

Draft June 29, 2017

Ontario Chapter for Econolier Book on Energy Efficiency in Canada

Background

In a world where the effects of climate change are becoming ever more apparent and more widespread, using energy wisely has assumed greater importance in recent years. Conservation is the cleanest and most cost-effective energy resource available. In Ontario and elsewhere, it has become a key resource in helping customers save energy, control costs and reduce their environmental footprint.¹

Over the past few decades, Ontario has used a number of different approaches to define the ways in which energy consumers can reduce their usage and to encourage greater demand-side participation. To this day, the province's efforts in this area are broad, encompassing everything from traditional, incentive-based conservation programs to training, education and support; direct load control; energy-efficiency codes and standards; price-based models (e.g., time-of-use rates); demand response auctions; behind-the-meter (load-displacing) generation; and energy storage, among other related policies, programs and mechanisms.

Ontario Hydro and the Early Days of CDM

Energy efficiency and conservation efforts in Ontario date back several decades, but the seed that was planted in the early 1980s by Ontario Hydro didn't really flourish until years later.

¹ For the purposes of this narrative, conservation and demand management (CDM) will be used interchangeably with demand-side management (DSM). Both represent the full suite of customer-based energy solutions.

For the most part, the 1980s in Ontario were dominated by supply-side initiatives,² including large-scale nuclear projects at the Pickering, Darlington and Bruce sites. Although there was some attention paid to conservation, and targets for load shifting and conservation were set in 1982 at 1,000 megawatts (MW) apiece by 2000, the province's supply situation meant that demand management received limited attention during this period.

By the time Ontario Hydro published its Demand/Supply Plan in 1989, it showed a notable shift in the company's long-term planning approach, such that resources on the supply side and the demand side were considered concurrently.³ In addition, several new demand-side management (DSM) programs were created. Although this plan was effectively shelved after the recession hit in the late 1980s when demand for electricity plummeted, especially from large industrial users, it established DSM as an important consideration in the context of energy adequacy and reliability in Ontario.

After the cancellation of Ontario Hydro's DSM programs in 1993, the provincial Ministry of Energy offered a number of programs for commercial, industrial and residential consumers. However, a change in government in 1995 resulted in these programs being discontinued as preparations were made for deregulation. The creation of a wholesale market for electricity was expected to incentivize consumers to use price signals as the basis for their decisions on whether to consume electricity.⁴

Market Opening

The *Energy Competition Act*, 1998, opened the door to a competitive electricity market and effectively split Ontario Hydro into five successor companies, each with specific roles and responsibilities (Ontario Power Generation, generation; Hydro One, transmission; the Independent Electricity Market Operator, now known as the Independent Electricity System Operator (IESO), market and system operations; the

² Electricity Conservation Policy in Ontario: Assessing a System in Progress (York U) – page 145

³ Steven Norrie article page 2

⁴ York U paper – pg 148

Ontario Electricity Financial Corporation, debt and contract management; and the Electrical Safety Authority, training and safety standards).

In addition to enabling the creation of a market for electricity, the Act triggered other structural changes. Where Ontario Hydro had been responsible for long-term planning in the province, the restructuring of the sector did not assign that function to any organization, as markets don't require central planning.⁵

After several years of collaboration between government, stakeholders, regulators at the Ontario Energy Board and technical experts at the IESO, Ontario's wholesale electricity market opened on May 1, 2002, introducing competition at the retail level.

Although local utilities engaged in some DSM measures in the early 2000s, there was limited coordination. It was several years later, with the creation in 2005 of the Ontario Power Authority (OPA) – which merged with the IESO on January 1, 2015 – that centralized power system planning and more coordinated energy conservation policies, programs and practices in Ontario were established.

The creation of a wholesale market for electricity in Ontario, coupled with extreme weather during the summer of 2002, resulted in volatile prices at the retail level. Prices were eventually frozen in 2003 to reduce the impact on ratepayers. The market was not open long enough before the price freeze to attract new entrants willing to invest in new generation resources. As a result of this and other factors, Ontario started to experience energy shortfalls, and IESO-issued public appeals to conserve energy became commonplace.

Culture of Conservation

In June 2003 the government created the Electricity Conservation & Supply Task Force (ECSTF), which was established to develop an action plan for attracting new generation, promoting conservation and enhancing the reliability of the transmission

⁵ Steve Norrie article pg 2

grid.⁶ Comprising 19 leaders from across the sector, the task force met on a weekly basis and heard expert testimony from dozens of stakeholders. Its final report, published in January 2004, was titled *Tough Choices: Addressing Ontario's Power Needs*.

Among the recommendations were a call to create a “conservation culture” in Ontario and an acknowledgement that conservation could play an important role in ensuring security, adequacy, affordability, reliability and sustainability, both financial and environmental. The report also explicitly noted that demand reduction should be given the opportunity to compete with supply-side alternatives and be evaluated on a level playing field.⁷

For conservation to achieve its full potential, the ECSTF argued, a lead organization needed to champion conservation efforts, coordinate activities by the different players, and assess the relative costs and benefits of different programs to ensure consistency and alignment with government policy.⁸ This call for a lead conservation agency was echoed by the Ontario Energy Board in a report to the Minister of Energy issued in March 2004.⁹

The *Electricity Restructuring Act*, 2004, came into force in December of that year and enabled the creation of the OPA, whose responsibilities included forecasting demand for electricity, undertaking power system planning, developing an integrated power system plan, and promoting electricity conservation, among others.

Origins of the Ontario Power Authority

The Conservation Bureau was established within the OPA in 2005 and served as a focal point for conservation-related activities in the province. During its formative early

⁶ ECSTF – page i

⁷ ECSTF – page ii

⁸ ECSTF – page 44

⁹ https://www.oeb.ca/documents/cases/RP-2003-0144/pressrelease_report_finalwithappendices_030304.pdf - pg ii

years, the Conservation Bureau designed and launched a range of conservation programs delivered by local distribution companies (LDCs) as well as industry associations and private companies.¹⁰ In 2009, the Conservation Bureau was discontinued; its reporting function was transferred to the Environmental Commissioner of Ontario in 2009, while the other functions remained with the OPA.¹¹

As an agency of the government, the OPA (now IESO) has been the subject of numerous directives from the Minister of Energy related to different aspects of its business. One of the most important directives – dated June 13, 2006 – called on the OPA to prepare an Integrated Power System Plan (IPSP) to meet a number of policy goals.

The directive gave the OPA some degree of flexibility in how it achieved the first goal, which was focused on conservation. Calling for a reduction in peak demand of 6,300 MW by 2025, it used a liberal definition of conservation that included codes and standards related to energy efficiency as well as load-displacing generation, including small-scale natural gas-fired cogeneration and tri-generation facilities on the customer side of the meter, among other options.

One month later, in a separate directive, the Conservation Bureau was directed by the Minister to create a three-year, \$400-million fund to help LDCs deliver conservation and demand management programs.¹² This directive was based on the following principles: LDCs have a legitimate role in delivering CDM; LDCs should be provided with stable, multi-year funding to deliver CDM; the relationship between the OPA and LDCs should be managed contractually; and the OPA's Conservation Bureau should manage the overall CDM program design as well as the evaluation, measurement and verification of program results.¹³

There were a number of challenges associated with reintroducing electricity conservation programs after a decade of relative inactivity. These include the need to

¹⁰ Peter Love, Past, Present etc. – page 33

¹¹ York U – page 139

¹² Find July 13 directive

¹³ York U – pg 156

rebuild the DSM program industry, disagreements regarding the proposed roles and responsibilities of various players in the sector, questions about the legitimacy of DSM as a resource, and alignment and cooperation between electricity and gas to make conservation action easier for customers.

Despite these initial hurdles, in June 2008 the OPA reported that Ontario had met its interim target of 1,350 MW of peak demand reduction by the end of 2007 – the first step towards meeting the 2025 target.

