in the short to medium-term while more long-term capital-intensive plans are developed.[29] One of the main reasons Toronto Hydro is proposing local conservation and DR is because the cost is significantly less than building new assets and therefore will have a lower impact on the customer's bills.

The LDC also proposed a conservation alternative to provide capacity relief for a transmission corridor between 2018 and 2021, advising that the incremental conservation would cost between $7-8 million and would defer the transmission need by 5 years.[30]

The OEB is expected to render a decision on the application in the second half of 2019.

For natural gas conservation, the primary economic benefit is reduced spending on commodity natural gas, which is almost entirely imported from outside Ontario. The benefits from gas conservation in avoiding infrastructure spending are not as large as in electricity. There is no direct equivalent in the natural gas system to the electricity conservation benefit of avoiding the need to build new electricity generating stations.[31] There is some benefit in reducing the infrastructure cost to deliver natural gas to customers, but this is only beginning to be quantified, and is discussed later in the chapter (textbox "Gas conservation and infrastructure planning").

Customer benefits

One of the primary benefits to customers participating in energy conservation programs is of course lower energy bills, from making homes, businesses and industries more energy efficient. In addition, conservation can offer valuable co-benefits for some participants.

One of the primary benefits to customers is lower energy bills.

Conservation programs geared towards more vulnerable customers such as low-income communities and Indigenous residents are often delivered at no cost to the customer and deliver a range of other benefits beyond simple bill savings. Programs help reduce energy bills, make living conditions more comfortable (especially for electrically heated homes) and help with better bill arrears management. The textbox "Customer experience with utility conservation programs" highlights two examples of customers from different sectors who have benefitted from utility conservation programs.

Customer experience with utility conservation programs

Lake Shore Gold Mine's experience with the Industrial Accelerator Program[32]

Lake Shore Gold (LSG) is a Canadian based gold producer (a division of Tahoe Canada) with operations based in Timmins, Ontario. The company currently operates two underground mines in Timmins West and Bell Creek, along with an ore-processing mill at Bell Creek. The Bell Creek mill is a conventional gold mill circuit, involving crushing, grinding, gravity and leaching, followed by gold recovery processes. The mill relies on ore from both the Timmins West site, and the Bell Creek underground operation. The company currently employs 650 employees. The two facilities have a combined annual electricity capacity of 27 MW and annual electricity consumption of 181,000 MWh.

Lake Shore Gold is eligible for Ontario's electricity conservation program for large transmission-connected customers, the Industrial Accelerator Program (IAP). According to Lake Shore Gold, the application process to participate in the IAP was straightforward and made easier because of support from an IESO account representative. Since April 2017, the company has been an active participant in several initiatives under the IAP. LSG has completed five design engineering studies with one progressing to a Small Capital Project, where LSG replaced six 30-year old compressors with three more energy-efficient ones at the Bell Creek mine site. The new compressors are expected to save the company 1300 MWh of electricity annually. The company is looking to start another small capital project to upgrade underground ventilation in Q2 of 2019. Lake Shore Gold recently completed a second successful year of the Energy Manager Incentive Program and all lighting in both the mines and the mills has also been changed to energy-

efficient LEDs under the IAP's Retrofit initiative. LSG has seen electricity savings and increased productivity from participating in the IAP. Its ore-processing throughput has improved by over 20%, while the electricity cost associated with processing has reduced by 20%. Participation in the IAP and other energy management programs has helped LSG reduce its electricity use by 8500 MWh in 2018.

A semi- autogenous grinding (SAG) mill at LSG's ore-processing mill, one of the most-energy intensive equipment at that site.

Photo credit: Lake Shore Gold.

Nipissing First Nation Home Weatherization program

In 2017, Nipissing First Nations (population: about 1,450) worked with Union Gas and Hydro One to improve home energy efficiency for its residents with poor home insulation. This ratepayer-funded program provided and installed home weatherization measures (e.g., additional wall/basement/attic insulation, window repairs, low flow shower heads and faucet aerators, and water tank insulation), as well as some non-energy related safety measures (e.g., carbon monoxide and smoke alarms, minor mold remediation, and ventilation improvements), at no cost to participants.[33]

Nipissing is located in Northern Ontario, about 40 km west of North Bay on the shore of Lake Nipissing, where residents face frigid winters. Heating costs are a major burden for residents in the community, many of which are low-income seniors and elders, living in older inefficient homes needing repairs.[34] Despite the fact that these weatherizing measures are very cost-effective, access to capital is a major issue for many residents, making these residents excellent candidates for free energy efficiency upgrades to their home envelopes. Such upgrades normally save about 15% of heating costs on typical housing stock, but can achieve much higher savings in less efficient homes. The community has already reported that homeowners have "seen a significant cost savings which they are able to apply [..] where it is much more needed."[35]

Homeowners have seen a significant cost savings which they are able to apply where it is much more needed.

This type of utility/First Nation collaboration is increasing in Ontario, for example recent electricity conservation projects were completed in Fort Albany, Kaschechwan and Attawapiskat on over 90 homes. By 2020, Union Gas plans to provide its Home Weatherization Program to all its on-reserve customers.[36]

Natural gas conservation has a larger impact on reducing GHG emissions.

Greenhouse gas reduction benefits

While both electricity and natural gas conservation reduce energy use, natural gas conservation has a larger impact on reducing GHG emissions since Ontario's electricity system mostly runs on clean generation (approximately 94% clean generation in 2018[37]). For every cubic metre of natural gas that is not used thanks to conservation, there is an associated reduction in GHG emissions. Natural gas combustion primarily releases carbon dioxide along with minor amounts of methane and nitrous oxide. Natural gas conservation from 2007 to 2016 has reduced Ontario's annual greenhouse gas emissions by roughly 3.3 Mt (approximately 2% of Ontario's annual emissions), as shown in table 2.2.

Table 2.2. Greenhouse gas emissions reductions (Mt CO_2e) from persistent gas utility conservation programs (2007-2016)

	GHG savings from persistent natural gas savings (2007-2016)
Enbridge emissions reductions	1.18 Mt
Union Gas emissions reductions	2.09 Mt
Total	3.28 Mt
Ontario total emissions in 2016 (rounded)	161 Mt
Emissions reductions from natural gas conservation as % of total Ontario emissions in 2016	2.04%

Note: Does not include reductions in upstream emissions.

Source: ECO calculation based on combining first-year net natural gas savings from conservation programs between 2007 and 2016, as reported by Enbridge and Union Gas, and assuming persistence of these savings in 2016.[38]

Electricity consumption leads to GHG emissions mostly during hours of the day when electricity demand is the highest (summer and winter weekdays) since GHG-emitting gas-fired generators are turned on to meet this higher demand. So not only does electricity conservation help in saving operational and fuel costs, it also helps reduce GHG emissions. IESO data has shown that in 2017, there was the potential to directly or indirectly reduce the use of gas-fired generation, i.e., reduce GHG emissions, in approximately 17-42% of the hours in a year.[39] Natural gas-fired generation is projected to run more frequently in future years, as discussed later in this chapter, so the longer-term GHG reduction potential of electricity conservation is higher.

Estimating the historical GHG emissions reductions from electricity conservation programs over the past decade is tricky as it relies on a number of assumptions as to what generation resources would have been used to produce electricity if conservation had not taken place. The ECO has previously looked at this and estimated that the combined impact of conservation programs, codes and standards, and renewable generation reduced electricity sector operational emissions in 2015 by 3-10 Mt CO_2e, depending on the assumptions used.[40] Taking the midpoint of this estimate (6.5 Mt CO_2e), and updating for program activity through 2017, the impact of electricity conservation programs alone was roughly a 2.6 Mt CO_2e emissions reduction in 2017.[41] While this is almost as large as the emissions reductions achieved from natural gas conservation programs, spending on electricity conservation has been much higher.

The future greenhouse gas reduction potentials of both electricity and natural gas conservation are examined in more detail later in this chapter.

Utility conservation also has other benefits such as cleaner air, better health and economic growth, which were discussed in **Chapter 1** of this report.

2.3. Current uncertainty

With a new government elected in 2018 that emphasizes the importance of cutting costs, electricity rates and taxes, there has been a high level of uncertainty about the future of utility conservation. Specifically, spending on electricity conservation programs has been considered by some to be an unnecessary charge on already high electric bills and creating more waste during hours of electricity surplus. We now look at what the current government's latest announcements are for the electricity and natural gas conservation frameworks.

2.3.1 Mid-term reviews

Mid-term reviews for both the electricity and natural gas conservation frameworks (initiated prior to the change in government) were completed in 2018. These reviews were expected to guide conservation policy through the end of the current framework (2020). For natural gas, the OEB completed this review in November 29, 2018, making only minor changes to the current framework (some of which are discussed later in this chapter). The OEB also indicated that the development of the next framework (post-2020) will commence in early 2019, where more substantive changes (e.g., budget expansions, amortization of DSM costs) to the framework could be considered.[42]

For electricity, the IESO completed its work on the mid-term review in spring 2018, and submitted an advice report to the Ministry of Energy, Northern Development and Mines (MENDM) with its recommendations. MENDM has not acted on this report yet, due to a change in policy priorities, discussed below. As a consequence, no changes have yet been made to the electricity conservation framework based on the mid-term review.

The IESO's draft advice report on the Electricity Conservation Mid-Term Review

The Independent Electricity System Operator (IESO) completed and filed a draft mid-term review report on the framework for electricity conservation programs (the Conservation First Framework (CFF)) on June 1, 2018, including recommendations, with what is now the Ministry of Energy, Northern Development and Mines (MENDM). Since this report was filed, Ontario has seen a change in government. It is important to note that the report was in draft state when filed, and MENDM has indicated that certain aspects of the report are now out of date and therefore not relevant to the government's current priorities, which include lowering electricity costs for Ontarians by 12%.[43]

MENDM provided the ECO with a confidential copy of the IESO's draft advice report.[44] Several recommendations made in the IESO's draft advice report align with the opportunities discussed in this chapter. Given its draft and confidential nature, the ECO is providing only a high-level summary of some of the pertinent aspects of the IESO's draft advice report.

Operation of the 2015-2020 Conservation First Framework: The report generally finds that the CFF is performing well to date, and makes relatively minor recommendations for adjustments to electricity conservation program operations within the existing framework. Two outstanding issues include how to ensure availability of conservation programs in all parts of the province, and what to do in areas where local distribution companies (LDCs) may exceed their budgets (often due to better than expected customer participation) before 2020. The report makes some recommendations regarding target and budget exchange, and centralized delivery of province-wide residential programs, to address these issues.

Improving the customer experience: The report flags that customers continue to be confused by a variety of conservation programs offered by multiple organizations and that there is a need for a "one-window approach" to conservation. The report notes the IESO's efforts in this area, including work on a multi-fuel collaboration guideline that will include principles on attribution of costs and benefits and best practices from other jurisdictions, and a mechanism to fund multi-fuel pilots and programs that are joint initiatives between the natural gas companies and the LDCs and/or other partners.

Customers continue to be confused by a variety of conservation programs offered by multiple organizations.

Updating cost-effectiveness calculations: The report recommends that the current 15% non-energy benefits adder used in program cost-effectiveness testing should be revised to separately value the cost of carbon from other non-energy benefits such as comfort. The report recommends that a 13% adder should be used for non-energy, non-carbon benefits, and that the avoided cost assumptions used to calculate the benefits of conservation initiatives should be updated to reflect current electricity system conditions and to include an explicit price on carbon.

Post-2020 conservation framework: All stakeholders who were part of the mid-term review process emphasized the importance of conservation continuing post-2020. The report recommends that larger projects that can take multiple years to bring projects into service should receive certainty of funding during the transition, but all other programs should be closed within the 2015-2020 framework to minimize administrative costs, and make a clean transition to a new framework.

In terms of the next framework, the report recommends that research and consultation on program design and governance should begin now, and that an improved governance model be in place by early 2020 that has been vetted through broader public and stakeholder consultations.

Before developing the next framework, the report recommends an independent third-party review to look at governance, and identify potential entities that could design, deliver and manage energy efficiency programs in Ontario, taking into account customer and sector needs. The report notes that energy efficiency is split amongst different entities (gas utilities, electric utilities/IESO, and at the time of the report, GreenON) all subject to different requirements. Savings in cost, increases in efficiency and enabling greater integration should be a goal for the post-2020 energy efficiency framework.

Other important elements for discussion for the next framework include:

- establishing the primary objective of the framework (e.g., energy savings, reducing peak demand, meeting supply needs, reducing greenhouse gas emissions or a combination of some or all of these goals)
- reviewing the definition of eligible conservation technologies, based on the objectives of the framework
- considering entities for delivering conservation beyond the IESO-LDC-natural gas model, that could be driven by markets
- achieving an integrated sustainability framework with a one-window experience for customers
- implementing a more flexible framework based on a longer-term target, that can be amended periodically without the need to stop and start the framework, and
- considering regional needs by targeting conservation to areas of the province where it may be more valuable in meeting electricity system needs.

Commentary

Several of the issues noted in the IESO's draft report are addressed in more detail later in this chapter (based on publicly available materials), specifically:

- Improving the cost-effectiveness testing used for electricity conservation, including better measuring and valuing greenhouse gas emissions reductions (section 2.4.2), and
- Increasing energy and cost savings and emissions reductions and improving the customer experience, through greater collaboration between natural gas and electricity utilities and/or a single administrator that is responsible for conservation programs for multiple energy sources, including other fuels for which programs do not currently exist (section 2.5).

2.3.2 Moving electricity conservation to the tax base

Spending on electricity conservation is currently charged to all electricity customers under the Global Adjustment, which is part of the commodity cost in electricity bills. There has been a promise from the current government to move some or all of the cost of conservation spending from the electricity bill to the tax base. Conservation costs about $400 million a year out of the $21 billion annual cost of the electricity system.[45] At this point in time, there are no timelines as to when or how this change will be implemented.

The proposal to move conservation spending to the tax base has raised concerns in the industry and amongst stakeholders about the future of electricity

Conservation costs about $400 million a year out of the $21 billion annual cost of the electricity system.

conservation in the province. If the government's main objective is reducing the provincial deficit, spending on electricity conservation that is funded by taxation may face cuts or complete cancellation. In light of the likely focus on cost-cutting, the industry has provided recommendations as to how money can be saved in the current framework.[46]

MENDM has confirmed that reducing electricity rates is a top priority for the government and decisions on conservation policy will be made with this in mind.[47] Given the new policy priorities, MENDM has indicated that the recommendations of the Conservation First Mid-Term Review, presented to the Minister of Energy in July of 2018, are now out of date and therefore not immediately relevant to discussions related to the future of electricity conservation.[48] It is important to note that the province's LDCs have performed exceptionally well in the current 2015-2020 Conservation First Framework, achieving almost 70% of the provincial target halfway through the framework.

Promoting further uncertainty, the government's recently released draft Environment Plan did not mention electricity conservation.

What would happen if we stopped electricity conservation programs altogether?

Cutting electricity conservation programs would make it more difficult for Ontario's electricity system to maintain reliability and deliver enough power to meet Ontario's needs. The IESO's 2018 Technical Planning Conference assumes that about 15 TWh of electricity savings and almost 2,400 MW of peak demand will be achieved from new conservation programs by 2035 (Figure 2.4).[49] To be clear, all of these savings are to be achieved from new (post-2017) conservation activity.

Cutting electricity conservation programs would make it more difficult to maintain reliability.

