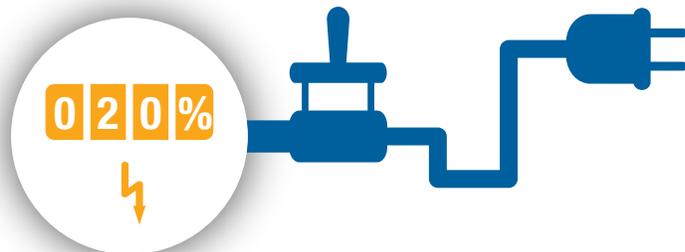
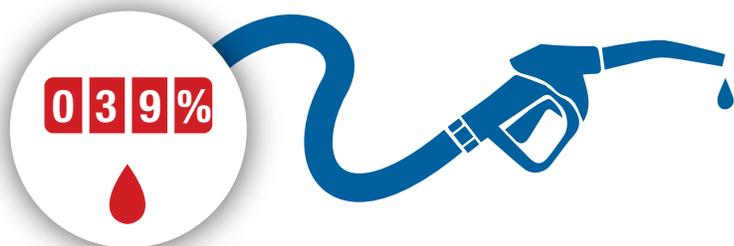
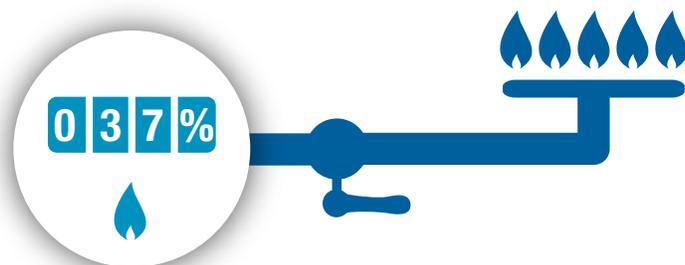


# Every Joule Counts

Ontario's Energy Use and Conservation  
Year in Review



## EXECUTIVE SUMMARY



Download the full report at:  
[eco.on.ca/reports/2017-every-joule-counts](http://eco.on.ca/reports/2017-every-joule-counts)

## Introduction (Chapter 1)

*Every Joule Counts* is Volume Two of the ECO's annual energy conservation progress report. This report is Ontario's only comprehensive public summary of energy conservation and efficiency.

The time frame covered by the report is by necessity a hybrid. Final numerical data on overall energy use and energy conservation is presented as of year-end 2015, except as noted. This is because 2015 data is the most reliable set of data across the sector. This is due to

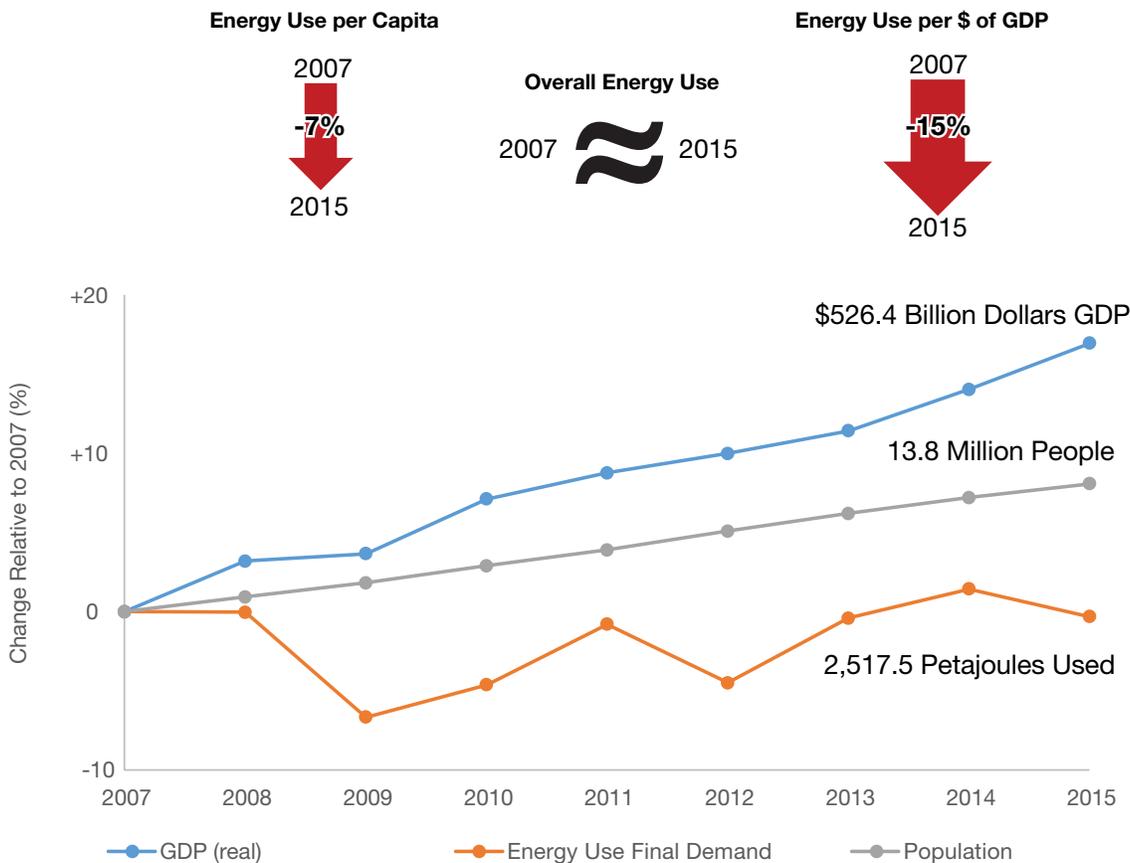
the time lag in data collection and reporting, as well as the need for evaluation prior to verifying final results of conservation programs. The report's description of policy developments, including policies that affect conservation program activity, is complete to the end of 2016.