Approximately one year after the creation of the OPA, the *Energy Conservation Leadership Act*, 2006, was passed. It contained a number of provisions and requirements, including ones related to energy use by public agencies. The Act enabled the government to set specific targets for energy conservation by these agencies and require the preparation of annual energy conservation plans. These plans – to be made publicly available – were expected to include itemized descriptions of energy-consuming technologies and operations, summaries of annual energy usage, descriptions of current and proposed activities and measures to conserve energy, and summaries of progress and achievements in energy conservation.

Conservation and the Green Energy Act

Other sections of this chapter will address subsequent changes to the legislative and regulatory framework for energy conservation in Ontario in greater detail. Some of the most important changes stem from the enactment of the *Green Energy Act*, 2009, (GEA) in May of that year. While much of this Act was focused on mechanisms to accelerate the adoption of renewable generation, it also included a fresh focus on conservation. For example, the GEA made energy conservation core to LDCs' business operations, by establishing that mandatory targets must be met as a condition of their licences.¹⁴

¹⁴ <http://www.energy.gov.on.ca/en/files/2014/09/conservation-first-en.pdf>

In addition to aggregating several existing policies related to conservation and energy efficiency, the GEA included some important new provisions, including ones pertaining specifically to government-owned and/or -managed facilities. It called on the provincial government to be guided by several conservation-oriented principles: clear and transparent reporting of energy consumption, water use and greenhouse gas (GHG) emissions associated with government facilities; planning and designing government facilities to ensure the efficient use of energy and water; making environmentally and financially responsible investments in government facilities; and using renewable energy sources to provide energy for government facilities.¹⁵ These requirements will be explained in greater detail in another section of this chapter.

The GEA also paved the way for tracking and reporting on energy consumption and GHG emissions by the broader public sector, including municipalities, universities, schools and hospitals (also known as the MUSH sector), as detailed in Ontario Regulation (O. Reg.) 397/11, which will be discussed in the Legal/Regulatory section of this chapter.

Save on Energy

The OPA worked collaboratively with LDCs to deliver CDM programs under the 2011-2014 CDM Framework. In January 2011, a suite of programs was introduced under the saveONenergy brand. Administered by the LDCs, these programs offered a variety of incentives for energy efficiency and conservation activities. They also contributed to engaging individuals and businesses on cost-effective ways to improve their living and work spaces while saving on annual energy costs, helping the province meet its energy needs and reducing or deferring the need to build new generation in the future.

Business programs were the primary driver of savings from the 2011-2014 conservation programs, accounting for 58 percent of the overall energy savings achieved. Between 2011 and 2014, the suite of business programs saved more than 4,000 gigawatt-hours

¹⁵ <https://www.ontario.ca/laws/statute/09g12>

(GWh) of energy and reduced peak demand by 389 MW, with the Retrofit program responsible for the largest savings, proportionally.¹⁶

Programs for residential customers, meanwhile, ranged from incentives to remove old, inefficient appliances to coupons that encouraged the purchase of energy-efficient products such as compact fluorescent lightbulbs, programmable thermostats, power bars, dimmer switches and motion sensors. Between 2011 and 2014, residential programs saved 1,169 GWh of energy and 253 MW of demand in the province – equivalent to powering approximately 122,000 homes for one year.¹⁷

After 2014, Ontario transitioned to the 2015-2020 Conservation First Framework (CFF). This framework will be covered in the next section, which describes the main stakeholders on the conservation file in Ontario in 2017 and beyond.

Although the IESO plays an important role with respect to formal CDM programs, there is a great deal of work being done in the conservation space in Ontario by consumers, tech companies, aggregators incubators, academic institutions and other innovators. For example, many Ontario LDCs are exploring other ways to meet their customers' energy needs, increase resilience and security in their service area, and unlock new value from their system by leveraging innovation. The primary function of these efforts may not be to reduce total consumption or lower peak demand, but some of the options being tested involve solar/storage systems, microgrids, dynamic pricing models, telemetry and communication systems, sensors and controllers, electric vehicle integration, distribution automation and other technologies.

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¹⁶ 2011-2014 Conservation Results Report – pg 4

¹⁷ 2011-2014 Conservation Results Report – pg 3

CDM Programs in Ontario

Province-wide Save on Energy Programs for Residential Customers	Province-wide Save on Energy Programs for Business Customers	Programs for Eligible Transmission-Connected Customers
Coupon (transitioning to Instant Discount)	Retrofit	Industrial Accelerator Program (IAP) – includes all Save on Energy programs for business customers
Heating and Cooling	Small Business Lighting	Energy Performance Program (EPP)
New Home Construction	High-Performance New Construction	Demand Response Auction
Fridge and Freezer Pick-up	Existing Building Commissioning	Capacity-Based Demand Response (transitional program for some existing loads)
	Process and Systems Upgrade	Dispatchable Loads
	Energy Manager	Industrial Conservation Incentive (ICI) Energy Manager

Organizations/Groups and their Role in CDM

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Organization/Group	Key CDM-Oriented Responsibilities
Ministry of Energy	Establishes the policy framework Develops energy-efficiency product standards Sets reporting requirements Show conservation leadership
Ministry of Municipal Affairs and Housing	Sets Building Code requirements
Ontario Energy Board	Regulates the electricity and gas sectors Approves licences, rates and fees Regulates gas DSM
IESO	Operates the grid to ensure supply and demand are balanced Oversees provincial and regional electricity planning, which includes consideration of CDM to manage demand growth or defer the need for major infrastructure in a local area Administers wholesale electricity markets Administers DR auction Manages the CDM portfolio for electricity • Works with LDCs to design and deliver CDM programs for electricity • Makes strategic CDM investments through the Conservation Fund • Provides central support services to LDCs • Works with gas utilities on areas of common interest • Manages programs for

	transmission-connected customers
Local Distribution Companies (Electric)	Work with the IESO to design and deliver CDM programs for electricity Work directly with customers on CDM projects
Channel Partners	Cross-sell CDM programs with other products, e.g., lighting and HVAC Provide energy services to customers Design and deliver CDM programs
NGOs	Deliver CDM programs and provide other services to customers
Municipal Governments	Develop corporate and community energy plans Provide input into regional energy plans Develop and implement policy Show conservation leadership
Canadian Standards Association	Develops energy-efficiency product standards
Local Distribution Companies (Gas)	Design and deliver CDM programs for gas Work directly with customers on CDM projects
Indigenous communities	Develop community energy plans Provide input into regional plans

All activity related to energy conservation in Ontario stems from government policy in one way, shape or form. The Ontario Ministry of Energy sets broad energy policy, but works closely with other ministries, including the Ontario Ministry of the Environment and Climate Change, as well as other agencies, organizations and stakeholder groups.

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As noted above, 2015 marked the start of a new approach to CDM in Ontario, with the launch of the 2015-2020 Conservation First Framework (CFF), which had its origins in the government's 2013 *Long-Term Energy Plan* (LTEP), released on December 2, 2013, and a directive to the OPA dated March 31, 2014.

The 2013 LTEP set a long-term conservation target of 30 terawatt-hours (TWh) in 2032, which represents a 16-percent reduction in the forecast gross demand for electricity compared to the 2010 LTEP.¹⁸

Conservation First Framework

The CFF reflects Ontario's conservation targets and consolidates many of the province's planned actions in support of these goals over a six-year period. It emphasizes the importance of a coordinated effort at all stages of the energy planning process, as well as more effective collaboration among sector partners (especially the province's 60+ LDCs) and between the gas and electricity sectors.

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The overarching goal of the CFF is to reduce energy consumption by 7 TWh through conservation programs delivered by LDCs to residential and business customers across the province by December 31, 2020. As outlined in a directive from the Minister of Energy dated July 25, 2014, an additional 1.7 TWh of energy savings are to be achieved through conservation projects undertaken by transmission-connected customers under the Industrial Accelerator Program (IAP) banner, for which the IESO has sole responsibility.¹⁹

With a total budget of \$2.6 billion, the framework gives a much larger role to LDCs, with each being assigned a share of the 7 TWh target that they can pursue individually or in partnership with other LDCs.