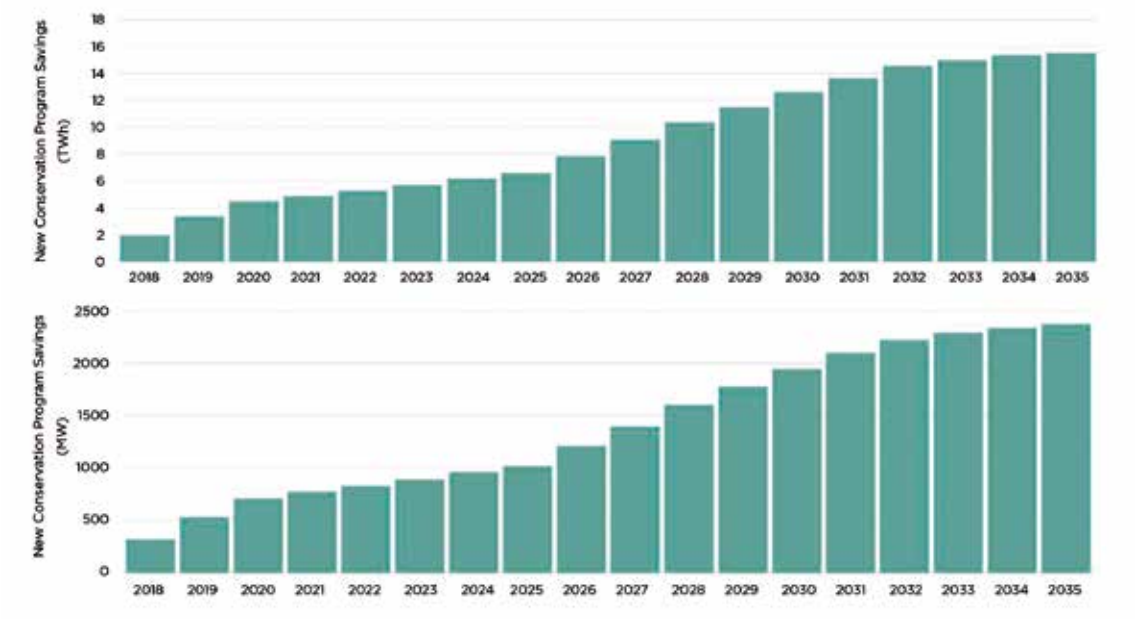


Figure 2.4. Projected electricity and peak demand savings from future (post-2017) electricity conservation programs.

Source: Independent Electricity System Operator, "2018 Technical Conference" (presentation at IESO Technical Conference, September 2018) at 20.

These estimated electricity and peak demand savings from future conservation programs are equivalent to about 10% of Ontario's current electricity supply and peak demand. If conservation programs are cancelled, this energy would have to come from generation resources instead, including new generation or imports.

Even if all of these future conservation savings are achieved, Ontario is forecasting a supply gap beginning in 2023 when long-term contracts start expiring, nuclear generation plants are being refurbished and Pickering nuclear units are shut down (Figure 2.5).[50] This gap has been made larger by recent policy shifts such as the cancellation of 751 renewable generation projects. Cutting conservation programs would increase this supply gap and put Ontario in a precarious position, in need of a large amount of new supply.

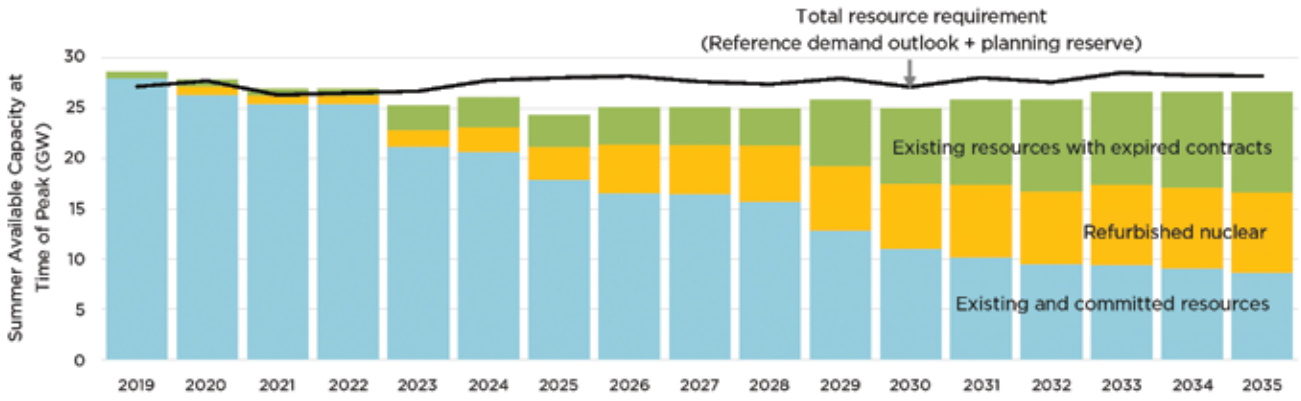


Figure 2.5. Projected future electricity supply gap.

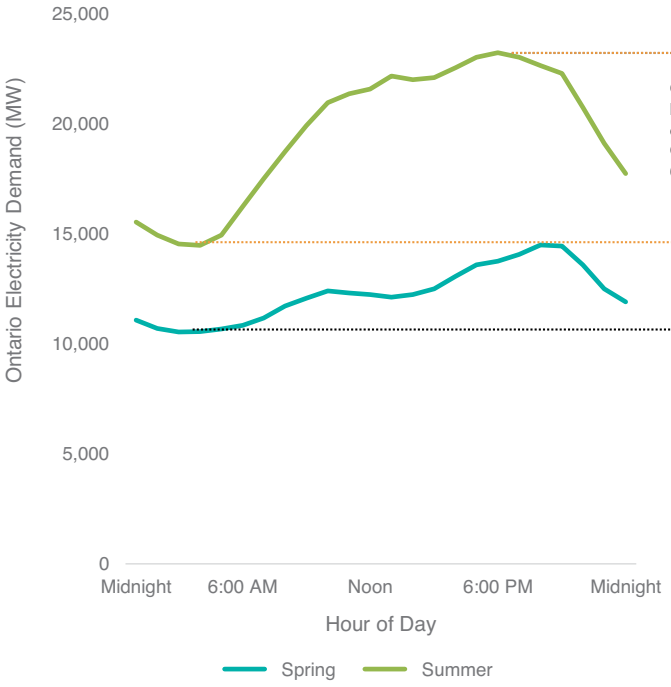
Note: This projection assumes that planned future electricity conservation programs will continue. If this does not occur, the gap between supply and demand would be larger.

Source: Independent Electricity System Operator, "2018 Technical Conference" (presentation at IESO Technical Conference, September 2018) at 50.

While many believe that Ontario has an electricity surplus, this is only true during periods of lower demand, such as spring and fall nights and weekends. During peak summer hours, the province can be in a position where it barely has sufficient electricity to maintain the grid's reliability.

The variability in electricity demand in Ontario depending on the time of the day and on the season is presented in Figure 2.6.

While many believe that Ontario has an electricity surplus, this is only true during periods of lower demand.



Ontario's electricity demand varies greatly by time of day and by season.

Figure 2.6. Variability in Ontario electricity demand.

Note: This is a simplified presentation of electricity demand in summer and in spring on a typical weekday to show the difference in electricity demand.

Source: Independent Electricity System Operator; Environmental Commissioner of Ontario.

There is another reason to continue and enhance electricity conservation, one that is favourable to ratepayers. Conservation remains the cheapest electricity resource, as shown in Figure 2.7. Electricity conservation is a much less expensive way of filling the supply gap than building new generation.

Conservation remains the cheapest electricity resource.

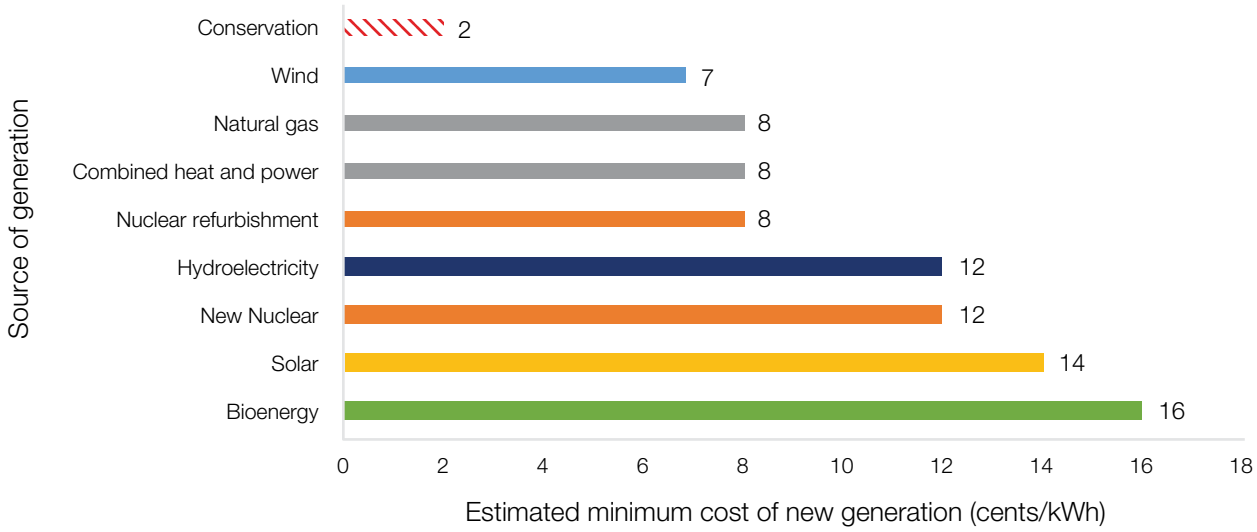


Figure 2.7. Estimated minimum cost of new electricity generation in Ontario, 2016.

Source: Independent Electricity System Operator, information provided to the ECO (31 January 2018).

The IESO now bills taxpayers $2.5 billion/year to keep our electricity system running.

In terms of keeping electricity costs low, another factor is the scheduled expiry of the Fair Hydro Plan in 2022/23. The Fair Hydro Plan has artificially reduced customer's electricity bills by 25%;[51] the IESO now bills taxpayers $2.5 billion/year to make up for this revenue shortfall and to keep our electricity system running.[52] When this artificial discount expires, Ontarians will face a spike in their bills. Conservation programs can help mitigate that increase.

Cutting electricity conservation programs would also make it more difficult for Ontario to meet its climate targets, as GHG-emitting gas-fired electricity generation would need to run more frequently. We will see in section 2.4.2 of this chapter how future electricity conservation could affect greenhouse gas (GHG) emissions, and how improvements could make electricity conservation programs more effective in contributing to the province's climate goals.

2.3.3 More natural gas conservation to fight climate change

The government's draft Environment Plan forecasts that gas utilities conservation programs will deliver 3.2 Mt CO_2e of the government's goal of 18 MT of greenhouse gas (CO_2e)[53] reductions by 2030, as shown in Figure 2.8.[54]

The government forecasts that gas utilities conservation programs will deliver 3.2 Mt CO_2e of greenhouse gas reductions.

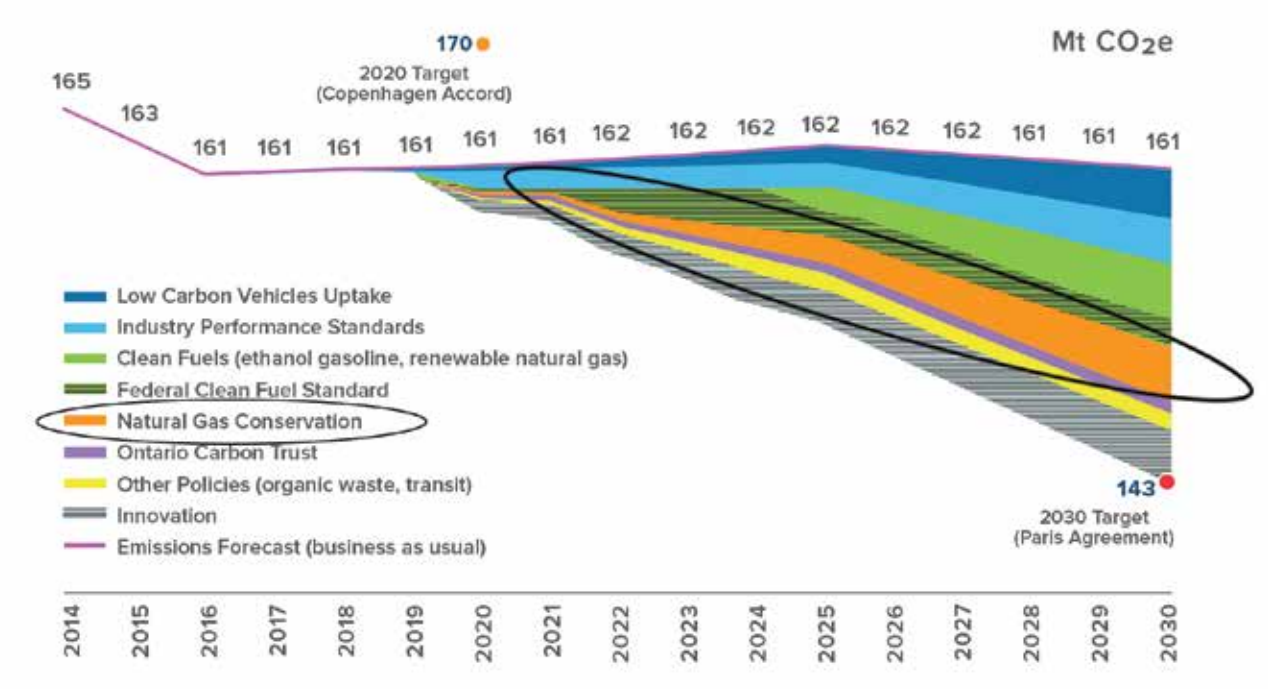


Figure 2.8. Proposed path to meeting Ontario's new, higher 2030 emissions target of 143 Mt CO_2e.

Source: Ontario Ministry of the Environment, Conservation and Parks, Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan (Toronto: Queen's Printer, November 2018) at 23.

The government states it will work with the OEB to expand cost-effective natural gas conservation to "simultaneously reduce emissions and lower energy bills".[55] The plan does not provide any details on what those programs will look like, what level of GHG emissions will be reduced from these programs, how much they will cost and what the impact will be on the utility bill. The forecast emissions reductions from expanding natural gas conservation begin in 2021, which may indicate that the government has no plans to alter natural gas conservation programs before the end of the current framework in 2020.[56]

2.3.4 Next steps

Both natural gas and electricity conservation have important roles to play in reducing GHG emissions, in saving money for the province's homes and businesses and in improving the well-being of Ontarians. With the current utility frameworks more than halfway completed, now is an opportune time for Ontario to review utility conservation programs to make them more effective, especially in light of the province's proposed climate goals under its Made in Ontario environment plan. In the next section, we analyze in more detail if the emissions reductions projections in the environment plan are feasible for Ontario to undertake and what more it can do to reduce GHG emissions via energy conservation.

Both natural gas and electricity conservation have important roles to play in reducing GHG emissions, in saving money and in improving the well-being of Ontarians.