Utility programs for conservation of natural gas and electricity are covered in detail; there is no equivalent program for petroleum products conservation to report on.

## Energy Use in Ontario (Chapter 2)

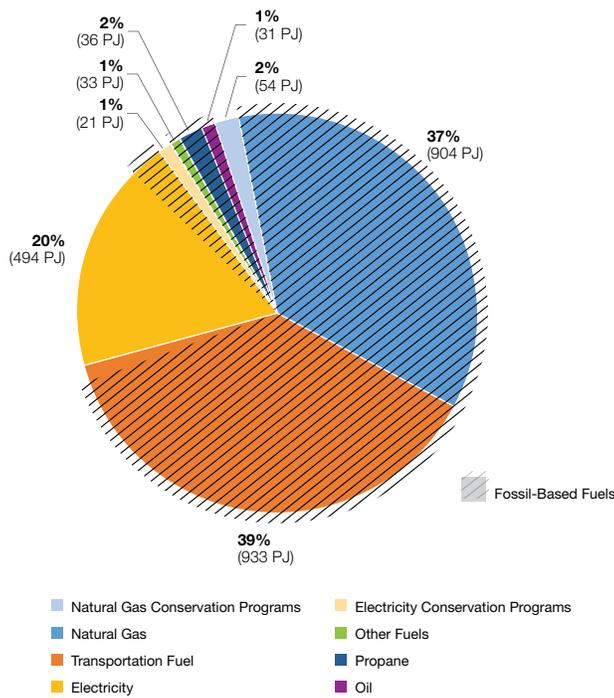
Despite population and economic growth, Ontario's overall energy use did not change significantly from 2014

to 2015; in other words, **Ontario continues to improve its energy efficiency**, as it has done since 2007.



**Figure 2.2. Ontario's overall energy use, population and GDP (2007-2015).**

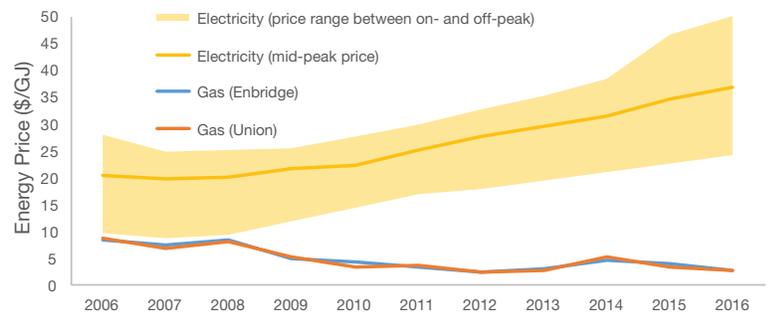
The ECO estimates that the **electric and gas conservation programs** offered since 2006 (by the Independent Electricity System Operator and electric and gas utilities) **have reduced overall energy use in 2015 by 3%.**



**Figure 2.1. Share of overall fuel demand in Ontario, by fuel type, including demand reduced by utility-run conservation programs (2015).**

The potential for further energy efficiency in Ontario is substantial. A reduction of over 25% in electricity and natural gas use is economically achievable by 2030, and by 2025 new vehicles sold in Canada will be 50% more efficient than they were in 2008. However, given the dominant role of fossil fuels in Ontario’s energy mix, **efficiency alone will not be enough to meet the province’s greenhouse gas reduction targets. Significant fuel switching to cleaner, non-carbon based fuels will also be needed.**

This will require policy intervention since Ontario’s electricity is much more expensive than natural gas and electric vehicles are more expensive than petroleum-fueled vehicles.