To support LDCs in the delivery of conservation programs, the IESO provides central services including evaluation, measurement and verification (EM&V); market research;

¹⁸ http://www.energy.gov.on.ca/en/files/2014/10/LTEP_2013_English_WEB.pdf

¹⁹ July 25, 2014 directive

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capability building (including training); administrative infrastructure; and technical support.

The IESO provides these tools, support and guidance to LDCs to help them meet their targets, as outlined in six-year Conservation and Demand Management (CDM) plans submitted to the IESO by each LDC. These plans enable LDCs to design and manage their own program offerings, giving them greater flexibility to align conservation programs with local needs and providing more customer choice. The CFF also delivers long-term, stable funding, which gives LDCs greater certainty as they design and deliver programs in their CDM plans.

Through recommendations from customers, stakeholders, LDC working groups, and the EM&V process, program enhancements are continuously implemented to ensure current program offerings meet LDC, customer and system needs across the province.

With a view to maximizing efficiencies and minimizing costs, collaboration is a key focus of the CFF and helps to distinguish it from previous frameworks. The IESO works closely with LDCs, which are also encouraged to partner with other LDCs to meet energy reduction targets and achieve efficiencies in program delivery.

With an emphasis on transparency, inclusivity, accountability, collaboration and efficiency, the Conservation First Implementation Committee (CFIC) supports the enhancement of existing province-wide programs and the development of new province-wide programs in order to meet provincial conservation targets in the most cost-effective way possible.

Established by the IESO with representation from LDCs, Enbridge, Union Gas, the Ministry of Energy and the Electricity Distributors Association (EDA), the CFIC establishes processes and provides oversight to working groups that help in the design of cost-effective, customer-centric and results-driven programs.

In addition, the CFIC provides recommendations on the adoption of proposed new province-wide programs and potential program enhancements, and monitors province-wide program results and LDC progress towards target achievement. It also helps to

develop new tools and services, and provides limited guidance and input to the IESO related to potential revisions to the allocation of targets and budgets among LDCs.²⁰

One of the most important improvements made in the development of the CFF was to increase LDC flexibility with respect to program design and delivery. Compared to the 2011-2014 framework, LDCs have substantially greater latitude to choose which programs work best in their own service territories.

As a result, in addition to offering standard, province-wide programs, many LDCs have introduced local programming options that are closely aligned with their customer base, load profile and conservation priorities – including programs related to swimming pool efficiency, home energy reports, small business refrigeration, social benchmarking, Wi-Fi-enabled smart thermostats, variable-frequency-drive pumps for agricultural uses and others.

Further information on CFF programs, including early results and key programs, can be found in the Policies and Strategies section of this chapter.

Market Transformation

With a view to maximizing the energy, employment, economic and environmental benefits of conservation, the IESO has taken a market transformation approach to promoting, facilitating and driving conservation in Ontario. This process takes a strategic, long-term view of the market and the cost-effectiveness of energy conservation measures. It includes interventions designed to identify and reduce barriers to participation; leverage new opportunities and new technologies; accelerate the adoption of energy-efficient products, services, practices and measures; and drive enduring changes in behaviour – not just on the part of energy consumers but the market itself.

²⁰ CFIC Charter, pg 1

To accelerate this market transformation, many of the CDM programs delivered in Ontario involve not just LDCs, customers and the IESO – but also other “channel allies.” These third parties may include manufacturers, distributors, retailers, consultants, engineers, contractors, electricians, technologists and other individuals or organizations involved in the sales, service or installation of energy-efficient equipment. As a result of the close relationship they share with their customers, these trusted partners are becoming an increasingly important channel through which to more deeply engage electricity consumers, increase program participation and maximize energy savings.

Conservation Fund

The IESO's Conservation Fund is another important player in the CDM space, serving as a key incubator of new ideas, technologies and solutions. Created in 2005, the Conservation Fund supports innovative conservation technologies, practices, research and programs that have the potential to deliver significant energy savings. It seeks projects that will lead to large-scale transformation in the marketplace or a change in consumer behaviour, demonstrate the energy-saving potential of emerging technologies and investigate novel conservation concepts.

Since 2005, the Conservation Fund has provided financial support for more than 200 innovative energy projects across Ontario, some of which have evolved from pilots to province-wide programs. The fund has invested more than \$52 million, leveraging an additional \$142 million from applicants and partners. Several themes have dominated recent project applications and inquiries. For example, there is a growing interest in heat pumps, especially among customers with existing electric baseboard heating, and from residential community developers who see heat pumps as a key enabling technology for meeting net zero energy and other high-performance building standards in the Canadian climate. .

Other recent proposals have focused on microgrids and district energy systems – an increasingly attractive construct for municipalities, universities and other types of energy users with multiple buildings, a commitment to environmental sustainability and a critical

need for an uninterrupted supply of power. In addition to the potential cost savings associated with producing their own electricity, many of these consumers are keen to enhance their resilience against outages caused by extreme weather events and other circumstances.

Social benchmarking is another phenomenon that's gaining momentum in Ontario. In the context of electricity usage, social benchmarking involves the use of paper and online media tools to enable users to compare their electricity usage with other users'. Research shows these comparisons can spur competition and drive significant reductions in electricity use.

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Three social benchmarking pilots that received support from the Conservation Fund in recent years enabled residential customers to compare their household's energy consumption against that of similar homes in their neighbourhood. Several of the province's largest LDCs have since come to market with programs that provide participating customers with detailed home energy reports, enabling them to monitor, track, compare and reduce their energy usage.

Benchmarking is certainly not limited to residential electricity consumers. Benchmarking enables organizations to not only compare facilities within their own portfolio but also to facilities across the country. It helps them identify which ones present the largest opportunity for savings. And, depending how they compare to their peers, it can really motivate them to step up their energy-efficiency initiatives. The IESO has been a strong supporter of the ENERGY STAR Portfolio Manager benchmarking tool offered by Natural Resources Canada (NRCan). Launched in Canada in 2013, this industry-leading interactive energy management tool enables owners and managers of commercial and institutional buildings to upload their building and utility information to an online platform that tracks their energy performance over time and enables meaningful comparisons to similar buildings. It offers weather-normalized energy use intensity values, GHG emission metrics, reporting features that help users track trends over time, and 1-100 energy performance scores for eligible building types where a score of 75, for example, indicates that that facilities is performing better than 75% of its

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peers and is eligible for certification.²¹ Ontario's Energy and Water Reporting and Benchmarking regulation require the use of Portfolio Manager as reporting mechanism.²²

As important as formal, incentivized CDM programs and other funding mechanisms are, they do not represent the only option available to the IESO to reduce peak demand and/or energy consumption in the province. Instead, the IESO has a full suite of other tools available – including demand response (DR).

Prior to the creation of the OPA in 2005, the IESO had already introduced several DR programs for participants in Ontario. These included the Emergency Demand Reduction Program, Hour Ahead Demand Response, Transitional Demand Response Program and the Emergency Load Reduction Program. The IESO also included the integration of dispatchable loads into the Ontario energy market. The programs had different eligibility criteria and activation triggers, but most helped to contribute to reliability when supply was tight.

Although the above programs were discontinued, Ontario's dispatchable loads can still reduce their demand for electricity by more than 450 MW.

Industrial Conservation Initiative

Amendments to the *Electricity Act*, 1998, enabled the creation of the Industrial Conservation Incentive, or ICI, which is administered by the IESO. The ICI is a form of voluntary demand response. Customers that participate in the program, referred to as Class A, are charged the global adjustment based on their percentage contribution to the top five peak Ontario demand hours over a 12-month base period. The global adjustment is a financial mechanism used to recover the costs associated with investments in conservation and generation, and is charged to all electricity consumers in Ontario in different ways. Class A customers that take action and shift their

²¹ <https://www.nrcan.gc.ca/energy/efficiency/buildings/energy-benchmarking/3727>

²² <http://www.energy.gov.on.ca/en/ontarios-ewrb/>

consumption away from the peak hours can reduce their price exposure and total energy costs quite significantly.