2.4. How can Ontario achieve 3.2 Mt CO_2e of emissions reductions from conservation?

2.4.1 Expansion of natural gas conservation

As mentioned earlier, in its draft Environment Plan, the government states that 18% of its GHG reduction goal of 18 Mt CO_2e by 2030 will come from the Natural Gas Conservation Action (see Figure 2.9).[57] This assumes a gradual expansion of natural gas conservation programs delivered by the utilities, subject to discussions and approval by the oversight body for gas conservation, the OEB.[58]

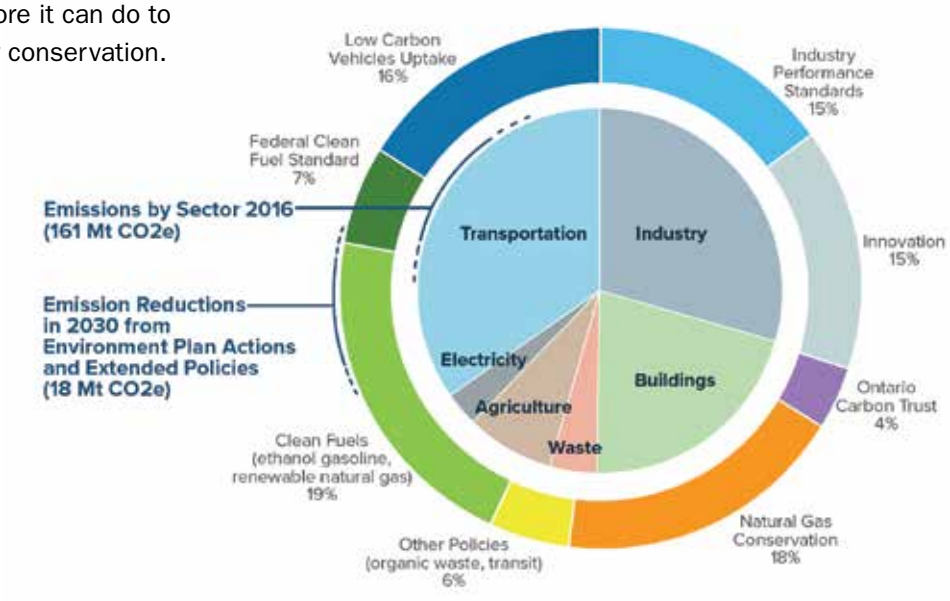


Figure 2.9. Planned emissions by sector and emission reductions actions in 2030.

Source: Ontario Ministry of the Environment, Conservation and Parks, Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan (Toronto: Queen's Printer, November 2018) at 24.

Expanding natural gas conservation will have many benefits for Ontarians, including:

- Per dollar spent, natural gas conservation has a greater impact in reducing GHG emissions than electricity conservation does. This is primarily because 94% of Ontario's electricity generation in 2018 was not fossil-fuelled and is not a net emitter of GHGs during operation, whereas essentially all natural gas is fossil-based.[59]
- Natural gas conservation has seen less funding to date than electricity conservation. Despite the fact that the natural gas utilities have seen a significant increase in budget under the 2015-2020 DSM Framework[60], their overall budget is still 1/3 of the conservation budget of the LDCs (See Table 2.1).

Natural gas conservation programs are very cost-effective.

- Natural gas conservation programs are very cost-effective. As discussed earlier in this chapter, every dollar spent on natural gas conservation delivers $2-$3 of value. DSM programs to date have accrued a net benefit of over $5 billion for its customers through reduced natural gas usage and lower energy bills.[61]
- Natural gas is a lower cost household expense than electricity, and natural gas rates have not risen in the same fashion as electricity rates. Therefore, increasing DSM budgets will have a lower impact on customers' pocketbooks (particularly relevant for customers who do not or cannot participate in conservation programs).
- Less natural gas use means more savings for the province as it will avoid out-of-province natural gas purchases (see **Chapter 1**).
- With the government's recent announcement that natural gas access will be expanded throughout rural and Northern Ontario at a cost to all gas customers[62], increased conservation programs may offset the cost and environmental impact of more natural gas access and use.

Some of the benefits associated with expanding natural gas conservation were brought up during the OEB's Mid-Term Review of the DSM Framework. To recognize the importance of the GHG reduction benefits of natural gas conservation, intervenors advocated for the federal cost of carbon to be included in the cost-effectiveness calculations for natural gas conservation programs, a recommendation that has been adopted by the OEB.[63] The 15% TRC adder will continue on top of the federal cost of carbon to account for other non-energy benefits.

Can natural gas conservation achieve 3.2 Mt CO_2e of GHG reductions?

Can natural gas conservation produce 3.2 Mt CO_2e reduction in GHGs by 2030? What will the costs and benefits be?

The OEB completed an Achievable Potential Study in 2016 to assess Ontario's potential for natural gas conservation.[64] The study concluded that Ontario has a range of natural gas conservation expansion options, and the more conservation the province undertakes, the more GHG emissions reductions the province will see. Figure 2.10 presents the potential GHG emission reductions from various natural gas conservation potential opportunities.[65]

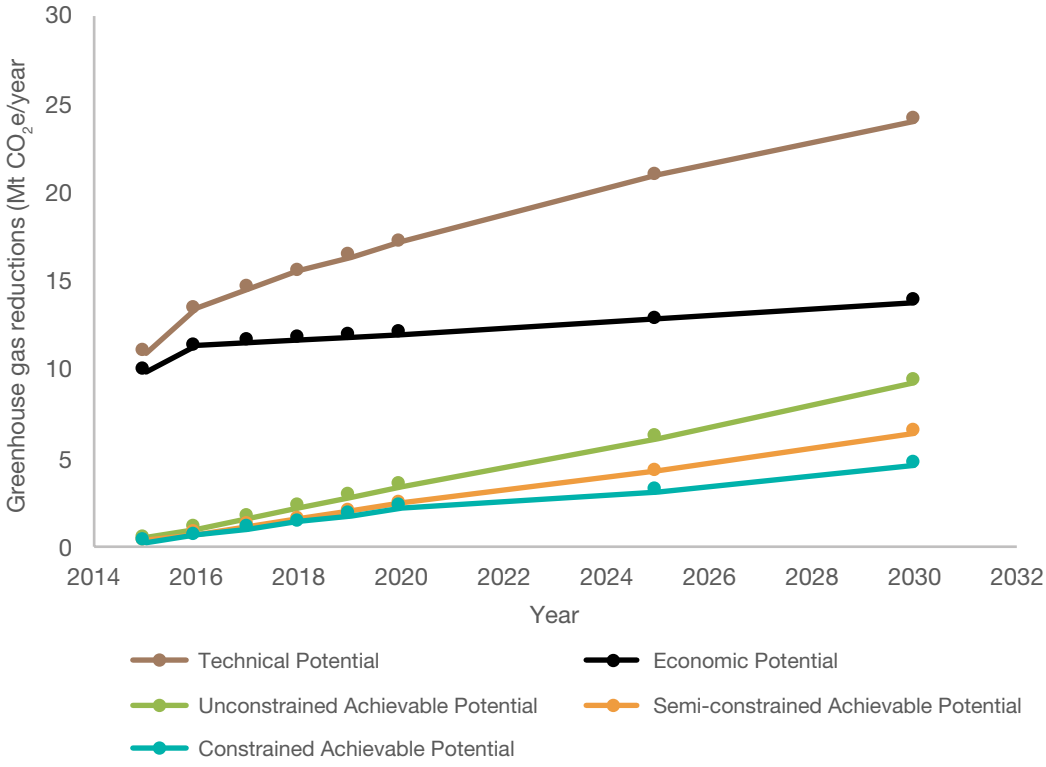


Figure 2.10. Greenhouse gas reductions under all possible natural gas conservation scenarios.

Note: The OEB's report presents GHG emissions in million kg CO_2e. To be consistent with previous ECO reports, this graph is presented in Mt CO_2e.

Source: Ontario Energy Board, Final Report: Natural Gas Conservation Potential Study by ICF International (Toronto: OEB, July 2016) at 7.

The theoretical natural gas conservation potential is very large.

The first thing to note from Figure 2.10 is that the theoretical natural gas conservation potential is very large – almost 25 Mt CO_2e by 2030 if all technically feasible conservation measures are adopted, and almost 14 Mt CO_2e by 2030 if only cost-effective measures (under the economic potential) are adopted. However, as discussed in **Chapter 1** of this report, many barriers prevent customer adoption of all cost-effective conservation opportunities. The three "achievable potential" lines are the OEB's estimates of how much conservation can realistically be achieved from conservation programs at different levels of spending ("unconstrained" = no budget limit or policy restrictions, "constrained" = budgets remain at current levels).

MECP advises that the estimate of a 3.2 Mt CO_2e emissions reduction from natural gas conservation programs by 2030 is the difference between the "unconstrained" and "constrained" lines in the OEB's Achievable Potential Study. The only difference is that the divergence of the two lines begins in 2021 instead of 2015 as shown in the study.[66]

In other words, the 3.2 Mt CO_2e of emissions reductions in the draft Environmental Plan are incremental to what would be achieved by existing

gas conservation programs continuing at their current level of spending. The OEB study estimated that the additional cost under an unconstrained scenario of this extra 3.2 Mt CO_2e of reductions would be about $440-$600 million/year, a fourfold increase from current annual spending levels for natural gas conservation.[67]

The actual cost may be considerably lower.

The actual cost may be considerably lower. An achievable potential study is only one tool. Its estimates are an approximation influenced heavily by the assumptions made. It cannot accurately predict future operational, behavioural and technological changes, and, in particular, the methodology of estimating program costs is very coarse-grained.[68] Policy and tax shifts, for example, can dramatically change conservation outcomes.

New conservation programs may initially have high upfront costs (which is when the financial incentive is helpful in driving participation), but as utilities, vendors, delivery agents and contractors gain expertise and familiarity, benefits such as improved delivery models, more streamlined supply chains and greater competition amongst delivery agents typically lead to lower administrative and financing costs. This drives down the cost of delivering more conservation, benefitting ratepayers, utilities and the overall system. These future benefits are not reflected in the OEB cost estimates as this was not in scope of the 2016 APS. Recent results from electricity conservation programs show how costs can drop with time and experience. While the unit cost of natural gas conservation savings increased in 2016 in the first year of an expanded budget as utilities initiated new programs (**Appendix D**), the cost of electricity savings fell as mature programs built on previous learnings and economies of scale and delivered larger savings (**Appendix C**). Costs for delivering demand response programs have also fallen 42% in the past three years.[69]

Some increase in spending to pay for more natural gas conservation makes sense, as the current natural gas conservation budget is capped by the OEB at a very low level of $2 per residential bill. However, some are concerned that most of the benefits of natural gas conservation programs (except the important benefits of reduced greenhouse gas emissions) go to conservation program participants, and not to non-participating ratepayers. Some of the steps that natural gas utilities can take to address this concern are:

1. expanding participation in conservation to more customers, particularly customer groups who have typically had low participation rates in conservation programs, such as small businesses, and

2. using gas conservation to reduce spending on new infrastructure, which benefits all customers. The textbox “Gas conservation and infrastructure planning” details the gas utilities’ findings about including gas conservation as part of larger infrastructure planning.

Gas conservation and infrastructure planning

When the 2015-2020 DSM Framework was established further to a Directive, the OEB was asked to take such steps as it considered appropriate towards the government policy of putting conservation first in gas infrastructure planning processes.[70] The OEB subsequently directed the gas utilities to conduct a study and prepare a transition plan to show how they would include gas conservation into infrastructure planning in time for the mid-term review.[71] The expectation from the OEB was that gas utilities would consider the role of DSM in reducing and/or deferring future infrastructure far enough in advance so that DSM can be reasonably considered a viable alternative.[72]

Enbridge and Union retained ICF Consulting to undertake an integrated resource planning (IRP) study to assess if conservation could replace or postpone the need for new infrastructure in the short to medium run, saving the ratepayer money. The study found that there is currently very little activity across North American utilities to directly reduce/defer new infrastructure investment using DSM programs.[73] A preliminary study of existing DSM data indicated that targeted DSM may have the potential to reduce some infrastructure investment.[74] However, major regulatory and policy changes will be required to facilitate such a transformational shift along with changes in the utility planning processes.[75] The study recommended further analysis and case studies before making any major changes. Therefore, the gas companies were hesitant to commit to considering conservation as an alternative to infrastructure investment, based on current barriers highlighted in the report.[76]

ICF's analysis suggested that up to 1.2% of demand growth per year may be offset by geo-targeted DSM program[77], but there is need for further research and testing with real data and actual costs before gas utilities can consider DSM to be part of IRP.

Based on ICF's study, Union and Enbridge filed a transition plan with the OEB that acknowledged that the current DSM framework and IRP regional process are independent of each other but now there is an increased need to incorporate energy efficiency, demand response and carbon-reduction into the natural gas infrastructure plans.[78] The utilities are now completing in-field studies to understand the impact of DSM on peak hour demand and the associated cost-benefit analysis of choosing DSM over new construction. Maintaining reliability requirements and the overall impact on the customers' bill are also important considerations of this study, as is the growing importance of reducing GHG emissions.[79] The in-field studies will be completed in 2019 and the results, along with relevant decisions/directions from the OEB and the government will determine next steps for the gas utilities.

The transition plan does not include any firm commitments from the gas utilities to incorporate DSM into their IRPs. In its final DSM Mid-Term Review Report, the OEB is pressing for stronger action from utilities in this area, noting that "the transition plan does not advance the understanding of the role and impact that energy conservation can play in deferring or avoiding capital projects".[80] The OEB has indicated that gas utilities will be required to demonstrate that they considered conservation as an alternative as part of an application for new growth-related infrastructure.

The ECO recommends that the Ministry of Energy, Northern Development and Mines grow natural gas conservation funded by ratepayers, while looking at ways for more natural gas customers to benefit, such as expanding participation in programs, and using conservation to avoid infrastructure investments.

2.4.2 Focusing electricity conservation on times of high demand

While the province's immediate focus on expanding natural gas conservation makes sense, the role of electricity conservation in reducing GHG emissions must not be ignored. With the current conservation framework expiring in 2020, the province should make electricity programs more effective in reducing GHG emissions as well as saving money and improving well-being.

How would GHG emissions change if electricity conservation programs were cancelled?

The Ministry of Environment, Conservation and Parks (MECP) has indicated that the overall emissions

projections in the government's draft Environment Plan includes a baseline of electricity sector emissions from the 2017 Long-Term Energy Plan (LTEP), represented by the black line in Figure 2.11.[81]

However, policy changes such as cancelling the cap-and-trade program and 751 clean energy projects mean that the IESO now forecasts higher emissions than the LTEP had projected (green line in Figure 2.11).

The LTEP forecast also assumed that electricity conservation programs would continue.

If the province were to cancel electricity conservation programs, this would offset most of the potential emissions reductions from expanding natural gas conservation.

If the province were now to cancel electricity conservation programs, emissions from the electricity sector would rise even more (blue line in Figure 2.11), by an additional 2 Mt CO_2e by 2030, and 2.5 Mt CO_2e by 2035. This would offset most of the potential emissions reductions from expanding natural gas conservation.