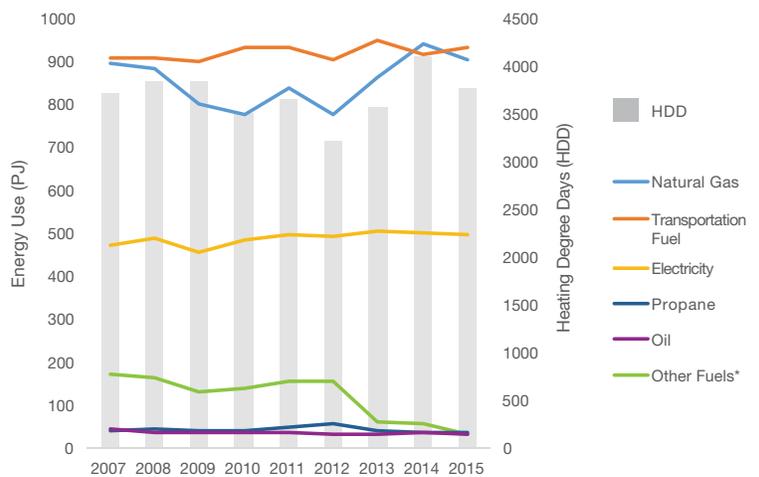


**Figure 2.4. Ontario’s annual residential time of use electricity prices compared to natural gas prices, per gigajoule (2006-2016).**

Note: Does not include cost of delivery to end user.

**Fuel-by-Fuel Trends**

From 2014 to 2015, transportation fuel use increased by 2% (likely influenced by 16% lower gas prices), and natural gas use decreased by 4% (partly due to a warmer winter and conservation programs). Though electricity use remained almost the same, the supply mix has changed, with more generation from natural gas and renewable energy in 2015.



**Figure 2.3. Ontario’s energy use by fuel type in petajoules, and southern Ontario heating degree days (HDD) (2007-2015).**

## Ontario Energy Policy in 2016 (Chapter 3)

The energy file in Ontario was very active in 2016, with a **tighter linkage between energy and climate policy** influencing most of the year's actions. Some of the most important energy developments in Ontario in 2016 were:

1. A law to implement **carbon pricing** through a cap and trade system, and a *Climate Change Action Plan* to further reduce greenhouse gas emissions, in part using revenues from cap and trade. Ontario consumers of fossil fuels began paying a carbon price as part of their energy costs as of January 1, 2017.
2. A new legal framework for energy system planning, and the initiation of an updated **long-term energy plan encompassing all fuels**. The legal requirement for an Integrated Power System Plan developed by the Independent Electricity System Operator has been removed, and the Ministry of Energy now has full control over the energy plan.
3. Actions to move **electric vehicles into the mainstream**, through incentives, public charging infrastructure, and new Building Code requirements. Electric vehicle uptake in Ontario has been slow, with just under 10,000 electric vehicles on the road in Ontario at the end of 2016.
4. Completion of a co-ordinated land-use planning review, followed by proposed changes to provincial **land use plans that focus on intensification and integration of transit**. Amendments are intended to build complete communities that will reduce energy use for personal transportation.
5. **Ownership changes of Ontario's energy utilities**, including the continuing government sale of Hydro One, the merger of four large electricity distributors into a new distributor (Alectra) that will be the second largest in Ontario, and the planned merger of the parent companies of Ontario's two large gas utilities (Enbridge Gas Distribution and Union Gas).
6. Full implementation of **new conservation frameworks for electricity and natural gas**, with new programs, targets, and budgets (conservation results are reviewed in detail in Chapters 5 and 6).
7. Initial steps to increase production and use of **natural gas from renewable energy sources**. The Minister of Energy wrote to the Ontario Energy Board to confirm interest in incorporating renewable natural gas into Ontario's natural gas supply. The Board is currently developing a framework to do so.
8. **Refurbishment of Ontario's nuclear fleet**, beginning with the shutdown of a unit at Darlington in October 2016. Refurbishments at Darlington and Bruce stations are to be staged over a period of almost 20 years, and the Ministry of Energy has approved plans to extend the life of the Pickering station from 2020 to 2024. The Ontario Energy Board is currently reviewing an application for cost recovery associated with the Darlington refurbishment and Pickering extension.
9. **Changes to renewable electricity procurement**, including a contract for hydroelectric imports from Quebec, a freeze on new large-scale renewable electricity projects, and a transition of small-scale renewable projects to net metering.
10. Some **electricity price relief** was provided to consumers, including the removal of the Debt Retirement Charge and the rebate of the provincial portion of the Harmonized Sales Tax for residential customers. In 2017, the Ministry of Energy took further action to reduce residential electricity bills through the "Fair Hydro" plan.