The initiative was introduced by the government in 2010 to encourage load shifting and provide opportunity for rate relief to large-volume industrial electricity customers. Initially they were required to have an average monthly peak demand greater than 5 MW, but program eligibility has been expanded several times to meet different policy goals, including most recently with passage of the *Fair Hydro Act*, 2017, on May 31, 2017. This lowered the threshold for participation to 500 kilowatts (kW) for certain designated consumers. Eligibility requirements are established in O. Reg. 429/04.

In addition to offering advantages to customers, the ICI is making a material difference to the province as a whole by reducing peak demand and deferring the need to build new generation or transmission resources. Although other factors must be considered when making year-over-year comparisons of peak demand – including the effects of embedded generation, which reduces demand for grid-supplied energy, and structural changes to the economy that have reduced the province's energy intensity – the ICI is clearly having the desired effect of incentivizing large loads to shift their consumption away from peak hours. In 2016, peak demand was reduced by approximately 1,000 MW as a result of actions taken by Class A customers.

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Other Demand Response Programs

In its role as market and system operator, the IESO considers DR an important tool in contributing to reliability. DR in Ontario has evolved over the past decade or more. Through ministerial directives issued in 2005 and 2006, the OPA was required to procure up to 500 MW of DR, which resulted in the creation of three DR programs: DR1, DR2 and DR3.²³ DR1 – a voluntary load-shedding program – was eventually discontinued, as was DR2, a mandatory load-shifting program.

²³ <https://eco.on.ca/reports/2009-energy-report-vol-1-rethinking-energy-conservation-in-ontario/>

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DR3, a mandatory, contract-based program evolved into the Capacity-Based Demand Response (CBDR) program, a transitional program that brings DR3 participants into the wholesale electricity market. This program, which currently represents 159 MW of DR capacity, provides availability and utilization payments to both aggregated and individual loads that can reduce their consumption at times of peak demand and when it is economic for them to do so.

These resources are considered in the IESO's economic dispatch process alongside bids from dispatchable loads and offers from other resources.

Over time the DR capacity within CBDR will decline as contracts expire and participation in the transitional program comes to an end. As this capacity expires, participants will have the opportunity to compete against other providers of DR capacity through the IESO's DR auction, a competitive process through which demand-side resources are selected to be available to reduce their electricity consumption during defined periods. The DR auction is an annual event that was implemented in December 2015.

Further down the road, following a planned redesign of Ontario's wholesale market over the next four to six years, these demand-side resources will be able to compete against other resource types – including generation and imports – in a capacity auction to meet Ontario's resource adequacy needs.

Development of an incremental capacity auction that can accommodate a range of resource types – on the supply side and the demand side – is one of the priorities of the IESO's Market Renewal program, an ambitious, coordinated set of projects that will result in a fundamental redesign of Ontario's electricity markets. When fully implemented, it will provide increased opportunities for all participants in Ontario's electricity market, with greater competition, flexibility and transparency resulting in efficiency gains for the entire sector, including customers and suppliers.

These efforts are part of the IESO's long-term focus on delivering superior reliability performance in a changing environment and driving to a more efficient and sustainable marketplace.

The DR auction is already having the desired effect of attracting DR new entrants and driving DR prices down. Compared to the prices set during the first auction in 2015, clearing prices for the 2016 auction fell sharply: a 12-percent decrease for the summer commitment period and a 17-percent decrease for the winter commitment period, reflecting good competition between existing resources and new entrants.²⁴

Conservation and Electricity Planning

Electricity planning in Ontario happens at the provincial, regional and local level, each with its own considerations and requirements.

At the provincial level, planning focuses on the flow of power across the province. This bulk system delivers power to regional systems, which in turn delivers power to transmission-connected customers and local distribution companies in the region. At this level, province-wide conservation programs and targets are considered in planning.

Regional planning is the process of identifying and meeting electricity needs for a specific local area and integrates local electricity priorities/customer needs (e.g., community energy planning) with provincial policy directions, such as outlined in the Long-Term Energy Plan, and system needs.

Regional planning has been conducted on an as-needed basis in Ontario for many years. In 2010, the OEB concluded that a structured approach to regional planning was required.²⁵ In 2013, this process was formalized.²⁶

To ensure communities in Ontario have a safe, reliable source of electricity supply, the IESO works closely with transmitters, distributors, customers, communities and other affected stakeholders to develop 20-years electricity plans for a number of regions across Ontario. These plans identify electricity needs that could arise within 20 year

²⁴ <http://www.ieso.ca/en/corporate-ieso/media/news-releases/2016/12/ieso-announces-results-of-demand-response-auction>

²⁵ <https://www.oeb.ca/industry/policy-initiatives-and-consultations/renewed-regulatory-framework-electricity>

²⁶ <https://www.oeb.ca/industry/tools-resources-and-links/information-regional-infrastructure-planning>

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time; consider infrastructure, generation, conservation programs, demand response distributed energy sources solutions and/or providing provincial supply resources into the area; and develop near-term and longer-term recommended actions. Regional planning is an ongoing process; it is revisited every five years at minimum.

As part of the regional planning process, LDCs, IESO and transmitter, look into potential applications of CDM that could alleviate local constraints and defer or eliminate the need for costly investment in wires-based infrastructure.

There is no single demand-side measure that's effective or appropriate in all areas. Every community's electrical infrastructure, load characteristics, building stock and customer demographics are different. As a result, the feasibility of CDM solutions must be undertaken and evaluated in a way that's site- and case-specific. What works in one area may not be viable – or even appropriate – somewhere else in the province.

Currently there is limited data to assess the cost and viability of targeted demand-side solutions such as targeted demand response, energy storage, small scale generation and other distributed energy resources at a local level (e.g., at the transformer station level. With the support of the Conservation Fund, local achievable potential studies (which assess the conservation potential of a particular area) are in the works in several parts of the province.

When complete, the local achievable potential study should provide valuable data that can be leveraged by LDCs and the IESO to determine whether CDM solutions are technically feasible and cost-competitive in those specific areas.

Local planning is typically carried out by the LDC and focuses on delivering power from the regional system to individual distribution-connected homes and businesses. They work to achieve their individual conservation targets and assist municipalities in community energy planning.

Leveraging the Value of Smart Meter Data

Access to good data is a growing focus in Ontario. As is the case in other jurisdictions around the world where investments are being made in smart grid infrastructure, the increased digitalization of Ontario's grid is starting to enable better coordination, communication, analytical capability and asset management.

Ontario took an early lead in the development of a smart grid by mandating the installation of smart meters and the transition to time-of-use prices. Some 4.7 million smart meters were installed in homes and small businesses earlier this decade and are now sending enormous quantities of energy consumption data to a centralized database known as the Meter Data Management/Repository (MDM/R), which is managed by the IESO in its role as the Smart Metering Entity as per O. Reg. 393/07.²⁷

Although most LDCs in the province have been using the MDM/R for billing purposes, the true value of the data it contains remains largely untapped. In response to a December 2016 Order from the OEB,²⁸ the IESO has begun collecting enhanced data, and is working with stakeholders to explore ways to extract the full value of Ontario's smart meter data while ensuring all customer privacy provisions are protected.

A Data Strategy Advisory Council was created in mid-2017 to provide input into the review and development of products and processes for the implementation of third-party access to this data. With representation from electricity consumers, LDCs, consultants, academia, service providers/delivery agents and municipalities, this group will help define the path forward. In addition to exposing opportunities for the private sector to develop new products, services and technologies, the enhanced data captured in the MDM/R could be used to further refine Ontario's CDM program offerings.