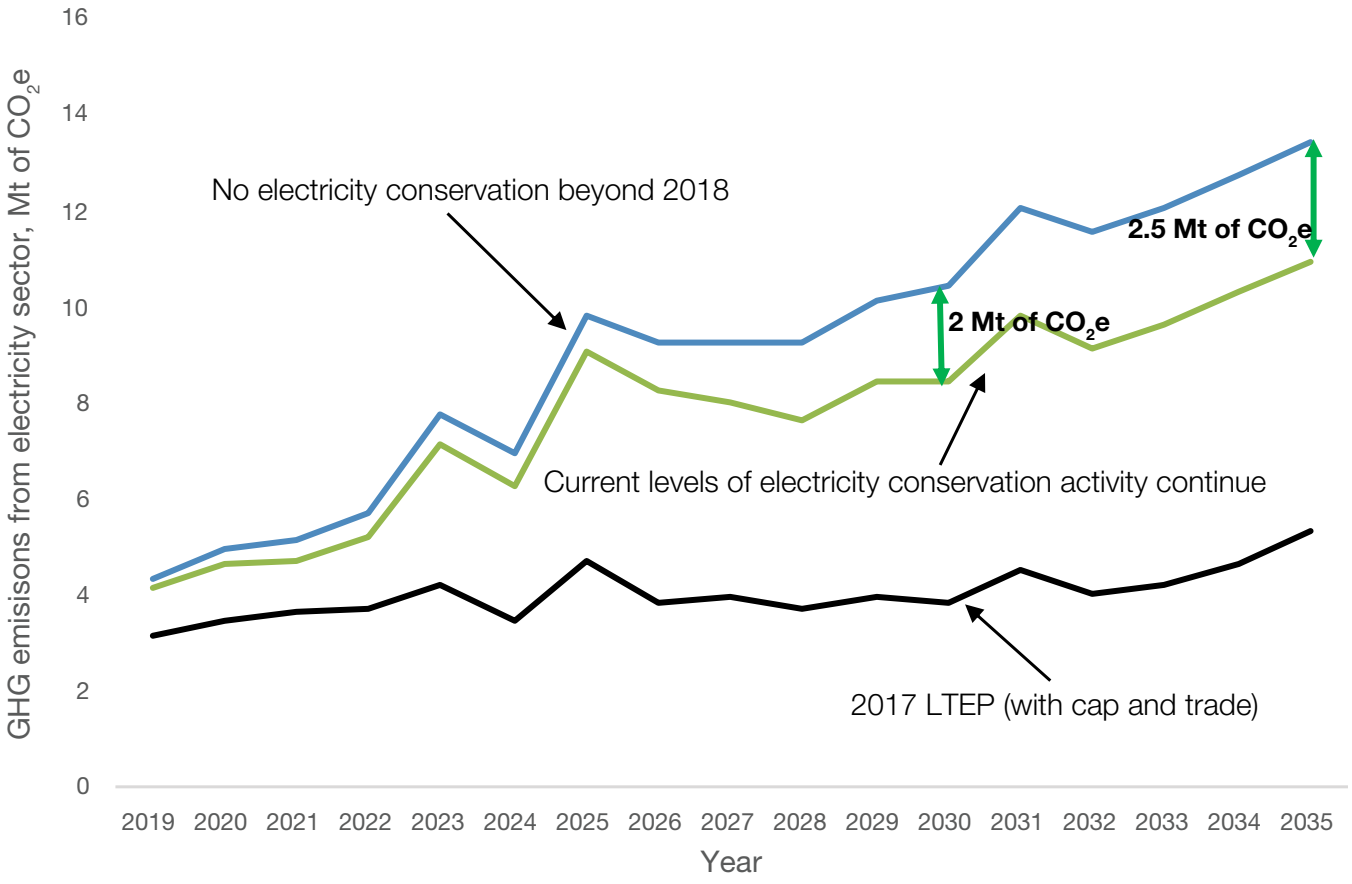


Figure 2.11. Change in greenhouse gas emissions from the electricity sector, if current programs were cancelled, 2019-2035.

Source: Independent Electricity System Operator, Information provided to the ECO (22 February 2019).

The reason for the increase in GHG emissions is that, in the absence of conservation, GHG-emitting gas-fired electricity generation would run more frequently, particularly after the Pickering nuclear station is closed down in 2024. Therefore, cancelling electricity conservation programs would be counter to the province's climate goals. The IESO's analysis emphasizes the continued need for electricity conservation in the province, particularly those programs that help reduce peak electricity use, when gas-fired generation is running.

Not all electricity conservation is of equal value.

Better targeting of electricity conservation to reduce greenhouse gas emissions

The 2015-2020 Conservation First Framework mandates LDCs to deliver programs that reduce overall electricity consumption, no matter what time of the day it occurs. **Appendix C** details the continued success of the LDCs in delivering those programs, but the conservation target is not the best metric. Not all electricity conservation is of equal value. Conserving electricity during nights and weekends (particularly in the spring and fall) provides only limited benefits to Ontario. During those times, Ontario often has surplus baseload generation, i.e. demand is less than the electricity that is generated by nuclear, hydro and other variable renewable generation. Because Ontario has limited storage capacity, such power must be used when generated or it has to be curtailed. In the near term, conservation during those hours does not have much value – it may lead to more exports of electricity to other jurisdictions at relatively low prices, or even curtailment, which provides no financial savings at all.

Conservation during times of high demand (usually summer and winter weekdays) has a much larger public and climate benefit.

Conservation during times of high demand (usually summer and winter weekdays) has a much larger public and climate benefit than conservation during off-peak. In Ontario, high demand is mostly met by increasing the use of peaking gas-fired generation, which means conservation during those hours reduces operating (fuel) costs of existing generators, defers the need for building new expensive assets to meet that higher demand, and reduces GHG emissions.

The selection of conservation programs offered in Ontario is based in part on how programs score on cost-effectiveness tests. Minor improvements to the current cost-effectiveness testing could prioritize electricity conservation at the times when it is most valuable. There are two separate (but closely related) issues:

- The values used to assess the benefits to the electricity system from conservation at different times of day and season are outdated, and do not reflect current supply conditions,
- No attempt is made to accurately measure or value the greenhouse gas reduction benefits from electricity conservation, and how these benefits differ by time of day and season.

Outdated cost-effectiveness inputs: Ontario's evaluation methodology for electricity conservation programs does attempt to measure how the value of electricity savings will differ, depending on the time of day and season when the savings occur.

But the inputs used are outdated (from 2014). This means that the test no longer accurately identifies what type of generation is being avoided in a given hour through conservation, and therefore what the benefits of conserving energy would be. In particular, the outdated numbers mean that electricity conservation in off-peak hours is valued more highly than it should be. Conservation programs that save electricity primarily at night when electricity demand is lower (such as more efficient residential lighting) are incorrectly considered to be almost as valuable as programs that save electricity during peak hours.[82]

No accuracy in valuing or measuring greenhouse gas emissions reductions: The other missing element in calculating the cost-effectiveness of electricity conservation is accurately measuring and explicitly valuing greenhouse gas reductions. GHG reductions only occur if conservation can reduce the use of gas-fired generation, so reductions vary wildly depending on when electricity conservation occurs. The IESO's analysis shows that on average, electricity conservation during summer peak periods in 2018 delivered roughly eight times the amount of GHG reductions per unit of electricity saved as did conservation during shoulder off-peak periods.[83] Updating the cost-effectiveness inputs will make it easy to accurately calculate GHG reductions.

The next step is to place a value on these emissions reductions. The current approach in cost-effectiveness testing is to simply increase the calculated net benefits of conservation by 15% to account for all "non-energy benefits",[84] including greenhouse gas reductions.[85] This valuation is not tied to the actual emissions reductions achieved by a conservation program, or the market or societal value for emissions reductions. It would be better to use an explicit value for emissions reductions – as noted, the OEB has mandated that the federal carbon price be used in natural gas conservation cost-effectiveness testing.

The good news is that the IESO has done most of the analytical work needed to address these problems. The bad news is that implementation of these updates as they relate to conservation program selection and analysis is on hold; pending further discussions with the Ministry of Energy, Northern Development and Mines on the future of the electricity conservation framework, the current evaluation inputs and methodology will continue to be used.[86] The textbox "IESO's progress on updating the cost-effectiveness methodology and inputs for conservation programs" provides more details on the latest development on updating those numbers.

IESO's progress on updating the cost-effectiveness methodology and inputs for conservation programs

The IESO had informed the ECO earlier in 2018 that its Cost-Effectiveness (CE) Tool used for conservation program analysis was being updated to account for GHG savings and to update avoided cost assumptions.[87]

As part of the update process, the IESO developed a set of emission factors (tonnes of CO_2/MWh of electricity consumption) for the time period of 2015-2035 using the IESO's standard time of use periods based on the generation forecasts of the 2013 Long-Term Energy Plan. Based on a conservation measure's load profile and using an assumed societal benefit of GHG reductions ($/tonne), the IESO could then calculate the lifetime CO_2 savings and the net present value associated with the avoided CO_2 emissions from that measure, and incorporate these benefits in cost-effectiveness testing.[88]

The ECO was initially informed that the updated CE tool would be in use as early as Q3 of 2018 (pending some updates by IESO's planning department), with the updated inputs and cost-effectiveness methodology to be used for evaluation of conservation program results (beginning with 2018 results) and for conservation program screening/review for 2019 and 2020.

However, with the change in government in 2018, the IESO has recently informed the ECO that these plans are on hold. Work to accurately calculate avoided costs and GHG reductions continues, but these updates are not yet being used for conservation program analysis. The value assigned to GHG reductions may also change, to reflect the cancellation of the cap and

trade program and its replacement by carbon pricing at the federal level.[89]

For the time being, in its conservation program analysis, the IESO will continue to use the current avoided costs and related inputs, pending further discussions with the government on the remainder of the 2015-2020 Conservation First Framework.[90] As a result, the IESO will continue to use a version of the CE tool with outdated avoided costs and the use of a 15% adder to account for all non-energy benefits, including GHG emission reductions.

In the meantime, current electricity conservation programs fail to focus conservation during hours of high demand when the province needs it the most. If these problems with cost-effectiveness testing were fixed, conservation programs that preferentially reduce electricity consumption during on-peak gas-generating hours would score better, relative to programs that save energy more evenly across all hours.[91] If electricity conservation budgets end up being reduced, these changes would enable Ontario to get better value from the money it is spending on electricity conservation, and ensure that the most valuable programs are preserved.

Current electricity conservation programs fail to focus conservation during hours of high demand when the province needs it the most.

The primary performance metric for utility conservation performance (on which utility incentives are based) is currently overall electricity savings. As a related change to further prioritize valuable programs that reduce GHG emissions, the province should make GHG reductions an explicit performance metric, that complements the metric of overall electricity savings.

These changes would have a two-pronged benefit for the province along with the reduced electricity use. One, the province would save money because peaking gas plants would run less; and two, there would be environmental benefits in the form of lower GHG emissions and better air quality. This would support natural gas conservation in meeting the 3.2 Mt CO_2e emissions reduction goal.

While the IESO is also responsible for procuring demand response resources to reduce peak demand during the hours of the day electricity demand is at its highest, these resources are not a complete substitute for electricity conservation programs. Demand response initiatives deliver few greenhouse gas reductions or overall energy savings, because they are activated so infrequently (see **Appendix C** of this report for more details). Conservation programs that can reduce electricity consumption, peak electricity demand, and greenhouse gas emissions would add greater value to society.

While the province prioritizes natural gas conservation to meet its climate goals, electricity conservation should not be forgotten.

The ECO recommends that the Ministry of Energy, Northern Development and Mines focus electricity conservation on programs that save electricity during hours of high demand, when fossil fuels are being used to generate electricity.

The ECO recommends that the Ministry of Energy, Northern Development and Mines accurately measure and value greenhouse gas reductions from energy conservation programs, including valuing the benefits of emissions reductions in cost-effectiveness testing (using up-to-date inputs), and making greenhouse gas reductions a performance metric for utilities or other conservation providers.

2.4.3 Reducing greenhouse gas emissions through multi-fuel conservation

So far, we have talked about natural gas and electricity utilities that separately deliver conservation programs to Ontarians. While collaboration with one another is encouraged in both industries, actual examples of collaboration in the current framework are minimal. Greater collaboration between Ontario's utilities would in many cases mean lower costs for the utilities and in turn for the ratepayers, more opportunities to reduce GHG emissions, and a more streamlined approach to improve the energy efficiency and well-being of Ontario homes and residents. Reviews of several top-performing jurisdictions indicate that coordinated efforts to offer electricity and gas efficiency programs together can have significant success in terms of energy savings and also in terms of cost savings for the utilities and, in return, for the customer.[92]

Coordinated efforts to offer electricity and gas efficiency programs together can have significant success.

In addition, certain opportunities to reduce GHG emissions, such as conservation of fuels other than electricity and natural gas, and fuel switching between energy sources, do not fit neatly into the current electricity and natural gas conservation frameworks, and would be better addressed in a multi-fuel approach.

The next section explores some of those opportunities.

2.5. Multi-fuel conservation and collaboration

Today, more and more jurisdictions are considering some form of integrated operations that address multiple energy sources, when designing and delivering energy efficiency programs.[93] A more integrated approach can save the customer time and money, lower administrative costs, expand conservation programs and drive more energy and GHG reductions. Some of the benefits include:

- **Making customer participation easier:** Currently in Ontario, if a homeowner is considering renovating their home to make it more energy efficient and the home uses both electricity and gas for heating, cooling and other functions, the homeowner has to contact both the gas and the electric utility separately to take advantage of utility conservation programs. This means that if the homeowner wants to maximize his/her home's energy efficiency during the renovation, it will require separate contractors recommending a different set of allowable measures and then implementing those measures separately in the home. For homeowners and businesses, the process can be confusing and onerous, sometimes leading to non-participation. For a commercial or industrial customer, dealing with separate utilities may not make an attractive enough business case, but dealing with one contractor for all conservation programs may convince the customer to participate.
- **Reducing GHG emissions:** Gas and electricity conservation programs currently do not include GHG reductions as a performance measure for their programs. Coordination between gas and electric utilities could ensure a consistent methodology that calculates the societal benefit of GHG reductions and establishes corresponding GHG targets, along with reductions of electricity and natural gas. Coordinated delivery could also support fuel switching when it makes sense and lead to GHG reductions (this is discussed in further detail later in the chapter). US states like Texas have set energy-efficiency goals to "be neutral with respect to specific technologies, equipment and fuels" as long as it "results in overall lower energy costs, lower energy consumption and high-efficiency equipment".[94] While GreenON programs had some of these elements, there were other logistical issues with the organization, as discussed in the textbox "GreenON: Ontario's experiment with multi-fuel conservation".

- **Lowering administration costs:** The electricity conservation programs and the natural gas conservation programs have separate marketing brands and materials and often have separate vendor and contractor agreements in the same jurisdiction serving the same customer. More collaboration would lead to lower program delivery costs and overheads, ranging from fewer site visits from contractors, integrated advertising and marketing and coordinated program administration.
- **Supporting more technologies:** A gas or electricity-only conservation measure that may not be cost-effective on its own due to high program costs relative to the savings may become cost-effective and therefore eligible for delivery under a collaborative delivery model or when combined with measures that reduce use of another fuel. This can also increase the diversity of the program portfolio for both utilities, allowing for greater customer participation and greater savings in energy and GHGs.
- **More accurate accounting:** Many energy conservation initiatives have interactive effects between fuels – e.g. improving the efficiency of building lighting may be done as an electricity conservation measure; however, it will also usually increase natural gas use for heating. Fuel switching, by its nature, will increase the use of one energy source, while reducing the use of another. These interactive effects can be considered better if there is more coordination amongst utility conservation programs.

2.5.1. Existing collaboration between Ontario electric and natural gas utilities

The natural place to begin a discussion of multi-fuel conservation is with collaboration between gas and electric utilities. Despite the potential benefits listed above, actual collaboration amongst gas utilities and LDCs has been limited given regulatory and coordination challenges, as noted in the electricity conservation mid-term review, despite customer interest in an integrated energy management approach.[95]

Actual collaboration amongst gas utilities and LDCs has been limited.

The textbox "LDC-Gas conservation collaboration examples" details some of the limited examples of collaboration to date.