## Progress on Conservation Targets (Chapter 4)

Progress towards government-established energy conservation targets is reported as of December 31, 2015, unless otherwise indicated.

Most initiatives are roughly on pace to meet their target. **The government has already met its target to reduce greenhouse gas emissions from the**

**Ontario Public Service** by 27% in 2020/2021, compared against 2006. The province is also far ahead in its efforts to use demand response measures to reduce peak electricity demand. However, much more effort will be needed to meet the province's target for reducing electricity use among large industrial transmission-connected customers.

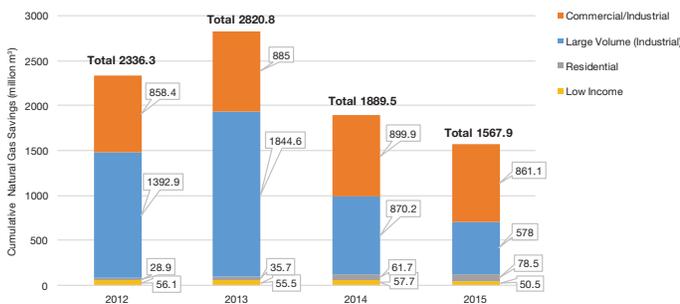
### PROGRESS ON ONTARIO'S ENERGY CONSERVATION TARGETS (As of December 31, 2015, unless otherwise indicated)

Electricity Targets			
<b>Overall Electricity Target: 30 terawatt-hour (TWh) reduction in 2032</b> *due to conservation efforts from 2005 onwards	<b>Distribution Utility Target: 7 TWh reduction in 2020</b> *due to conservation activities by utilities between 2015-20	<b>Transmission-Connected Customer Target: 1.7 TWh reduction in 2020</b> *Industrial Conservation Target	<b>Demand Response to meet 10% of peak demand in 2025</b> (2,400 MW under current forecasts) *Peak Demand Target
Natural Gas Targets		Transportation Fuel Targets	
<b>Union: 2.1 billion m<sup>3</sup> cumulative natural gas savings</b> *from 2015 programs	<b>Enbridge: 0.8 billion m<sup>3</sup> cumulative natural gas savings</b> *from 2015 programs	<b>5% of passenger vehicle sales to be electric or hydrogen in 2020</b>	
Ontario Public Service (OPS) Targets (As of March 31, 2016)			
<b>Add 500 electric vehicles to OPS by 2020</b>	<b>Reduce greenhouse gas emissions from the OPS by 27% by 2020/2021</b> *compared against a 2006 baseline.	<b>Other Fuels Targets</b> There are no targets for propane, oil, or other fuels	

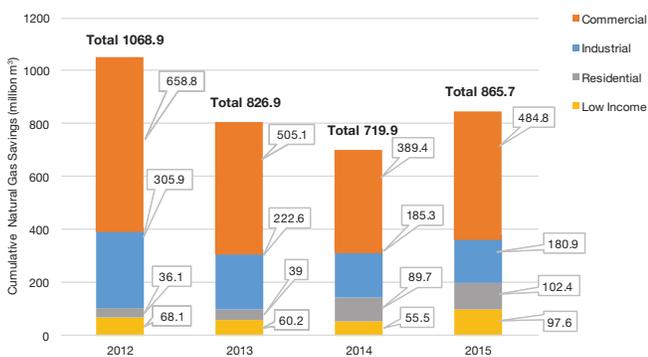
## Natural Gas Conservation Programs (Chapter 5)

Natural gas supplies about 37% of Ontario’s energy needs. Reducing natural gas use through conservation is important for reducing energy bills and for climate change mitigation.

This chapter reviews 2015 conservation program results (the most recent results available) from Ontario’s two major natural gas utilities (Enbridge Gas Distribution and Union Gas), and policy developments in 2016 that directly affect utility conservation programs.