²⁷ <https://www.ontario.ca/laws/regulation/070393>

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²⁸ http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/552233/view/dec_order_es_SME_20161124.PDF

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Codes and Standards

Turning to other CDM activity in Ontario that's not incented, administered or overseen by the IESO, codes and standards are another important contributor to energy conservation, representing approximately one-third of total energy savings. Appliance and product standards are captured under O. Reg. 404/12 made under the *Green Energy Act*, 2009 and apply to household and commercial appliances such as water heaters, furnaces and other space heating equipment, air conditioners, lamps and other lighting products, motors, pumps, electronic equipment and other related products. The federal government also regulates equipment standards.

For new houses and large buildings, the energy-efficiency requirements contained in Ontario's *Building Code*, administered by the Ministry of Municipal Affairs and Housing, are among the most rigorous in North America. With every iteration, requirements related to energy performance have been strengthened for new construction. However currently there are no energy requirements for retrofitting existing buildings. Presently, Ontario is watching developments at the federal level with interest, energy-efficiency requirements are being considered for existing buildings and, potentially, a National Energy Retrofit Code for Buildings that, once available, could be voluntarily adopted by provinces as part of their energy-efficiency regulations.

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Although the energy-efficiency requirements contained in Ontario's *Building Code* are progressive by North American standards, when viewed from an international perspective, they fall slightly behind other leading European jurisdictions. As indicated in the 2016 *Climate Change Action Plan*, however, the Ontario *Building Code* is moving towards net zero carbon emission homes and small buildings by 2030.²⁹ Further information on codes and standards can be found in the Legal/Regulatory section of this chapter.

²⁹ <https://www.ontario.ca/page/climate-change-action-plan#section-5>

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Policies and Strategies

In Ontario, conservation goals, targets and priorities are factored into energy policy and planning at different points – most importantly during the long-term planning process. As enshrined in the *Energy Statute Law Amendment Act*, S.O. 2016 c.10 (also known as Bill 135),³⁰ the Minister of Energy is responsible for issuing a long-term energy plan that sets out the Government of Ontario's goals and objectives with respect to energy – a process that replaces the Integrated Power System Plan framework under which the IESO, OEB and other stakeholders previously operated.

Ontario produced its first *Long-Term Energy Plan* in 2010, which was reviewed and updated in 2013 with input from residents, businesses and other stakeholders in communities across Ontario. The government also issued a discussion paper in 2013 entitled *Conservation First: A Renewed Vision for Energy Conservation in Ontario*. In this document, the government reaffirms its commitment to prioritizing conservation in energy planning, stating conservation should be the first resource considered in meeting Ontario's electricity needs.³¹

Ontario's latest *Long-Term Energy Plan* is expected to be released in late summer 2017. The government has indicated five principles will guide decision-making related to the 2017 plan: affordability, reliability, clean energy, community and Indigenous engagement, and conservation and demand management.

Ontario Planning Outlook

As required by legislation, the IESO provided a technical report to inform government planning and prioritization. Published on September 1, 2016, the IESO's *Ontario Planning Outlook* (OPO)³² is a technical report that provides a 10-year review (2005-2015) and a 20-year outlook (2016-2035) for Ontario's electricity system. This sweeping

³⁰ <https://www.ontario.ca/laws/statute/S16010>

³¹ <http://www.energy.gov.on.ca/en/files/2014/09/conservation-first-en.pdf> p 4

³² <http://www.ieso.ca/sitecore/content/ieso/home/sector-participants/planning-and-forecasting/ontario-planning-outlook>

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report covers a broad range of considerations, including costs, conservation and demand management, supply resources (including energy storage), capacity, reliability, market and system operations, transmission and distribution, and emissions from the electricity sector.

The OPO examines how conservation and other low-carbon resources can support reliable and efficient operations over a range of possible demand outlooks. Each of the four demand scenarios assumes the achievement of three key targets set in the 2013 LTEP:

- 30 TWh of total energy savings by 2032
- 7 TWh of energy savings through LDC programs delivered under the CFF and 1.7 TWh of savings through the IAP by 2020
- demand response to meet 10 percent of peak demand by 2025.

It delves into the many factors that may impact demand for electricity over the next 20 years, including population growth, commercial and industrial sector activity, electric vehicle penetration levels, and the electrification of space heating, water heating and transportation, among others.

The OPO predicts that by 2035, almost half of all energy savings will stem from updated building codes and equipment standards, which deliver energy efficiency with a high degree of certainty and require no ratepayer incentives. Codes and standards implemented to date will continue generating savings going forward, growing to about 7.9 TWh in 2035.

Planned and anticipated codes and standards should save an additional 7 TWh over the same period, with the vast majority of energy savings coming from the commercial and residential sectors. The breakdown between the two measures shows 9.6 TWh coming from equipment efficiency standards and 5.3 TWh from building codes.³³

³³ <http://www.ieso.ca/sitecore/content/ieso/home/sector-participants/planning-and-forecasting/ontario-planning-outlook> module 3, pg 9

Ontario has already made great strides towards reducing the impacts of human activity on the environment, including the elimination of all coal-fired power generation by 2014 – the single largest climate change initiative undertaken in North America, and an important contributor to the province achieving its ambitious 2014 emissions reduction target of six percent below 1990 levels.³⁴

Ontario's Decarbonized Supply Mix

Building on a strong foundation that includes nuclear generation and renewable resources like hydroelectric, wind and solar units, Ontario's electricity supply mix is already largely decarbonized. Since the supply shortfalls of the early 2000s, more than \$35 billion has been invested in cleaner generation, coupled with \$16 billion in transmission- and distribution-related upgrades.³⁵

Electricity generation in Ontario produces few GHG emissions. Transmission-connected natural gas-fired generators provided just nine percent of Ontario's electricity in 2016.³⁶ While its contribution is relatively small in absolute MW, gas generation will continue to play an important role in Ontario for the foreseeable future, providing flexibility and enabling the IESO to respond quickly to unexpected changes in supply and/or demand. In addition to providing energy and capacity, this flexibility also enables gas generators to deliver a variety of ancillary services that are essential to operating a well-balanced, reliable and cost-effective power system.

Going forward, the government has signalled its intention to continue aligning its policies with respect to energy and climate change. The *Climate Change Mitigation and Low-Carbon Economy Act*, 2016, (Bill 172) passed in May 2016. The legislation sets the

³⁴ <http://www.energy.gov.on.ca/en/archive/the-end-of-coal/>

³⁵ <http://www.economicclub.ca/events/display/ontarios-minister-of-energy>

³⁶ <http://www.ieso.ca/en/corporate-ieso/media/news-releases/2017/01/ontarios-independent-electricity-system-operator-releases-2016-electricity-data>

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framework for climate action and establishes the following GHG emission targets in statute.³⁷

- A reduction of 15 percent below 1990 levels by the end of 2020
- A reduction of 37 percent below 1990 levels by the end of 2030
- A reduction of 80 percent below 1990 levels by the end of 2050.

Approximately one month later, the government released its *Climate Change Action Plan*, which identified more than 90 actions to be implemented over the next five years in an effort to fight climate change, reduce GHG emissions and transition to a low-carbon economy – many of which will impact how residential, commercial, industrial and institutional customers consider and use energy.³⁸

The plan included a \$325-million commitment to the Green Investment Fund that will help homeowners use less energy, support more electric vehicle charging stations across Ontario, retrofit social housing developments, help businesses reduce emissions, help fund local environmental organizations and help provide Indigenous communities with training, tools and infrastructure to address climate change.³⁹

Collaboration with Gas Utilities

Of that amount, \$100 million will help homeowners reduce their energy bills while cutting GHG emissions through the expansion of Enbridge Gas' Home Energy Conservation program and Union Gas' Home Reno Rebate Program with electricity-focused enhancements. These multi-fuel, province wide home energy audit and retrofit programs offered by Enbridge Gas and Union Gas represent a coordinated effort by the IESO, Enbridge and Union Gas that provides residential consumers with a single point of entry and a streamlined approach to identifying and financing home energy-efficiency improvements. The enhancements to Enbridge Gas' Home Energy Conservation Program and Union Gas' Home Reno Rebate Program expand program eligibility to

³⁷ http://www.ontla.on.ca/web/bills/bills_detail.do?locale=en&BillID=3740

³⁸ <https://www.ontario.ca/page/climate-change-action-plan>

³⁹ <https://www.ontario.ca/page/green-investment-fund>

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electrically heated homes, include an additional in-home assessment of electricity use, and offer new incentives to reduce electricity consumption, including ENERGY STAR qualified air conditioners and appliances, gas furnaces with electronic control modules and air source heat pumps.