LDC-Gas conservation collaboration examples

Toronto Hydro-Enbridge Smart Thermostat Initiative

In Q4 of 2016, Toronto Hydro and Enbridge Gas launched a local smart thermostat program for Toronto residents who were customers of both the utilities. The pilot offered customers a $100 rebate (either as an Enbridge bill credit or as a cheque) if they purchased and installed a qualifying smart thermostat. The cost of the $100 rebate was shared between Toronto Hydro and Enbridge for participants who signed up for the Enbridge program but also had central air conditioning. The program experienced some slowdown when GreenON started offering the same thermostats at $0 cost in the summer of 2017. However, with the cancellation of the cap –and-trade framework, the pilot was expected to run until the end of 2018.[96] Since the launch

of the program, close to 10,000 households have participated in the program.[97] While verified results are not available yet, the business case has estimated 233 kWh of gross savings and 174 kWh of net electricity savings per device.[98]

One of the Ecobee thermostat models available under the Smart Thermostat Program.

Photo credit: Toronto Hydro.

Niagara Peninsula Energy's Energy Concierge Program

Niagara Peninsula Energy Inc. (NPEI), in collaboration with Enbridge Gas Distribution and Ontario Restaurant Hotel & Motel Association launched an Energy Concierge Program in 2015, that targeted the hospitality industry situated in NPEI's jurisdiction. The program offered a comprehensive set of electricity and natural gas savings initiatives. Participants included large establishments such as the Fallsview Casino Hotel and the Marriott Getaway in Niagara Falls.[99] As part of the initiative, participants are provided with a customized 3-year energy management plan that identifies energy efficiency opportunities using existing province-wide CDM and DSM programs, along with some new measures tailored to the hotel/motel sector.[100] The pilot has achieved electricity savings of 42.6 MWh.[101]

Old air- conditioning unit (left) at the Peninsula Inn Hotel in Niagara Falls switched for an energy efficient packaged terminal heat pump unit (right) under the pilot.

Photo credit: Niagara Peninsula Energy Inc.

IESO, Gas Utilities run Whole Home Pilot

On June 10, 2016, the Minister of Energy directed the IESO to develop a province-wide Whole Home Pilot Program for residential customers and deliver it, where appropriate, with the gas utilities. IESO launched the program in May 2017 as a "one-window, one service provider multi-fuel efficiency program", to be delivered by Enbridge and Union Gas and their service providers. The Pilot was an enhancement of the gas utilities' existing Home Energy Conservation Program by adding on electricity measures and expanding eligibility to electrically heated customers. For example, a customer undergoing insulation and furnace upgrades to save natural gas would now also have their home assessed for measures that would save electricity (accompanied by supporting incentives), such as high-efficiency air conditioning and appliances. Approximately 24,000 homes participated in the pilot. In the first thirteen months (for which evaluated results are available), the program delivered an additional 11.5 GWH of electricity savings.[102]

Was the pilot successful in getting customers to install add-on electricity-savings measures? More than 82% of the customers whose homes were heated with natural gas also chose to install one or more electricity-savings measures.[103] However, these numbers are skewed because one of the electricity-savings measures (a furnace fan) may have been installed even under a gas-only program (as part of a furnace upgrade). Roughly one-third of participants also installed high-efficiency air conditioners, while only a small percentage of participants upgraded their electrical appliances.[104]

In terms of the customer experience, initial evaluation had shown that customers were satisfied with the "one stop" approach, with over 80% reporting they would recommend the program and over 80% of the customers were satisfied with both the pre and post-renovation audit process.[105]

Financially, however, the add-on electricity measures did not prove cost-effective; the incremental operational costs and incentive costs outweighed the electricity savings from these measures.[106] This was due in part to the fact that the energy savings for some technologies were lower than expected, and a different choice of measures (such as direct install LED lighting) might have delivered lower-cost savings. However, it was also the case that additional administrative costs and higher audit costs (to allow for the additional assessment of electricity-saving opportunities in the house) accounted for more than one-third of the program budget.[107] This was only a pilot program, and administrative costs would likely drop in the future.[108] However, because the pilot was not cost-effective, it stopped accepting new participants at the end of October 2018 once the budget was exhausted. It will not transition to a full province-wide program.

To conclude, the Whole Home pilot's attempt at integrating conservation of multiple energy sources was a success from the perspective of customer experience, but not from a financial perspective. It is unfortunate that the program evaluation did not specifically examine whether opportunities for administrative efficiencies had been maximized, and whether the joint program delivered more savings, or savings at a lower unit cost, than separate stand-alone programs. These questions should be a part of any future evaluations of programs with multi-fuel collaboration.

Table 2.3, which was developed by the IESO's consultant during the electricity mid-term review, shows that there are many similarities between existing electricity and natural gas conservation programs.

Table 2.3. Current CDM and DSM program similarities.

ELECTRICITY PROGRAMS	NATURAL GAS PROGRAMS: Custom Industrial	Custom Commercial	Commercial & Industrial Direct Install	Commercial & Industrial Prescriptive	Savings by Design – Commercial	Run it Right (Run Smart)	Comprehensive (Strategic) Energy
Retrofit (prescriptive and custom)	✔	✔	✔	✔			✔
Audit Funding			✔				
Energy Managers							✔
Process & Systems	✔					✔	✔
System Re-Commissioning						✔	
New Construction					✔		
Monitoring and Targeting						✔	✔

Note: the tick mark indicates that the programs have a similar component.

Source: Independent Electricity System Operator, "Conservation Framework Mid-Term Review: Collaboration" (presentation at IESO Mid-Term Review Advisory Working Group, 27 April 2017), slide 59, online: <www.ieso.ca/-/media/Files/IESO/Document-Library/engage/cf/CF-20170427-Collaboration.pdf?la=en>.

There are currently no incentives for utilities to collaborate.

Given the similarities between programs and some of the benefits we have already discussed, why is there limited collaboration amongst Ontario's utilities? Some of the reasons are:

- There are currently no incentives for utilities to collaborate, nor penalties for not collaborating. When the LDCs were offered a higher performance incentive for delivering programs jointly under the CFF, the province saw 16 joint CDM plans which captured 83% of the province's target.[109] Without a proper incentive or penalty, utilities may be risk-averse to using up resources on collaboration, if they are not certain this will increase results.
- The difference in the number of LDCs and the number of gas utilities can also be considered a barrier to collaboration. With 1 dominant gas utility in the province and around 65 LDCs, the logistics behind collaboration are quite difficult. A smaller LDC may not have the same level of funds and other resources to work with a much larger gas utility, and the gas utility may not want to devote the effort to develop partnerships with each LDC individually.
- The risk of sudden policy changes can also create concerns regarding collaboration. As Table 2.1 shows, the conservation framework for the gas

companies is overseen by the OEB while the oversight of electricity conservation is with the IESO. While the government can issue policy directives to either the OEB or the IESO, the quasi-judicial status of the OEB makes it seem more arms-length. The IESO is often mandated to make changes by the Ontario Minister of Energy's office via Directives, and the Minister of Energy has issued six Directives to date to establish and amend the Conservation First Framework. Therefore, there may be hesitation, particularly from gas utilities, to collaborate when there is a chance that the electricity framework elements might change without sufficient notice.[110]

- There is concern that collaboration will mean diluting the utilities' existing customer relations. Most households, businesses and industries in Ontario are both gas and electricity customers, and when it comes to marketing conservation programs, LDCs and gas companies are often competing for the same customer's attention. Utilities remain concerned that the positive customer relationship that has been built over the years because of billing and other account activities will be diluted if the program is jointly marketed and delivered.
- Tracking costs and attribution of benefits to each of the utilities, specifically if a measure has savings of both fuels, is currently unclear. Managing vendor and contractor relationships can also become an issue especially if the utilities had different delivery agents before coordination. However, the reverse also holds true – currently, an energy service provider may be dealing with multiple utility contracts, for programs that could be delivered in one coordinated effort.[111]

While Ontario's electricity and gas markets are unique in many ways, other jurisdictions facing similar challenges have successfully coordinated separate single-fuel utilities. The textbox "Successful gas-electricity collaborations" highlights some success stories where separate gas and electric utilities have been successful in collaborating to offer coordinated programs to their customers.

Successful gas-electricity collaborations

EfficiencyCrafted New Homes by AEP Ohio and Columbia Gas of Ohio[112]

American Electric Power (AEP) Ohio and Columbia Gas of Ohio, distributing electricity and natural gas respectively in the state of Ohio, launched this residential new construction program in 2010 without any policy or regulatory mandates to collaborate. Both utilities were motivated to increase savings and reduce expenses through a coordinated program. The program was also expected to address market barriers such as upfront costs, lack of education amongst building developers and customer confusion arising from two utilities offering programs for one home. This program is aimed at builders of single-family (attached and semi-attached) homes and multifamily residential units that meet certain requirements. One of the benefits of this coordinated design and delivery model is that builders face a single technical criteria and a single application process, which reduces upgrade decisions and reduces administrative hassles. This also translates to lower costs and sharing of those costs for the utilities. All program materials, which went through several rounds of negotiations, now include the name of the program "EfficiencyCrafted" and the logos of both utilities. Therefore, the customer receives a single consistent message that reduces confusion and increases brand awareness, driving participation.

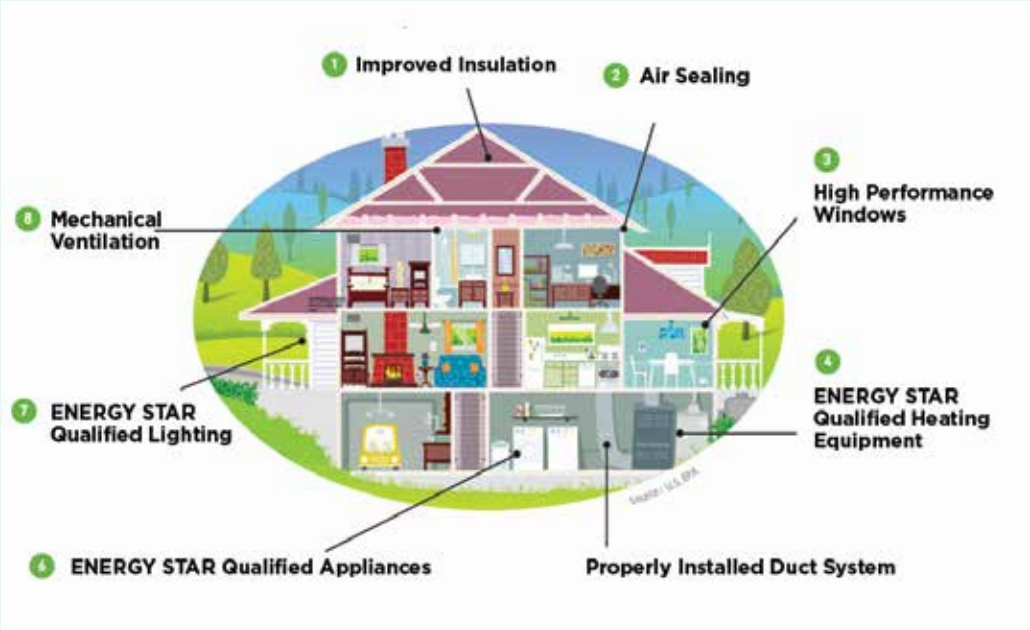


Figure 2.12. Snapshot of EfficiencyCrafted New Homes measures.

Source: American Electric Power Ohio, information provided to the ECO, 4 March 2019.

Under this program, each utility has signed a separate agreement with a single contractor who implements the program on behalf of both utilities. A program manager, along with support staff, are assigned by each utility to handle the daily interactions with the contractor. Since there is only one contractor, program management costs such as administrative expenses, staff training and marketing are split appropriately between the two utilities. Incentives paid to builders are predetermined based on new homes meeting Home Energy Ratings (HERS)/ ENERGY STAR certifications, and each utility claims the savings for its respective fuels when the incentive is paid. Columbia Gas recovers program expenses through a DSM rate rider while AEP Ohio collects via a rider on residential electric bills.

The program currently has a 34% market penetration, with over 9000 units completed under the program to date.[113] Average electricity savings per unit is 3000 kWh and average incentive paid out per home is $562.[114] The Program scores 1.7 on the Total Resource Cost score and 3.4 on the Program Administrator Cost score which means that the program is cost-effective overall.[115] In 2017, the program saved 5300 MWh of energy consumption and 2.8 MW of peak demand, which were 112% and 286% over the program's 2017 energy savings and peak demand savings targets.[116] Its forecasted budget in 2017 was $2 million, but actual expenses came in at $2.2 million, with over $990,000 paid in customer incentives.[117]

Commercial Direct Install (CDI) Program by SoCalGas and LADWP

In 2012, Southern California Gas (SoCalGas), which delivers natural gas in Southern California, and the Los Angeles Department of Water and Power (LADWP) signed a master partnership to allow both utilities to develop standard procedures and criteria that would enable joint program design and delivery.[118] This master agreement was set up because the regulatory bodies for both utilities were making energy efficiency at the local and

at the state level a bigger priority. With LADWP facing higher energy efficiency goals, it proposed a formal agreement with SoCalGas to allow for faster program delivery and greater customer participation, both of which would drive greater energy savings. For SoCalGas, gas-only measures installations was not cost-effective and therefore made business sense to partner with LADWP in the design and development of this business sector program.[119] Since the launch of the Commercial Direct Install (CDI) Program in 2012, 21,000 small businesses have benefitted from free energy and water efficiency upgrades.[120]

The CDI Program is available to all business or other non-residential customers in the city of Los Angeles that have an average monthly electricity demand of 250 Kw of less.[121] Some of the measures included in this program are: [122]

- energy efficient lighting retrofits
- LED signs
- low flow water devices
- hot water pipe and tank insulation, and
- faucet aerators.

LADWP has taken the lead in developing marketing materials, which displays both company's logos. LADWP manages the vendor and consults with SoCal on program changes and monthly reporting. One of the major hurdles that both utilities had to overcome is the fact that the utilities are regulated and funded under different rules- LADWP is an Investor-Owned Utility (IOU) and SoCalGas is a Publicly Owned Utility (POU). While historically this made collaboration between IOUs and POUs difficult, these two companies resolved the problem by one company, LADWP, incurring all costs up front and invoicing SoCalGas on a quarterly basis.[123]

Since each company is under different regulatory frameworks, the program evaluation requirements are also different. Each utility performs evaluations for their respective resource and share all relevant program information and results between the utilities to minimize customer inconvenience.[124]

Since LADWP and SoCalGas have signed this master agreement, they have co-funded 18 programs at an operating budget of $80 million per year.[125] SoCalGas has also set up similar agreements with other municipalities such as Riverside, Pasadena, Anaheim and Metropolitan Water District.[126] These agreements have led to savings of over 44 GWh between 2013 and 2017.[127]

Top-performing US jurisdictions in overall energy efficiency tend to have combined gas and electricity conservation programs.

2.5.2 Encouraging Ontario's utilities to collaborate more

Greater collaboration between the gas utilities and LDCs can increase customer participation and bring in more energy savings, lower program administrative costs, lead to greater GHG savings and improve the well-being of more Ontarians. Rankings by the American Council for an Energy-Efficient Economy (ACEEE) have shown that top-performing US jurisdictions in overall energy efficiency tend to have combined gas and electricity conservation programs.[128] Some of the tools that the province could use to encourage LDC-gas collaboration include:

- Developing the proper tools so that utilities are able to quantify their efforts. The examples in the textbox "Successful gas-electricity collaborations" highlight the fact that the utilities collaborating established clear savings attribution rules at the outset to ensure

savings are not missed or double-counted. To track savings properly, evaluation tools need to take account of any interactive effects between fuels (e.g. whether an electricity savings measure increases or decreases natural gas use), and must also include the proper accounting of GHG reductions to drive those programs that have the biggest impact in reducing carbon emissions.