**Figure 5.1. Union Gas cumulative natural gas savings from conservation programs, by sector (Ontario, 2012-2015)**



**Figure 5.2. Enbridge Gas Distribution cumulative natural gas savings by sector (Ontario, 2012-2015)**

### 2015 Results

**2015 results have yet to be verified and approved by the Ontario Energy Board and could still change significantly.** Based on draft results, overall natural gas savings for Union Gas were down 17% from 2014, primarily due to a drop in savings from large industrial customers. Enbridge’s results were 20% higher than in 2014, due to higher savings from commercial and low-income customers.

Both companies have programs in the residential, commercial and industrial sectors. In the residential sector, the focus is on deep home retrofits, a program that has grown rapidly in recent years. Both companies also offer programs to low-income residents, at low or no cost to participants. The largest savings come from commercial and industrial customers. However, given the higher cost of electricity, these customers often favour electricity conservation programs over natural gas programs as the financial rate of return is higher. This puts natural gas at a conservation disadvantage.

Total conservation spending for both utilities was \$68 million in 2015. Cost-effectiveness testing showed that **natural gas utility conservation programs make good sense – delivering roughly three dollars in benefits for every dollar spent.** For the first time, the cost-effectiveness test includes a 15% non-energy benefit adder to recognize the environmental, economic and social benefits of conservation.

Burning less natural gas reduces greenhouse gas emissions. Each year gas conservation programs have avoided approximately 0.2% of Ontario’s annual GHG emissions (300,000 tonnes per year). The average abatement cost of conservation from the utility perspective (not even including the savings from purchasing less natural gas) has been around \$15 per tonne of carbon emissions, cheaper than the current cost of allowances in the cap and trade program.

### 2016 and Beyond

In a carbon-constrained economy, gas conservation makes even more sense. This has been reflected in the new six-year conservation framework and expanded

budget for natural gas conservation. While 2015 was officially the first year of the new framework, it served in reality as a transition year that rolled over programs and budgets from 2014. Conservation budgets for both gas companies combined will increase significantly to just under \$120 million per year, beginning in 2016. This is still much less than is spent on electricity conservation.

Given its climate mitigation potential, funding for gas conservation is also being made available by the Ontario government from cap and trade proceeds. Careful oversight will be needed to ensure that these initiatives do not conflict and that utility programs continue to be delivered effectively.

## Electricity Conservation Programs (Chapter 6)

The 2015-2020 Conservation First Framework (CFF) was established in a 2014 Minister of Energy Directive. The framework mandates that each Local Distribution Company (LDC) reduce electricity consumption by offering conservation programs to its individual customer segments “as far as is appropriate and reasonable”. This was expected to give LDCs more flexibility to align their programs with local needs.

The Directive stipulated that energy savings would be counted on the basis of persistence throughout the course of the framework (i.e., only conservation measures still delivering savings at the end of 2020 will count towards targets). **Short-term reductions in electricity are less critical over the next few years, given the province’s strong short-term supply position. Longer-lasting conservation projects have more value, as they will help avoid new generation in future years.**

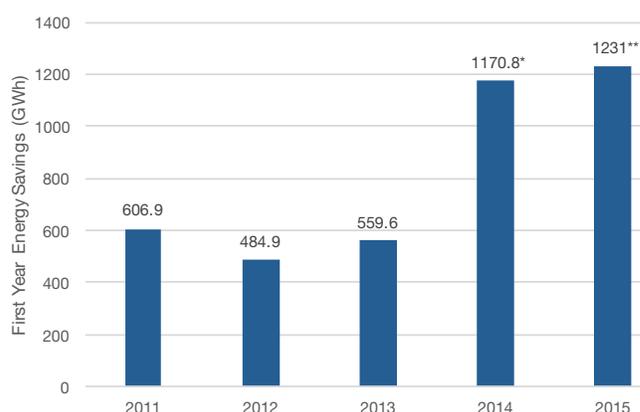
Previously, LDC conservation programs were required to deliver both overall electricity savings and (the more difficult and critical) reduction in electricity use at times of system peak. However, **reducing peak electricity demand is now solely the Independent Electricity System Operator’s (IESO’s) responsibility**, and was moved to a market-based auction system starting in late 2015.