The audits will provide homeowners with a holistic view of their home, including its energy requirements and savings opportunities. Armed with this information, homeowners can prioritize their spending on energy-efficiency measures. The pilot will also provide some larger incentives to drive investments in high-cost, high-value equipment such as air-source heat pumps, which have steep upfront costs but offer substantial energy-savings potential. The electricity focused enhancements to Enbridge Gas' Home Energy Conservation Program and Union Gas' Home Reno Rebate Program were launched in May 2017 and are expected to be accessed by 22,000 households by the end of the year.

In addition to reducing their electricity consumption by approximately 5,000 kWh per year for electrically heated homes by making energy-efficient upgrades, participating households should also benefit from improved home comfort and increased resale value.

Addressing Climate Change

The *Climate Change Mitigation and Low-Carbon Economy Act, 2016*, also enabled the creation of a cap-and-trade program, the proceeds of which will be used to finance a "green bank" known as the Ontario Climate Change Solutions Deployment Corporation, established in February 2017.⁴⁰

At a high level, it was created to stimulate business related to the development of commercially available technologies that reduce GHG emissions from buildings or from the production of goods. Its focus will be on providing information, services and

⁴⁰ <https://www.ontario.ca/laws/regulation/r17046>

incentives to individuals; stimulating private sector financing; and identifying/reducing market barriers that currently inhibit the deployment of low-carbon technologies.

Over the spring and summer of 2017 the IESO worked closely with the Ministry of Energy and the Ministry of the Environment and Climate Change to create a website, staff a call centre, develop marketing material and prepare for the launch of the Green Ontario Fund. Leveraging the IESO's expertise in designing and delivering appealing, customer-focused CDM programs, the fund will build on existing infrastructure and offer a "one-window" approach to customer service and simple processes that should drive high participation rates. An initial portfolio of programs should be launched in fall 2017, starting with ones targeted at residential consumers before programs for business customers are made available.

As Canada moves towards a lower carbon future, Ontario is starting from a place of relative strength by having a largely decarbonized supply mix already. Renewable energy now comprises 40 percent of Ontario's installed capacity and generates approximately one-third of the electricity produced in the province. When combined with nuclear resources, which account for one-third of Ontario's installed capacity and produce nearly 60 percent of its electricity, these non-fossil sources now generate approximately 90 percent of the electricity in Ontario.⁴¹

Looking ahead, electrification – whether related to space/water heating in buildings; railways and public transit; or passenger and commercial vehicles, for example – provides an important opportunity for Ontario to prioritize a sensible, strategic, efficient transition. This way, the province should be able to avoid unintended complications down the road, especially in parts of the province that may already be experiencing local constraints or other electricity-related supply issues.

Developing and executing an electrification strategy will require extensive engagement with a broad range of stakeholders in the public and private sectors over the coming months and years. While the IESO is expected to provide a critical coordinating function

⁴¹ <http://www.ieso.ca/-/media/files/ieso/document-library/planning-forecasts/ontario-planning-outlook/ontario-planning-outlook-september2016.pdf> p 2

on the electrification file, transmitters and distributors will play an important role in implementing any large-scale electrification policies.

Conservation First Framework – Key Programs and Results

As noted above, the CFF has transformed the landscape for incentivized CDM in Ontario. LDCs are making good progress towards their 2020 targets, and the LDC CDM portfolio remains cost effective. Similarly, many of Ontario's 59 transmission-connected customers – some of the province's largest employers – have undertaken multi-year IAP-funded projects to drive operational efficiencies. Like the LDC-delivered portfolio of programs, the IAP remains cost-effective, though it may be several years before these large, complex projects fully deliver the expected conservation results. Both sets of programs are currently delivered at less than \$0.04/kWh.

LDC-delivered programs are managed and promoted under the Save on Energy (SOE) brand and include options for residential and business customers (including commercial, institutional and low-volume industrial users). Programs for business customers deliver the lion's share of results, averaging 71 percent of total energy savings. Residential programs, by contrast, represent 20 percent of total savings – though this number is on the rise, in large part due to the success of a coupon redemption program targeting residential energy-efficiency products, known in Ontario as the Coupon program. Small, embedded industrial consumers are responsible, on average, for nine percent of SOE-supported energy savings.

Coupon redemption has been popular with residential and small business consumers, with 4.1 million coupons redeemed across the province, representing 6.4 million energy efficient products purchased in 2015.⁴² Results for 2016 are even stronger, showing a 28-percent increase over 2015.

⁴² <http://www.ieso.ca/en/sector-participants/conservation-delivery-and-tools/conservation-e-blasts/2016/12/2015-conservation-results-report>

Some of this growth can be attributed to recent price drops of energy-efficient products as compared to non-energy-efficient alternatives, making upgrades more financially palatable than in previous years. That said, the success of the Coupon program is also evidence that Ontarians understand the full spectrum of benefits that energy efficiency can deliver.

To build on these results, the program model is shifting later this year. Instead of relying on coupons, the new Instant Discount program is expected to increase engagement with consumers to an even greater extent, enabling them to benefit from incentives when making online energy-efficient purchases, while simultaneously reducing administrative costs and challenges for LDCs and the IESO.

For business customers, the most important program in Ontario is the Retrofit program. Delivering approximately 54 percent of total energy savings tracked under the CFF and the 2011-2014 framework, the Retrofit program provides incentives that enable participants to replace outdated, inefficient equipment with high-efficiency alternatives and install new control systems that improve operational processes.

While the program is subject to continuous improvement and change, eligible measures include lighting retrofits and controls; HVAC redesign; chiller replacement; variable speed drives; building envelope improvements; and implementation of new operating systems, procedures and/or equipment, including things like energy management systems, sensors and controls, metering equipment and related communication systems.

The Retrofit program really delivers for Ontario. It has broad applicability and can be implemented by most types of commercial, industrial and institutional consumers. It also includes both prescriptive and custom tracks for maximum flexibility. When the next iteration of the program is brought to market, it's expected to reflect the natural evolution of products, technologies, applications and prices.

Training and Support

For optimal results, funding to purchase and install energy-efficient equipment should be complemented by training that enables users to operate the equipment more effectively and identify other potential improvements at their facility. In Ontario, building market capability through training and support is becoming as much of a priority as incentivizing the purchase and installation of energy-efficient products.

The SOE Training and Support incentives are designed to enhance CDM-oriented knowledge and skills among LDCs, channel partners, customer employees and other individuals with a role in delivering SOE-funded projects. Incented courses enable participants to identify operational savings opportunities, increase employee engagement in energy matters, integrate new technologies and best practices, and secure executive approval to implement proposed changes. As the capability of Ontario's businesses and institutions grows, and energy efficiency is considered a standard practice for planning and budgeting purposes, the need for ratepayer-funded incentive programs is expected to decline.

Energy Managers Program

Since 2011, Ontario has also provided direct financial support to large electricity consumers to hire energy managers to increase participation in existing programs and drive the implementation of non-incented energy-efficiency projects. Energy managers in Ontario are active in all sectors of the economy including industrial sites, office buildings, retail complexes, multi-unit residential properties, hospitals, universities and municipal buildings.