- Conservation reporting tools could also be updated to encourage LDCs and natural gas companies to collaborate. Current CDM and DSM Plans could be amended to indicate a utility's efforts to collaborate across fuels. Developing matrices that quantify and track customer convenience and increased participation would also highlight the benefits of collaboration across industries.
- Current regulations need to be changed so that the oversight bodies can take appropriate actions to encourage collaboration. The IESO and the OEB could establish other incentives to collaborate with the other major fuel provider, such as faster approval timelines or more flexibility around cost-effectiveness for CDM/DSM plans that include an LDC-gas program, or apply penalties for lack of collaboration. While the government could take a more direct route of making LDC-gas collaboration mandatory, this may place undue administrative and cost burdens on the utilities.

Long-term commitment to energy efficiency is needed to ensure that utilities do not get "cold feet".

- Long-term commitment to energy efficiency is needed to ensure that utilities do not get "cold feet" when it comes to making significant decisions about investing in energy conservation. Gas-LDC collaboration requires extensive commitment from all parties in terms of time, expertise and other resources to see through the design and then the implementation process before a joint program will see success. Moving forward, if the province wants to encourage substantial LDC-gas collaboration in energy conservation, then there needs to be a long-term commitment towards energy conservation from the government as well. A stable framework will assure LDCs and the gas utilities that funding will not be taken away overnight, leaving any work that they have done in limbo.

2.5.3 Conservation of other heating fuels and fuel switching

One challenge with the model of electric and natural gas utilities delivering conservation is that it leaves out some Ontarians. In 2016, roughly 10% of the province's residences were heated by a fuel source that was not electricity or natural gas.[129] These fuel sources, which include wood, as well as GHG-emitting fossil fuels such as propane, heating oil, and coal, are not regulated like the electricity and natural gas industries and homes and businesses using these heating fuels cannot participate in the current suite of utility conservation programs. Natural gas customers served by Kitchener Utilities and Utilities Kingston are also not covered by the current conservation framework and do not have access to the full suite of conservation programs (although both of these utilities do provide some programs).[130]

The government had previously proposed setting conservation targets for other fuels (as part of its consultation on the 2017 Long-Term Energy Plan), but did not follow through with this proposal. The Green Ontario Fund (see the textbox "GreenON: Ontario's experiment with multi-fuel conservation") did offer some conservation programs for other fuels. In particular, the program expanded a home energy retrofit program to customers of other heating fuels (with gas utilities as the delivery agent) and saw relatively high participation from customers using heating oil and propane (see the textbox "Cap and trade funding for home retrofits" in **Chapter 3** of this report). With the wind down of all GreenON programs, there are no longer any specific initiatives aiming to reduce the use of these other fossil fuels used for space heating.

Fuel Switching

The government's draft Environment Plan mentions fuel switching in energy-intensive residences and commercial buildings to cleaner fuel sources such as electricity and other lower carbon fuels where it makes economic sense.[131] It makes sense to implement conservation and fuel switching together – if a switch to a different fuel source is being considered, proper consideration of energy efficiency can help reduce the size and cost of the new heating equipment, and the annual operating costs. However, the current model of conservation being delivered by electric and gas utilities is a poor fit for encouraging fuel switching: converting to the utility's fuel will increase use of that fuel, not decrease it (hence reducing utility performance against conservation targets); converting **away from** the utility's fuel will reduce energy use, but (for gas utilities in particular) may cost the utility a customer.

It makes sense to implement conservation and fuel switching together.

Significant fuel switching to electricity will be needed in the future to meet deep emissions reductions targets (see Q15 of the Environmental Commissioner of Ontario's 2018 Energy Conservation Report "Making Connections: Straight Talk about Electricity in Ontario). Converting to electric heat pumps in homes heated by propane and heating oil makes sense today, from the point of cost savings and environmental benefits (GHG emission reductions). Financial incentives for this were available under the Green Ontario Fund as part of the previous government's Climate Change Action Plan (cancelled as of August 2018), the details of which we see in the textbox "GreenON: Ontario's experiment with multi-fuel conservation". The IESO has already assessed that heat pumps are cost-effective against less-efficient fuel oil, propane and electric baseboard heating, especially when buildings are more energy efficient.[132] At the current time, switching natural gas furnaces and natural gas water heaters to electricity ones is a less feasible option because of the low cost of natural gas compared to electricity; however this type of fuel switching will also be needed in the future.

Both conservation of other fuels and fuel switching may be easiest to address in a single administrator model for conservation, discussed in the next section.

2.5.4 A single administrator model for conservation?

In theory at least, a single administrator model for conservation of all energy sources could deliver all of the potential benefits of gas-electric utility collaboration (e.g., including saving customers' time, effort and money, diversifying program portfolios and reducing program administration costs) while being better able to address conservation of other fuel sources and fuel switching, and prioritizing GHG reductions. There is some evidence that a more coordinated approach to energy conservation drives more energy and GHG emission reductions, saves on administration costs and makes customer participation easier.[133]

A more coordinated approach to energy conservation drives more energy and GHG emission reductions, saves on administration costs and makes customer participation easier.

There is an increasing trend for utility-run conservation frameworks to transition to single "efficiency utilities" with multi-fuel objectives, including GHG emission reductions and integrated multiple funding sources.[134] Vermont, one of the leading U.S. states in energy efficiency, was one of the first major jurisdictions to adopt a third-party model for efficiency programs.[135] Other North American jurisdictions such like Maine, Delaware, NY State and Nova Scotia have also gone the same route[136], with Efficiency Alberta being the

most recent third-party agency delivering energy efficiency programs.

Ontario's GreenON agency, created under the provincial government's now cancelled Climate Change Action Plan was the closest that Ontario came to implementing a multi-fuel single administrator model to deliver energy efficiency and reduce GHGs. However, as the textbox "GreenON: Ontario's experiment with multi-fuel conservation" highlights, GreenON was not truly a single administrator model, and partly duplicated existing utility programs. This meant that, while offering some new initiatives that could not have been launched under utility programs, the execution was somewhat rocky and raised concerns among existing utility conservation program operators.

GreenON: Ontario's experiment with multi-fuel conservation

The Green Ontario Fund (GreenON) was created as an independent GHG reduction agency under the previous provincial government's Climate Change Action Plan. It launched in August 2017 and offered a variety of energy saving measures including the following:[137]

- free smart thermostat program- 150,000 devices were distributed in the first year
- GreenON Industries Program- $200 million dedicated to large-scale demonstration projects to reduce facility and manufacturing emissions
- GreenON rebates program- offered up to $20,000 per project in incentives for residential energy retrofits such as window installations, insulation and heat pumps
- GreenON Social Housing program- $25 million was committed towards social housing of less than 100 units. The Program received applications of over $200 million from 41 social housing providers
- four modern wood heating pilots- launched in northern and Indigenous communities without access to natural gas to replace with more efficient wood stoves
- solar panel installations: rebates worth $90 million in total (announced but not implemented), and
- $300 million GreenON challenge to encourage innovative GHG reduction ideas from businesses.

GreenON was cancelled in June 2018 as part of the cancellation of the province's cap-and-trade legislation. The agency in its short existence offered some benefits to the customers:

- One-window approach to energy efficiency: Residential and business customers could easily access information on a wide range of programs (GreenON and utility conservation programs) through one website and one call centre.
- Expanding energy conservation: Launching programs like the wood heating pilots meant that energy conservation was going beyond electricity and natural gas conservation. Expansion of the home retrofit offering under the Green Investment Fund also offered access to energy efficiency measures to customers on propane/heating oil.
- Enabling fuel switching to cleaner technologies: GreenON provided incentives to move to efficient electric heat pumps/ geothermal from propane or heating oil, which would reduce customer energy use, heating bills and GHG emissions. This type of measure was ineligible for funding under the utility conservation frameworks.

The key word in a single third-party administrator model to deliver energy efficiency is "single".

The key word in a single third-party administrator model to deliver energy efficiency is, of course, "single". However, in Ontario, that was definitely not the case. The launch of a GHG reduction agency when the market already had separate electricity and natural gas conservation programs added another layer of complication and confusion, particularly from the utilities invested in their conservation programs. Some of the concerns raised regarding GreenON include:

- More customer confusion: LDCs and natural gas utilities already had their own separate suites of energy conservation programs, and now a separate entity was offering programs that to a regular customer looked similar to existing ones. While GreenON was publicized as a "one-stop shop" for energy efficiency, it added another layer of confusion for some customers.
- Program duplication: LDCs and natural gas utilities expressed their concerns to the ECO that several programs launched by GreenON were duplicative of existing programs and pilots. The free smart thermostat program, for example, is highlighted in the textbox "LDC-Gas conservation collaboration examples" as a Toronto Hydro- Enbridge pilot. Measures under the GreenON rebates program were also to some degree competing with existing gas and electricity initiatives. The ECO noted that ideally, GreenON programs should target unmet needs and not replace or compete with existing utility programs.[138]
- Cannibalization of utility targets: GreenON programs geared towards reducing GHG emissions also reduced electricity and/or gas consumption, especially those that were duplicative of existing utility programs. Utilities have shared examples with the ECO that businesses and industrial facilities that were ready to participate in CDM/DSM programs (where utilities had invested significant resources in developing projects) ended up participating in GreenON programs instead because of higher incentives.[139] Therefore, GreenON programs were cannibalizing existing CDM and DSM programs and utilities were losing out on savings to meet their framework targets.
- Savings attribution: With similar programs in the market that contributed to energy savings and GHG reductions being marketed by more than one provider/agency, attributing or giving credit to a utility or to GreenON for energy and GHG savings became an issue. The IESO retained Navigant to develop recommendations for allocating costs and attributing savings in early 2018, but this process was started after GreenON had already been in the market for six months. The ECO underlined several concerns in its response to Navigant during the consultation, including the fact that GreenON funding should not be counted towards energy utility program results and there should be accountability that any incremental GreenON funding is actually leading to GHG reductions.[140] There was also the risk of double-counting when energy conservation activities led to GHG reductions, primarily for natural gas conservation programs.[141] With the cancellation of GreenON, a final paper with a preferred attribution approach was never published by the IESO.
- Lack of coordination with utilities: During the existence of GreenON, both gas and electricity utilities indicated to the ECO that despite making several proposals and presenting business plans that showed how GreenON programs could better leverage existing utility conservation resources, GreenON did not take advantage of existing conservation resources available.[142] GreenON issued its own Request for Proposals and delivered several of the programs through the IESO and the Ontario Centres of Excellence. This potentially created another layer of confusion for contractors and higher delivery costs.

If Ontario is to gain the benefits of a single efficiency utility, it will be important to minimize disruption in the industry and for the customers. Some of the key elements could include:

- Transition plan: An abrupt move from one model to another will create uncertainty on all fronts. Vermont, often cited as an example of a jurisdiction that underwent a well-managed transition, took three years to completely move over to the single administrator model.[143] The transition plan will require the proper authority, adequate funds and a strict but appropriate timeline to move over to the new framework.

An abrupt move from one model to another will create uncertainty on all fronts.

- Timing: Regardless of how robust the transition plan is, timing of its execution is key so that there is sufficient time for all relevant parties to move over to the new model. With the current CFF and DSM frameworks concluding on December 31, 2020, discussions will be beginning shortly on the next energy efficiency frameworks. This might the opportune time for government to consult on the single administrator model.
- Testing: Before Wisconsin decided in 2001 to transition from utility-run conservation to a single state-run model for gas and electricity conservation programs, it ran a pilot program in 1998 in northeast Wisconsin.[144] The pilot tested the idea of a single-administrator model where contractors separate from the utilities delivered programs and ads were run for programs that offered cross-fuel savings. Subsequent market research and analysis allowed Wisconsin Focus on Energy to focus on the right messages and the right initiatives when it launched.[145]
- Extensive consultation: The government will need buy in from a vast range of stakeholders to make such a drastic shift in the design and delivery of conservation. When the government of Alberta established Efficiency Alberta, it struck up a panel of experts who consulted with a cross-section of Albertans including residents, businesses, Indigenous communities, municipalities and industry stakeholders. The engagement process gathered information on existing barriers to energy efficiency, on the types of technologies to adopt and how best to measure success.[146] The panel held consultations over four months including several open houses, technical sessions, municipal sessions and sessions with Indigenous communities. After the consultation, the panel released a report that set out the vision and outcomes of Efficiency Alberta so that there was transparency towards all parties and to regular citizens. As mentioned earlier, the timing may be right now for the province to start having such a conversation. Previous consultations for conservation frameworks have been rather narrow in scope. A drastic change in framework will require an extensive stakeholder process that engages the broader public, and should include use of the Environmental Registry. Implementing some of the best practices from the Alberta process might be the way to go if Ontario is considering a single administrator model.

The government will need buy in from a vast range of stakeholders.

- Establishing key policy objectives: The government must establish and determine an appropriate balance between key policy objectives, e.g., maximizing targets (reductions in electricity, gas and GHG emissions), minimizing costs, broad customer inclusion through programs, overcoming market barriers and encouraging innovation in energy efficiency, amongst others.
- Continuation and enhancement of programs: Successful programs that have seen significant savings such as the Conservation First Framework Retrofit Program and the Demand Side Management Home Weatherization Program should continue in

some form under the new framework. With one administrator, some electricity and gas programs could be merged and enhanced into one offering for the customer, possibly driving more participation.

- Evaluation of savings: Independent evaluation of results from all fuels should continue as that will be a clear indication of the success of the model.
- Regulatory changes: The province will need to make extensive regulatory and policy changes to transition from the current model to establish the new entity and also to establish /amend oversight responsibilities for such an entity. Successful energy administrators have excelled under supportive and robust laws and policy structures that have created long-term certainty, e.g. through a franchise model[147], which also means independence from political decisions. There might also be a need to amend regulations to establish how the framework will be funded, e.g, through the rate base, the tax base, or some combination.
- Industry support: This undoubtedly will be the toughest hill to climb if Ontario moves to a single-administrator model. LDCs and gas companies have successfully delivered conservation programs for years and have the established customer relationships, as well as much of the technical expertise. Similar to the Vermont model,[148] electricity and natural gas companies could bid into requests for proposals to deliver energy efficiency under the single administrator model in their own jurisdictions and in other jurisdictions. The extensive knowledge and skill sets developed by the utilities must be utilized in the consultation process to develop this framework. It will be important to partner with both electricity and gas utilities from the onset of this consultation to get their buy in and to assure them that they will have the opportunity to still deliver energy efficiency, albeit under a different model.

The textbox "Single Administrator Models in other jurisdictions" reviews two existing single administrator models, one that is often lauded as the pioneer in this field, while the other is one of the newest entrants.