## The Value of Conservation

The province is about halfway through its second multi-year conservation framework, and conservation remains the cheapest form of energy. The cost of conservation comes in at 3.5 cents/ kWh compared to renewable generation (hydro, wind and bio energy) at 6.5-26 ¢/kWh, hydro generation at 12-24 ¢/kWh, nuclear generation at 12-29 ¢/kWh, and 8-31 ¢/kWh for gas generation. In 2015, a total of \$429 million was recovered from Ontario’s ratepayers through the Global Adjustment Mechanism (GAM) for conservation. This is about 4.3% of the total GAM charged on electricity bills in 2015 and about 2% of the total electricity cost. These percentages are in line with previous years. Therefore, **conservation is still adding significant value at a very low cost** and will become more critical as nuclear refurbishments and (eventually) the Pickering shutdown get underway.

## Overall Performance

In 2015, the transition between frameworks went smoothly. The province’s LDCs achieved 1,117 GWh of net energy savings, which represents 16% of their 6-year target. As such, LDCs collectively are on pace to meet their 2020 target. Of these savings, 94% can be attributed to conservation programs from the 2011-2014 CDM framework that were started in 2014 but completed in 2015. Between 2014 and 2015, there was a 5% increase in reported energy savings.



**Figure 6.1. First year energy savings from new conservation program activity for distribution-connected customers**

\*Note: the 2014 incremental first year savings numbers have been updated from the ECO’s 2015 *Conservation: Let’s Get Serious* report based on IESO true-ups.

\*\*Note: For an equivalent comparison with other years, the 2015 results are the incremental first year energy savings. Of the 1231 GWh saved in 2015, only 1117 GWh will persist into 2020 and therefore will be counted towards the final 7 TWh target.

## Electricity Conservation Programs (Chapter 6, continued)

### Performance by Sector

Business programs contributed close to 65% of the year's savings, largely due to the Retrofit program. Some programs such as the Small Business Lighting Initiative and the Home Assistance Program saw a decrease in results but policy and program changes have been made to encourage participation in subsequent years.

One issue that needs to be addressed is the role of combined heat and power. Many utilities are counting on combined heat and power projects to help meet their 2020 conservation targets, but there is **uncertainty about whether combined heat and power increases or reduces greenhouse gas emissions**, and whether it should continue to be supported by conservation funding.

### Spending and Cost-Effectiveness in Conservation First Framework

In total, in 2015 the province spent \$432 million in the delivery of CDM programs. Only 1.2% of this spending was from the 2015-2020 CFF budget; the rest was funded from the unused budget from the previous framework. This means that LDCs now have almost 6 years' worth of budget left to deliver 5 years' worth of programs, which undoubtedly should help LDCs in achieving their targets.

The cost-effectiveness numbers for the first year of the CFF were positive, with each dollar of spending yielding \$1.27 in benefits from a societal perspective, using the Total Resource Cost (TRC) test. The TRC number has improved slightly from last year. This may be in part due to the adder to the TRC calculation to account for non-energy environmental benefits.

### Local/Regional Programs

The CFF has triggered a proliferation of **innovation in conservation programming** (unlike the previous framework), with 28 local programs and 31 pilots

approved to date. The change in the approvals process and the establishment of clearer rules has made it much easier for LDCs to develop and test program ideas.

### IESO-only Programs

The IESO has several programs that it administers directly for large customers. The Industrial Accelerator Program has seen dismal results to date (only 3% of target) and has had several changes made to it to increase participation through to 2020. The IESO is now also responsible for the demand reduction targets for the province. Ontario is aiming to use demand response and peak pricing to reduce peak demand by 10% by 2025, approximately 2,400 MW under forecast conditions. The auction-based mechanism to procure demand response, launched at the end of 2015, has seen an increase in participants from the previous demand response program. The IESO is facilitating the participation of peaksaver PLUS resources in the DR Auction after termination of the program at the end of 2017.

### Next Steps in the Framework

Since the CFF was launched, the Minister has amended some of its requirements. In December 2015, LDCs were directed to include all province-wide programs in their CDM delivery, instead of having the flexibility to offer the programs they found appropriate for their customer base. Following another Ministerial Directive, the IESO developed and launched a pay-for-performance multi-utility program in late 2016 and a whole home pilot in 2017. Both programs are being delivered by other parties and not the LDCs; the pay-for-performance program by the IESO and the whole home pilot by gas utilities.

The IESO has completed its Achievable Potential Study which concluded that current funding and programs are sufficient for LDCs to meet the 7 TWH target. The results of this study will feed into the IESO's Mid-Term Review of the CFF, which is required to be completed by June 1, 2018.