Inspired by BC Hydro's pioneering incentivized Energy Manager program, and informed by other pilot projects through the IESO's Conservation Fund, the IESO's Energy Manager program has two streams: one for embedded energy managers who work full-time at the participant's site(s) and one for so-called "roving" energy managers hired by LDCs to provide support to smaller industrial, commercial and institutional consumers

that would benefit from the expertise of an energy manager but individually lacked the savings potential to justify a full-time resource.

Over the 2011-2014 period, the embedded and roving Energy Manager programs produced more than 115 million kilowatt-hours (kWh) of net verified energy savings and more than 4,600 kW of net verified summer peak demand reduction. Interest on the part of large volume, transmission-connected customers eventually prompted the expansion of the program to include IAP-eligible consumers, including steel mills, petrochemical facilities, automotive factories and mines, among others. As of March 2017, more than 17 customers – representing almost one-third of all eligible IAP customers – were participating in the Energy Manager program.

In the spirit of providing conservation opportunities that meet customers' needs and expectations, the IESO also worked closely with LDCs, customers and service providers to create an energy manager option specifically for customers with facilities located in multiple LDCs' service territories. For multi-distributor customers, the program offers administrative simplicity through a single contract and a single point of contact with the IESO for activities across the province.

To maximize their chances of success in identifying and implementing energy-efficiency improvements, IESO-funded energy managers have access to a broad range of tools and support, including a private online discussion forum, a monthly newsletter, in-person events, training courses in presentation skills and financial basics, and other research and resources. Energy managers may even benefit from "energy hunts," during which other energy managers tour a host facility and search out new, undiscovered energy-savings opportunities.

Multi-site customers were the beneficiaries of another program designed and implemented in 2016: the Energy Performance Program (EPP). After a successful Conservation Fund pilot project undertaken by a large grocery chain, the program was formally launched in December 2016. Designed to be highly flexible, the program enables participants to choose which conservation measures are most appropriate and offer the greatest energy savings potential to their business.

The EPP provides commercial and institutional customers with facilities located in multiple service territories the opportunity to receive energy-efficiency incentives on a whole-building, pay-for-performance basis leveraging building interval meter data – the first such program of this scale and scope in North America. Its unique structure promotes operational and behavioural changes to achieve energy efficiency, along capital investment projects, and reduces the administrative burden on large, multi-site customers by enabling them to apply through one window for many different facilities and access larger incentives than would normally be the case – assuming they sustain the achieved electricity savings for multiple years. Although the program is being centrally administered by the IESO, savings will be credited to LDCs and count towards their CDM Plan targets.

Evaluation, Measurement and Verification

Rigorous, independent evaluation, measurement and verification (EM&V) of conservation results is essential to credibility. Evidence-based analysis helps to establish CDM as valuable resource for meeting Ontario's energy needs by providing answers to key questions. Can conservation reliably deliver energy savings? Is conservation more cost-effective than supply-side alternatives? Do the benefits of conservation outweigh the costs? And is conservation an effective and appropriate use of public funds?

EM&V provides essential information to policy-makers, system planners and program administrators to use in developing long-term plans, optimizing program performance and determining whether energy-savings and demand-reduction targets are being met. It is also used to develop a reliable net savings estimate – those energy savings attributable to or resulting from program-sponsored efforts as distinguished from other measures.⁴³

⁴³ <http://ieso.ca/-/media/files/ieso/document-library/conservation/ldc-toolkit/emv-protocols-and-requirements-10312014.pdf> p vi

Cost-effectiveness is a priority in Ontario and has broad implications for program planning, design and implementation to ensure ratepayer dollars are invested wisely. In general terms, conservation is considered cost-effective when the lifecycle costs of implementing conservation programs and actions are less than the benefits (e.g., avoided costs of new generation, transmission or distribution.)

When it comes to EM&V, Ontario has taken existing best practices developed in other jurisdictions and adapted them to ensure they are meaningful and relevant. In some cases, Ontario has taken established benchmarks and used them as a foundation for more rigorous EM&V protocols and processes, enabling a more strategic view of program and portfolio effectiveness.

To ensure they continue to meet established policy objectives and other criteria, the IESO evaluates every conservation program every year – as compared to many other jurisdictions, which evaluate programs every few years and/or integrate spot checks into their EM&V process. Evaluating programs regularly deepens the collective understanding of what's driving the market, enables administrators to identify potential enhancements and reveals which programs are delivering the greatest benefit to customers and to the system as a whole. All evaluation results are made public and support the province's commitment to transparency.

Cost-effectiveness metrics can be used to assess CDM during planning stages and as part of the EM&V process. It can be assessed at various levels of detail: measure, program or portfolio. The measure is the most granular level of CDM and represents the conservation technology, product or action implemented by a participant. A program is defined as a collection of measures and/or activities targeted towards, for example, a particular end-use (e.g., lighting) or customer type (e.g., small commercial). And a portfolio is a collection of programs.⁴⁴

The IESO uses multiple tests when evaluating the cost-effectiveness of its CDM activities. In addition to assessing individual programs, the IESO also considers them on

⁴⁴ <http://ieso.ca/-/media/files/ieso/document-library/conservation/ldc-toolkit/cdm-ee-cost-effectiveness-test-guide-v2-20150326.pdf> p 7

a broad, portfolio-wide basis that considers other policy drivers and social objectives. The most meaningful test is the Total Resource Cost (TRC) test, which compares the costs incurred to design and deliver conservation programs (and customers' costs) with the avoided supply-side resource costs, including generation, transmission or distribution options. The strength of the TRC test is that it provides a holistic viewpoint that considers costs and benefits to both the local utility and participating customers.⁴⁵

Other common tests used to assess conservation programs include the Program Administrator Cost (PAC) test, which is focused solely on the costs to program administrators (e.g., LDCs or the IESO); the Societal Cost (SC) test, which is identical to the TRC test but also includes the cost of "externalities" such as carbon emissions and health costs; and the Levelized Unit Electricity Cost (LUEC) test, which normalizes the costs incurred to design and deliver CDM programs on a unit basis to enable comparison with supply-side alternatives.⁴⁶

⁴⁵ <http://ieso.ca/-/media/files/ieso/document-library/conservation/ldc-toolkit/cdm-ee-cost-effectiveness-test-guide-v2-20150326.pdf> p 9

⁴⁶ <http://ieso.ca/-/media/files/ieso/document-library/conservation/ldc-toolkit/cdm-ee-cost-effectiveness-test-guide-v2-20150326.pdf> p8

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Legal/Regulatory Framework

Codes and Standards

The *Ontario Energy Efficiency Act*, 1990, gave the province the authority to require minimum energy performance standards (MEPS) on the sale of certain energy-consuming products. Two years later, the federal Energy Efficiency Act enabled the federal government to require MEPS on products traded across provincial or international borders. Both pieces of legislation, and the associated codes and standards, have driven substantial energy savings in Ontario in the intervening years.

Given that regulation of building construction is a provincial responsibility, Ontario's first *Building Code Act* was proclaimed in 1974, with the first *Building Code* regulation taking effect the following year.⁴⁷ It is updated roughly every five years, with the most recent *Building Code* (2012) coming into force on January 1, 2014. The code is administered by the Building and Development Branch of the Ontario Ministry of Municipal Affairs and Housing. While its focus is on ensuring public safety in newly constructed buildings, it also supports the government's commitments to energy conservation, barrier-free accessibility and economic development.

To the extent possible, efforts are made to harmonize Ontario's Building Code with model national construction codes, including the *National Building Code of Canada* and the *National Energy Code of Canada for Buildings*, which was designed to complement provincial/territorial building codes. It sets out minimum requirements for energy efficiency that may be adopted in whole or in part into provincial or territorial legislation and codes or, alternatively, used as guidelines for the construction of new, energy-efficient buildings.⁴⁸

As noted above, the *Green Energy Act*, 2009 (GEA) – also known as the *Green Energy and Green Economy Act*, 2009 – is better known for encouraging renewable generation than it is for promoting energy conservation. However, it also introduced energy-

⁴⁷ <http://www.mah.gov.on.ca/Page10806.aspx>

⁴⁸ http://www.nrc-cnrc.gc.ca/eng/solutions/advisory/codes_centre/codes_brochure.html

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efficiency standards for a number of household and commercial appliances through O. Reg. 404/12.