Single Administrator Models in other jurisdictions

Efficiency Vermont

Vermont was the first state to create a statewide "energy efficiency utility" in the form of Efficiency Vermont in 2000.[149] Under Vermont's current 12-year franchise model, Efficiency Vermont and the smaller Burlington Electric Department deliver electricity and unregulated heating and processing fuel energy efficiency services to homes and businesses.[150] To ensure that energy efficiency is "fuel blind" in nature, state statute has established that energy service providers must deliver whole building and process heat efficiency regardless of fuels, facilitate fuel switching where appropriate and promote electricity and other fuel efficiency across all customers.[151]

Historically, electricity utilities were the face of energy efficiency programs in Vermont but this system did not work well. Investor owned utilities found it difficult to promote programs that would reduce their revenues; also, there were administrative inefficiencies with 22 utilities delivering programs.[152] In 1999, the state established one energy efficiency utility (EEU) to provide energy efficiency to all Vermonters. Initially, Efficiency Vermont and its fiscal and contractor agents had a short-term contract with the state Commission to design, deliver and fund programs. In 2009, the structure moved to a more long-term order of appointment or franchise model which added more stability to the programs.[153] This has also given Efficiency Vermont more responsibility and oversight to design long-term energy efficiency. Along with transparent public proceedings on its results, the Commission also undertakes a comprehensive review of the EEU every 6 years.

In 1999, the Vermont Public Service Board was authorized to start collecting a volumetric Energy Efficiency Charge (EEC) from electricity and natural

gas ratepayers. In 2018, residential electricity customers paid 1.4 cents per kWh for energy efficiency[154], while gas customers paid 5 cents per CCF (100 cubic feet).[155] The programs for reducing fuel use such as heating oil and propane are funded from the Regional Greenhouse Gas Initiative (RGGI) auction proceeds and from the New England Forward Capacity Market.[156]

Under this structure, utilities do not have a role in delivering conservation measures. A single non-utility contractor that has a multi-year performance-based contract with Vermont's Public Sector Board (PSB) undertakes program design and delivery. Utilities were relieved of their obligation to deliver conservation programs during the settlement process to create Efficiency Vermont.[157] Utilities refer customers seeking energy efficiency programs to Efficiency Vermont and also provide full electronic customer identification and consumption records to the EEU so that it can maintain the energy use database and also track savings[158].

Efficiency Alberta

Efficiency Alberta is one of the newest energy efficiency delivery administrators in North America, established as a not-for-profit Crown Corporation under Alberta's Energy Efficiency Act.[159] Its role is to educate customers about energy use, design and deliver energy efficiency programs, help develop micro-generation and small scale renewable energy systems and to promote the development of an energy efficiency services industry in the province. As mentioned earlier, an Energy Efficiency Advisory Panel undertook an extensive consultation to receive input from all Albertans before putting forward final recommendations on the Efficiency Alberta framework. The panel also reviewed other jurisdictions such as Efficiency One in Nova Scotia and the Energy Trust of Oregon to understand best practices.

Dunsky Energy Consulting were retained to design the first suite of programs with cost and savings estimates (energy and GHG). Its report set the first-year budget at $43.3 million and a target of 594,300 gigajoules of annual energy savings and 682,300 tons of CO_2e in lifetime GHG reductions.[160]

The first programs launched in early 2017 and now include but are not limited to the following:[161]

- Residential No-Charge Energy Savings Program which include LED lighting products, high-efficiency shower heads, faucet aerators and a smart thermostat
- Residential Retail Program which included online rebates for home improvements and instant savings
- Business, Non-profit and Institutional Energy Savings Program which offers incentives up to $25,000 per facility to install high-efficiency products
- Residential and Commercial Solar Program offers a maximum payable incentive and a $/watt incentive for solar installations
- Custom Energy Solutions which offers a tailored approach to businesses to reduce operating costs and reduce energy use, and
- Indigenous Green Loan Guarantee, which funds the development of large-scale renewable electricity generation, projects in Indigenous communities. $50 million in Green Loan Guarantees are currently available.

The Government of Alberta funds Efficiency Alberta through its carbon tax. The province has earmarked $645 million in its 2016-2017 budget for spending on Efficiency Alberta over the next 5 years.

Successfully establishing and administering a single administrator model is not easy. Jurisdictions like Vermont took almost a decade to get it right. In many cases, lack of independence from the government has affected operations and funding. Some of the key requirements of a single administrator of energy efficiency should include:

- long-term commitment to funding
- recognition that energy efficiency is a resource on par with traditional energy resources
- independence from government and other agencies so that there are no abrupt changes or interruptions to its operations
- stability of appointment such as through a franchise model (see the textbox: "Single Administrator Models in other jurisdictions"), and
- accountability for performance to ensure it is driving energy savings and reducing GHG emissions.

2.6. Conclusion

Utility-run energy conservation programs have delivered multiple benefits for Ontario, and can do even more. But the current model of utility delivery of conservation programs has key gaps, regarding coordination of natural gas and electricity conservation, coverage of other fuels, fuel switching, and a lack of clarity on the overall objectives of conservation programs.

A conservation framework that integrates electricity and natural gas conservation programs and brings in conservation of other fuels could lead to lower costs to deliver conservation while increasing the potential for energy and GHG savings, and expand the ability of more Ontarians to make their lives more comfortable.

A single administrator model for conservation of all energy sources used in buildings might help achieve these objectives. If a single administrator model is to be considered, then the discussions with key stakeholders must begin now. Along with those discussions, there must be long-term commitment to fund conservation programs with an appropriate stable funding mechanism to encourage this shift, and conservation programs for non-regulated fuels need to be designed and delivered alongside regulated fuel conservation. More importantly, the necessary regulatory and policy changes will need to amended and strengthened to ensure that the single administrator can be established and implemented successfully.

The ECO recommends that the Ministry of Energy, Northern Development and Mines prepare a post-2020 energy conservation program framework to deliver its planned 3.2 Mt CO_2e of greenhouse gas reductions from conservation programs by:

- **growing natural gas conservation funded by ratepayers, while looking at ways for more natural gas customers to benefit, such as expanding participation in programs, and using conservation to avoid infrastructure investments**
- **including conservation of other heating fuels and fuel switching**
- **focusing electricity conservation on programs that save electricity during hours of high demand, when fossil fuels are being used to generate electricity**
- **accurately measuring and valuing GHG reductions, including valuing the benefits of emissions reductions in cost-effectiveness testing (using up-to-date inputs), and making greenhouse gas reductions a performance metric for utilities or other conservation providers, and**
- **assessing whether a single administrator model for conservation of all energy sources is a preferred model to achieve these objectives.**

Endnotes

1. For more information see section C.3 in **Appendix C** of this report.
2. For natural gas utilities, the OEB approves the rate that they can charge on the natural gas rate base to cover the cost of delivering conservation programs. On the other hand, the IESO determined the current budget for the electricity conservation programs based on government direction and achievable potential studies completed at the time. Actual spending (which cannot exceed the budget limit) is added to the electricity rate base and charged to all electricity customers.
3. Electricity conservation programs were first introduced by Ontario Hydro in the early 80s, which at the time was the only major transmitter and distributor of electricity in Ontario, and was responsible for regulating over 300 municipally owned distribution utilities. Conservation efforts were abandoned in the 90s as the then government's priorities shifted to keeping electricity bills down. A province-wide framework to pursue electricity conservation was only re-established after the 2003 election, in which all parties pledged to close the coal-fired power plants and pursue conservation to improve the province's poor power reliability. For the gas utilities, energy conservation programs are generally described as "demand side management" (DSM). The two main natural gas delivery companies, Enbridge Gas Distribution and Union Gas Limited, have filed DSM plans with the OEB since 1995, offering a range of programs to the majority of their customers.
4. $1.8 billion for LDCs+ $0.8 billion for the IESO central services, over the six-year period.
5. The total amended budget for IAP is $280 million over 6 years.
6. Independent Electricity System Operator, information provided to the ECO (12 January 2018).
7. The total revenue of Enbridge and Union Gas in 2017 was $5.534 billion. For more information see: Ontario Energy Board, 2017 Yearbook of Natural Gas Distributors (Toronto: OEB, August 2018) at 6.
8. "Price Overview", online: Independent Electricity System Operator <www.ieso.ca/power-data/price-overview/global-adjustment>. [Accessed 14 February 2019]
9. Ontario Energy Board, EB-2014-0434 Report of the Board: Demand Side Management Framework for Natural Gas Distributors (2015-2020) (Toronto: OEB, December 2014) at 17.
10. Savings methodologies are detailed in **Appendices C** and **D** of this report (available online).
11. 2015-2020 IESO-LDC Energy Conservation Agreement (2014), article 4 at 6-7.
12. Ontario Energy Board, EB-2014-0434 Report of the Board: Demand Side Management Framework for Natural Gas Distributors (2015-2020) (Toronto: OEB, December 2014) at Appendix A.
13. 2015-2020 IESO-LDC Energy Conservation Agreement (2014), article 5.4 at 10-11.
14. "About Public Appeals", online: Independent Electricity System Operator <www.ieso.ca/en/Corporate-IESO/Media/About-Public-Appeals>. [Accessed 14 February 2019]
15. Independent Electricity System Operator, information provided to the ECO (8 August 2018).
16. 9,358,170,026 kWh net 2017 annual energy savings at the generator level = 8,731,172,635 kWh net 2017 annual energy savings at the distribution system end-user level / 9,000 kWh average home annual energy consumption at the distribution system end-user level = 970,130 homes for one year. Source: Independent Electricity System Operator, information provided to the ECO (25 February 2019).
17. Total electricity demand in the province in 2017 was 131.83 TWh. See: "Year End Data 2017", online: Independent Electricity System Operator <www.ieso.ca/Corporate-IESO/Media/Year-End-Data/2017>. [Accessed 14 February 2019]
18. There are electricity consumption and demand reductions from codes and standards that make buildings and appliances more energy efficient, There are also savings associated with "other" conservation initiatives such as gas conservation and federal conservation programs.
19. Ibid.
20. See **Appendix D**, Table D.1 of this report. This is likely a slight underestimate as some program activity before 2007 is still delivering savings today.
21. 1.7 billion m^3 of persistent natural gas savings divided by the average natural gas consumption in a home at 2400 m^3.
22. Directive from the Minister of Energy to the Independent Electricity System Operator re: Amending March 31, 2014 Direction regarding 2015-2020 Conservation First Framework (23 October 2014).
23. Independent Electricity System Operator, information provided to the ECO (15 January 2019).
24. This includes LDC delivered conservation and the IESO delivered Industrial Accelerator Program. Source: Independent Electricity System Operator, information provided to the ECO (15 January 2019).
25. Ontario Energy Board, 2016 Natural Gas Demand-Side Management Annual Verification by DNV-GL (Toronto: OEB, October 2018) at 4.
26. Toronto Hydro-Electric System Ltd, Custom Incentive Rate-Setting Application for 2020-2024 Electricity Distribution Rates and Charges, Ontario Energy Board EB-2018-0165 (Toronto: THESL, August 2018), Exhibit 1B, Tab 5 at 11.
27. Ibid.
28. Ibid at Exhibit 2B, Section E7.4 at 2.
29. Ibid at Exhibit B, Section E7.4 at 18.
30. Ibid at Exhibit 2B, Section B, Appendix E at 68.
31. Unlike the electricity system, natural gas is purchased in the broader North American market; so cost savings from avoiding having to bring new wells into production are not fully captured by Ontario customers.
32. Lake Shore Gold, Information provided to the ECO (5 February 2019).
33. Enbridge Gas Distribution Inc., information provided to the ECO (13 December 2018).
34. Letter from Thomas Lambert, Manager of Employment &Training/ Economic Development of Nipissing First Nation to Union Gas (16 July 2018).
35. Ibid.
36. Enbridge Gas Distribution Inc., information provided to the ECO (13 December 2018).
37. "2018 Electricity Data", online: Independent Electricity System Operator <www.ieso.ca/en/Corporate-IESO/Media/Year-End-Data>. [Accessed 14 February 2019]
38. Enbridge persistent gas savings 623.8 million m^3, Union Gas persistent gas savings 1100.76 million m^3. An emissions factor of 1.899 kg CO_2e/ m^3 of natural gas is used.

39. For more information, see Environmental Commissioner of Ontario, Making Connections: Straight Talk about Electricity in Ontario, 2018 Energy Conservation Progress Report, Volume One (Toronto: ECO, April 2018) at 309.

40. Environmental Commissioner of Ontario, Making Connections: Straight Talk About Electricity in Ontario, 2018 Energy Conservation Progress Report, Volume One (Toronto: ECO, April 2018) at 170-172.

41. The estimate of 6.5 Mt CO_2e includes the combined contributions of conservation programs (6.1 TWh), codes and standards (4.2 TWh) and renewable generation (13.5 TWh). Assuming each component reduced emissions in proportion to its share of electricity, the impact of conservation programs alone would be 1.6 Mt CO_2e. However, by the end of 2017, savings from conservation programs were higher (9.4 TWh) due to two more years of program activity. Assuming these additional savings delivered emissions reductions in the same proportion leads to an estimate of 2.6 Mt CO_2e emissions reductions from conservation programs through 2017.

42. Ontario Energy Board, Mid-Term Review of the Demand-Side Management (DSM) Framework for Natural Gas Distributors (2015-2020), EB-2017-0127/0128 (Toronto: OEB, November 2019) at 6.

43. Ministry of Energy, Northern Development and Mines, information provided to the ECO (15 January 2019).

44. Ibid.

45. Independent Electricity System Operator, information provided to the ECO (31 January 2018).

46. An Ontario Energy Association white paper presented over $120 million of potential savings but no recommendations have been put forward formally by the IESO. For more information see: Ontario Energy Association, Reforming Conservation: Building a Better Framework (Toronto: OEA, December 2018).

47. Ministry of Energy, Northern Development and Mines, information provided to the ECO (15 January 2019).

48. Ibid.

49. Independent Electricity System Operator, "2018 Technical Planning Conference" (presentation, 13 September 2018), slide 20.

50. Ibid at 50, 51.

51. "The Fair Hydro Act, 2017", online: Ontario Energy Board <www.oeb.ca/newsroom/2017/fair-hydro-act-2017>. [Accessed 22 February 2019]

52. "Settlements: Variance Account Under Ontario's Fair Hydro Plan ($M)", online: Independent Electricity System Operator <www.ieso.ca/en/Sector-Participants/Settlements/Global-Adjustment-for-Class-B>. The variance for 2018 was $2540 million. [Accessed March 5, 2019]

53. CO_2e or carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For more information see: "Carbon Dioxide Equivalent", online: OECD <stats.oecd.org/glossary/detail.asp?ID=285>. [Accessed 21 February 2019]

54. Ministry of the Environment, Conservation and Parks, Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan (Toronto: Queen's Printer, October 2018)at 23.

55. Ibid at 32.

56. Ministry of Energy, Northern Development and Mines, information provided to the ECO (15 January 2019).

57. Ministry of the Environment, Conservation and Parks, Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan (Toronto: Queen's Printer, October 2018) at 24.

58. Ibid at 23.

59. "2018 Electricity Data", online: Independent Electricity System Operator <www.ieso.ca/en/Corporate-IESO/Media/Year-End-Data>. [Accessed 14 February 2019]

60. Enbridge's budget is now $60 million/year and Union Gas' budget is at $57 million/year.

61. Enbridge Gas Distribution Inc., 2018 Cap and Trade Compliance Plan Application, OEB EB-2017-0224 (Toronto: EGD, January 2018),Transcript vol. 3, p. 133, lns. 5-9.

62. "Ford Government to help expand access to natural gas", online: Ontario Newsroom <news.ontario.ca/opo/en/2018/09/ford-government-to-help-expand-access-to-natural-gas.html>. [Accessed 6 March 2019]

63. The OEB agrees that all material benefits of DSM should be recognized as part of the screening and cost-effectiveness analyses. As such, the OEB agrees that the cost of carbon should be added to the TRC-Plus cost effectiveness test. This will ensure that planning and cost-effectiveness analyses fully consider the costs and benefits of the DSM programs. The natural gas utilities should include the federal cost of carbon as part of future avoided cost updates, as it is the most relevant public data source currently available. The OEB will also include the cost of carbon in the cost-effectiveness analysis undertaken as part of the annual program evaluation work. Additionally, the OEB will maintain the non-energy benefit adder of 15% currently included in the TRC-Plus cost-effectiveness test. The OEB will further consider this topic as part of the post-2020 DSM framework development. Source: Ontario Energy Board, Mid-Term Review of the Demand Side Management Framework for Natural Gas Distributors, EB- 2017-0127 and 0128 (Toronto: OEB, November 2018) at 6.

64. An achievable potential study (APS) is one way to assess how much of a fuel or an energy use conservation programs can reduce. The study usually considers the following elements:
- Current availability of conservation programs
- Existing budget
- Current participation rates
- Financial incentives on offer
- Determination of a range of energy efficiency measures and their related consumption
- Costs and savings across customer sectors, and
- Cross-jurisdictional studies.

65. While there are many variations and terminology, the more commonly used potential studies are the following:
- Technical potential: this is considered as the maximum potential of a jurisdiction, estimating the savings potential from all technically feasible energy efficiency measures implemented at their full market potential.
- Economic potential: this is a subset of the technical potential, which considers the maximum potential when all economically feasible (i.e. cost-effective) energy efficiency measures are implemented. Different methodologies may be used to calculate cost-effectiveness.
- Unconstrained achievable potential: a subset of the economic potential, this level estimates conservation savings of all economically feasible and existing measures based on achievable cost curves and without any budgetary or policy constraints.
- Constrained achievable potential: this is part of the unconstrained potential, as it assumes that budgets stay at their current levels.

66. Ministry of Energy, Northern Development and Mines, information provided to the ECO (15 January 2019). The 3.2 Mt CO_2e of GHG reductions by 2030 is the "sum of the difference in rate of change (million m^3/year) between the constrained and unconstrained potential scenarios presented in the OEB's 2016 Natural Gas Achievable Potential Study". However, the Ministry also stated that the baseline does not explicitly include current levels of natural gas demand- side management programs, which appears incompatible with the previous statement. A check of the Achievable Potential study confirms that the math works out, showing 3.3 Mt CO_2e in potential savings:

Table comparing the Unconstrained and Constrained Achievable Potentials.

Year	GHG savings from Constrained Achievable Potential*	GHG savings from Unconstrained Achievable Potential*	Difference	Cost of delivering Constrained Achievable Potential	Cost of delivering Unconstrained Achievable Potential	Difference
2020**	2.2 Mt CO_2e	3.5 Mt CO_2e	1.3 Mt CO_2e	$111 million/year	$550 million/ year	$439 million/year
2030	4.7 Mt CO_2e	9.3 Mt CO_2e	4.6 Mt CO_2e	$120 million/year	$722 million/year	$602 million/year
2030 - 2020	2.5 Mt CO_2e	5.8 Mt CO_2e	3.3 Mt CO_2e			

Note*: the OEB's APS presents the GHG savings in million m^3, the numbers have been converted to Mt to be consistent with previous climate change reports released by the ECO.

Note**: the APS projects conservation savings from 2015 to 2030, but the ECO is only using the numbers starting in 2020 since the government's environment plan has a starting date of 2021.

67. Ontario Energy Board, Final Report: Natural Gas Conservation Potential Study by ICF International (Toronto: OEB, July 2016) at 5. Also, see Table in endnote 74.

68. Ontario Energy Board, Final Report: Natural Gas Conservation Potential Study by ICF International (Toronto: OEB, July 2016) at 13 (section 2.8.3).

69. "IESO announces Results of Demand Response Auction", online: Independent Electricity System Operator <www.ieso.ca/en/Sector-Participants/IESO-News/2018/12/IESO-Announces-Results-of-Demand-Response-Auction>. [Accessed 14 February 2019]

70. Directive from the Ontario Minister of Energy to the Ontario Energy Board (31 March 2014).

71. Letter from the Ontario Energy Board to the Natural Gas Distributors re: DSM Mid-Term Review (20 June 2017).

72. Ontario Energy Board, Demand Side Management Framework for Natural Gas Distributors (2015-2020) (Toronto: OEB, December 2014) at 36.

73. Ontario Energy Board, Final Report: Natural Gas Conservation Potential Study by ICF International (Toronto: OEB, July 2016) at 3.

74. Ibid.

75. Ibid at 4.

76. ICF's report to the OEB highlights some of the current barriers in the industry, including the following:
• There is currently no precedent or evidence of gas utilities benefitting from incorporating DSM into long-term planning- only one North American utility is planning to pilot such a geo-specific study.
• Current DSM programs are mostly focused on reducing overall consumption and not peak consumption, which is often the main driver for new infrastructure.
• Lack of metered data (like smart meters in electricity) makes it difficult for gas utilities to measure the impact of DSM on peak demand and are therefore not reliable enough to be considered as an alternative to new infrastructure.
• ICF's research indicated that gas infrastructure costs are usually less than electricity infrastructure costs, and therefore have less impact on the customers' bills.
• The electricity system structure, which is built for instant peaks vs. gas, which is built to meet daily requirements, makes demand response a more feasible alternative for the electricity system. Without the proper infrastructure, gas utilities will not have the assets to handle a reliability issue and an outage in the natural gas system takes much longer to bring back online compared to electricity.
• DSM planning and infrastructure planning would need to be timed so that the DSM program is running and has produced results with a certain level of reliability (2-4 years) for the utility to reconsider the need for new planned infrastructure. However, the utility may not know 2 to 4 years ahead of time if it actually needs to build new assets for them to implement a DSM program instead ahead of time.
• DSM programs may not be a useful alternative to new construction in a new community.
• Geo-specific or regional DSM programs may benefit a small section of the population at the expense of the rest of the rate base.
• The current short timeframe of the DSM framework is not favourable to DSM being incorporated into IRP regional planning.

77. Ontario Energy Board, Final Report: Natural Gas Conservation Potential Study by ICF International (Toronto: OEB, July 2016) at 42.

78. Enbridge Gas Distribution, EB-2017-0127/0128- DSM Mid-Term Review, Submission to Ontario Energy Board (Toronto: EGD, January 2018), Appendix E at 8.

79. Ibid.

80. Ontario Energy Board, Mid-Term Review of the Demand Side Management Framework for Natural Gas Distributors, EB-2017-0127/0128 (Toronto: OEB, November 2018) at 20.

81. Ministry of the Environment, Conservation and Parks, information provided to the ECO (4 February 2019).

82. For more information see: Environmental Commissioner of Ontario, Making Connections: Straight Talk About Electricity in Ontario, 2018 Energy Conservation Progress Report, Volume One (Toronto: ECO, April 2018) at 312.

83. Summer peak period is defined as weekdays from 11 am to 5 pm in June through September; shoulder off-peak period is all weekend hours and weekday hours from 10 pm to 7am in April, May, October, and November. Source: Independent Electricity System Operator, information provided to the ECO (8 August 2018).

84. Directive from the Minister of Energy to the Independent Electricity System Operator re: Amending March 31, 2014 Direction regarding 2015-2020 Conservation First Framework (23 October 2014).

85. Research done by a consultant during the IESO's Mid-Term Review process concluded that the current 15% adder might be too conservative as non-GHG benefits from conservation programs (e.g. improved comfort) may be around that much on their own.

86. Ministry of Energy, Northern Development and Mines, information provided to the ECO (15 January 2019).

87. Independent Electricity System Operator, information provided to the ECO (8 August 2018).

88. In some jurisdictions, the cost of GHG emissions are already internalized in the TRC and PAC calculations. In others, when GHG and other non-energy benefits are added on, it is termed a societal cost test and not a TRC. Jurisdictions such as Massachusetts have gone with this definition.

89. The value assigned to greenhouse gas emissions reductions is a policy choice. It could be based on the estimated societal benefit in terms of avoided climate impact, or on the current market value of the emissions reductions, based on the relevant carbon pricing framework in effect. The Ministry of the Environment and Climate Change had originally proposed a carbon price of $43 which the IESO was taking into consideration as part of the Midterm Review. Source: Independent Electricity System Operator, information provided to the ECO (1 December 2017 and 12 January 2018). With the cancellation of Ontario's cap and trade program and its replacement by federal carbon pricing, the market value of emissions reductions has also changed.

90. Independent Electricity System Operator, information provided to the ECO (15 January 2019).

91. A similar methodology was proposed in The Atmospheric Fund, A Clearer View of Ontario's Emissions: Practical Guidelines for Electricity Emissions Factors (Toronto: TAF, July 2017) at 11.

92. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at v.

93. Ibid at 1.

94. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 24.

95. Independent Electricity System Operator, Conservation Framework Mid-Term Review: Final Report by Navigant (Toronto: IESO, March 2018) at 113-114.

96. Enbridge and Toronto Hydro may extend the program- program is offered on a year to year basis.

97. Toronto Hydro, Information provided to the ECO (21 September 2018).

98. Ibid.

99. "Energy Conservation Program", online: Niagara Peninsula Energy Inc. <www.npei.ca/conservation/energy-concierge-program>. [Accessed 6 March 2019]

100. Ibid.

101. Independent Electricity System Operator, 2017 Program Evaluation: Niagara Peninsula Energy Inc. Hotel. Motel Pilot by Nexant and NMR Group Inc. (Toronto: IESO, November 2018) at 4.

102. Independent Electricity System Operator, Whole Home Pilot Evaluation by Cadmus (Toronto: IESO, November 2018 at 8).

103. Independent Electricity System Operator, information provided to the ECO (15 January 2019).

104. Independent Electricity System Operator, Whole Home Pilot Evaluation by Cadmus (Toronto: IESO, November 2018) at 13.

105. Independent Electricity System Operator, information provided to the ECO (8 August 2018).

106. Independent Electricity System Operator, Whole Home Pilot Evaluation by Cadmus (Toronto: IESO, November 2018) at 8.

107. Ibid.

108. Ibid.

109. Independent Electricity System Operator, "Conservation Framework Mid-Term Review: Collaboration" (presentation by Navigant, 27 April 2017), slide 18.

110. LDCs and energy service providers, information provided to the ECO (June-August 2018).

111. Ibid.

112. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 128-136.

113. American Electric Power Ohio, EfficiencyCrafted Homes Program: 2017 Evaluation Report by Navigant Consulting (Chicago: AEP Ohio, April 2018) at 10.

114. Ibid

115. Ibid at 16.

116. Ibid at 17.

117. American Electric Power Ohio, 2017 Portfolio Status Report of Energy Efficiency and Peak DR Programs Vol I by Navigant Consulting (Chicago: AEP Ohio, April 2018) at 12 and 20.

118. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 104.

119. Ibid at 105.

120. "LADWP Helps Thousands of LA Businesses Save Energy and Water", online: LADWP <www.ladwpnews.com/ladwp-helps-thousands-of-la-businesses-save-energy-and-water/>. [Accessed 6 March 2019]

121. Ibid.

122. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 102.

123. Ibid at 104.

124. Ibid.

125. Southern California Gas, "Come Together: Turning Utility Collaboration into a Strategic Energy and Water Efficiency Resource" (Presentation at the 2017 ACEEE National Conference on Energy Efficiency as a Resource, 1 November 2017), slide 7.

126. Ibid.

127. 1 Therm is equal to 105.5 megajoules or 29.3 kWh or 2.83 cubic meters. Source: <www.kylesconverter.com/energy,-work,-and-heat/gigawatt-hours-to-therms-(uk)>. [Accessed 6 March 2019]

128. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at iv.

129. 2016 Natural Resources Canada Comprehensive Energy Use Database Residential Sector Table 14. These other sources include heating oil, propane, coal and wood.

130. These customers though have access to Conservation First electricity CDM programs through their respective LDCs.

131. Ministry of the Environment, Conservation and Parks, Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan (Toronto: Queen's Printer, October 2018) at 24.

132. Cold climate electric heat pumps have payback periods of less than 5 years compared to fuel oil or baseboard heating. Source: Independent Electricity System Operator, An Examination of the Opportunity for Residential Heat Pumps in Ontario (Toronto: IESO, 6 March 2017) at 19.

133. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 1-4

134. American Council for an Energy-Efficient Economy, Nobody's Perfect: Choosing (and Improving) Models for Program Administration by Dunsky Energy Consulting (Washington DC: ACEEE, 2010) at 5-74.

135. Ibid at 5-81.

136. Ibid.

137. Environmental Commissioner of Ontario, Climate Action in Ontario: What's Next? (Toronto: ECO, September 2018) at 222-224.

138. Letter from the Environmental Commissioner of Ontario to Navigant Consulting re: Navigant's attribution concept paper (5 June 2018) at 2.

139. Local distribution company, Information provided to ECO (June 2018).

140. Letter from the Environmental Commissioner of Ontario to Navigant Consulting re: Navigant's attribution concept paper (5 June 2018) at 2.

141. Ibid.

142. Local distribution companies and natural gas utilities, Information provided to the ECO (June-August 2018).

143. American Council for an Energy-Efficient Economy, Taking the Efficient Energy Model to the Next Level by Vermont Energy Investment Corporation (Washington DC: ACEEE, August 2008) at 10.

144. Wisconsin Energy Conservation Corporation, Says Who? Transitioning from Utility to Third-Party Energy Efficiency Information Sources (Milwaukee: WECC) at 3.

145. Ibid at 6.

146. Alberta Energy Efficiency Advisory Panel, Getting it Right: A More Energy Efficient Alberta (Calgary: EEAP, 2016) at 19.

147. American Council for an Energy-Efficient Economy, Taking the Efficient Energy Model to the Next Level by Vermont Energy Investment Corporation (Washington DC: ACEEE, August 2008) at 9.

148. "State and Local Policy Database", online: American Council for an Energy-Efficient Economy <database.aceee.org/state/vermont>. [Accessed 6 March 2019]

149. Ibid.

150. It is important to note that Vermont lacks natural gas mains and natural gas service throughout the state. Therefore, heating fuels include fuel oil, propane, wood and electricity. . Source: American Council for an Energy Efficient Environment, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 14.

151. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014) at 14.

152. "History and Structure", online: State of Vermont Public Utility Commission <puc.vermont.gov/energy-efficiency-utility-program/history-and-structure>. [Accessed 6 March 2019]

153. Ibid.

154. "2018 electric EEE rates", online: State of Vermont Public Utilities Commission <puc.vermont.gov/sites/psbnew/files/doc_library/AttachmentToOrderRe2018EECRates.pdf>. [Accessed 6 March 2019]

155. "Residential Rates" online: Vermont Gas <www.vermontgas.com/account/rates/>. [Accessed 6 March 2019]

156. American Council for an Energy-Efficient Economy, Successful Practices in Combined Gas and Electric Utility Energy Efficiency Programs by Nowak S. et al (Washington DC: ACEEE, August 2014)at 15.

157. American Council for an Energy-Efficient Economy, Gauging Success of the Nation's First Efficiency Utility: Efficiency Vermont's First Two Years by Efficiency Vermont and Optimal Energy Inc. (Washington DC: ACEEE) at 2.

158. Ibid at 8.

159. Alberta Energy Efficiency Advisory Panel, Getting it Right: A More Energy Efficient Alberta (Calgary: EEAP, 2016) at 15.

160. Alberta Climate Change Office, Alberta Energy Efficiency Program Design: Phase 2 Final Report by Dunsky Energy Consulting (Calgary: Alberta Climate Change Office, March 2017) at 6.

161. "Who We Are", online: Energy Efficiency Alberta <www.efficiencyalberta.ca/about-us/our-history/>. [Accessed 6 March 2019]