Energy Efficiency and the Public Sector

Amendments to the GEA introduced in 2012 brought other changes. Most notably, buildings that fall under broader public sector (BPS) ownership – municipal facilities, universities/colleges, schools, hospitals and the like – became subject to new energy consumption and GHG reporting requirements.

As established in O. Reg. 397/11, affected groups in the BPS are required to publicly report their energy use and GHG emissions, and produce five-year CDM plans. The Environmental Commissioner of Ontario (ECO's) 2015-2016 annual energy conservation progress report suggests the BPS-owned and/or leased portfolio represents about 590 million square feet of floor space across 15,000 facilities with total energy consumption of 18.6 billion equivalent kWh (ekWh)/year.⁴⁹

While voluntary programs can and do deliver useful results, mandatory energy reporting programs are generally considered more effective in driving long-term, persistent energy performance improvements. Mandatory reporting regimes bring heightened scrutiny to energy consumption patterns – not just on the part of the building owner doing the reporting, but also by local residents, special interest groups, other government bodies, and even independent third parties seeking to improve on existing results through new approaches or technologies.

With several years of consumption data now available, the ECO's report declares energy use in Ontario's public buildings shows "significant potential" for energy-efficiency improvements. When fully implemented, these improvements could produce

⁴⁹ http://docs.assets.eco.on.ca/reports/energy/2015-2016/ECO_Consevation_Lets_Get_Serious.pdf p 63

many benefits, including reduced operating costs, less demand on energy infrastructure, more green jobs and reduced GHG emissions.⁵⁰

As important as energy consumption within the BPS is, those properties represent a fraction of the untapped conservation potential across the province. Provincial public buildings – whether owned/leased by the government itself or by the BPS – account for just eight percent of the energy used in all Ontario buildings.⁵¹

O. Reg. 20/17, made under the *Green Energy Act*, 2009, was passed in February 2017 and introduced new reporting requirements for energy consumption and water use by certain privately owned properties in excess of 50,000 square feet. These include office buildings and other commercial properties, multi-unit residential properties with more than 10 units, retail stores and some industrial properties.⁵²

Using the ENERGY STAR Portfolio Manager mentioned above, reporting will be phased in over three years (2018-2020) according to property size, from largest to smallest. Although some large commercial property owners have been using Portfolio Manager for several years and have found ways to leverage what they've learned from benchmarking against their peers, the process will be new for many participants, including owners of large retail facilities, warehouses and condominiums. More details are available here: <http://www.energy.gov.on.ca/en/ontarios-ewrb/>. The Ministry of Energy has established a stakeholder working group to support implementation of its Large Building Energy and Water Reporting and Benchmarking (EWRB) initiative. Through IESO-supported initiatives such as Race to Reduce and Housing Services Corporations UMP, a significant number of private and public property owners have already voluntarily begun benchmarking their buildings using Portfolio Manager, helping to establish benchmarking as a best practice and Portfolio Manager as the default tool to use in Ontario.

While the reporting requirements described above apply to buildings within the BPS portfolio and, separately, to the private sector, different requirements apply to

⁵⁰ http://docs.assets.eco.on.ca/reports/energy/2015-2016/ECO_Conservation_Lets_Get_Serious.pdf p 81

⁵¹ http://docs.assets.eco.on.ca/reports/energy/2015-2016/ECO_Conservation_Lets_Get_Serious.pdf p 79

⁵² <http://www.energy.gov.on.ca/en/ontarios-ewrb/>

government-owned or -managed properties. In support of the 2007 Go Green Action Plan (GGAP), the Ontario Ministry of Infrastructure (MOI) committed to reducing GHG emissions through energy conservation measures. The GGAP outlined overall Ontario Public Service (OPS) targets in a number of areas, including OPS building-related emissions.

Ontario has met this target through extensive energy retrofits in government-owned buildings and energy conservation measures undertaken by employees. To help achieve the overall GGAP targets, MOI committed to a building-related emissions reduction of 27 percent by 2020 (over a 2006 baseline). The MOI portfolio has already achieved a previous target of 19-percent reductions by 2014.

Annual energy and GHG reporting requirements are outlined in the Ontario Facilities Energy Consumption Directive (per the Green Energy Act). Annually, the energy and GHG reporting requirements are split out:

- The 5-Year Energy Plan reporting on target buildings and initiatives for MOI buildings
- The Enterprise-Wide GHG Summary, which includes the MOI-managed portfolio as well as custodial ministries, which have buildings that are managed by the ministry directly and fall outside of the scope of MOI management.

In support of the building-related GHG emissions targets for 2014 and 2020 (19 percent and 27 percent respectively), an electricity reduction target was set at 20 percent by 2012 (over a 2002 baseline). To achieve this target, Infrastructure Ontario (IO) was directed by MOI to implement building-related electricity reduction initiatives.

The 2014 target was achieved. Moving forward, MOI has given IO direction to implement a new target encompassing all fuel types (electricity, natural gas, propane, fuel oil, chilled water, steam). The new target is a two-percent reduction, year over year, for all fuel types.

Considerable progress has been made since committing to emission reduction targets, with results coming through a variety of initiatives including major building retrofits,

retro-commissioning and new design guidelines/standards. Although the 2014 target was achieved, the 2020 target remains uncertain, with a number of factors contributing to this uncertainty.

As noted above, in the spring of 2016, the Ontario government released its five-year *Climate Change Action Plan*. In this plan, the government seeks to reduce its GHG emissions from its facilities. A new target was established: a 50-percent reduction of GHG emissions by 2030, using 2006 as a baseline. IO-managed facilities are heading in the right direction and showing improvements in the area of energy efficiency and conservation. With aging buildings, investment in new technologies will improve the chances of hitting those emission targets in the future.

MOI reports GHG emissions annually using an internally developed methodology that incorporates some elements of The World Resources Institute Greenhouse Gas Protocol (GHG Protocol). The GHG Protocol provides standards and guidance for reporting greenhouse gases. Because of the nature of government facilities, elements of the GHG protocol were adapted into an internal methodology for applicability to the MOI portfolio.

In January 2017, IO and the IESO announced they had struck a five-year partnership to test innovative CDM technologies, processes and program delivery models in the public sector. With a view to accelerating the adoption of CDM solutions in both the public and private sectors, IO received up to \$10 million in support from the Conservation Fund.

Through this agreement, the IESO will support the testing of new CDM projects across IO's diverse portfolio. IO's portfolio features approximately 4,000 buildings and structures across the province that support a wide-range of ministry programs. This includes multi-ministry office buildings, courthouses and correctional facilities.

Approved projects are expected to yield insights in a number of areas including facility benchmarking; building automation; heating, ventilation and air conditioning and advanced controls; lighting systems; building envelope; energy-efficiency options for heritage buildings; efficient building operation; electricity, gas and water collaboration;

energy storage technologies; integration with regional energy planning; and opportunities to work toward net zero buildings.

By creating a safe, controlled environment in which new technologies and solutions can be tested, this partnership is expected to reduce some of the existing barriers to widespread implementation and encourage uptake by the broader public sector and potentially the commercial, industrial and institutional sectors.

Financial Mechanisms

For customers in Ontario considering energy-efficiency improvements at their homes or businesses, the primary source of funding for these measures is the IESO's conservation programs, delivered mainly through LDCs.

To help Ontario customers become more energy-aware and enable them to better control their consumption and their costs, the Ministry of Energy has compiled a list of incentive programs for business (<http://www.energy.gov.on.ca/en/incentives-program-for-business/>) and for communities (<http://www.energy.gov.on.ca/en/incentives-programs-for-communities/>).

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Some other options include:

The Atmospheric Fund (TAF): This is a not-for-profit organization that invests in “urban solutions” to reduce GHG emissions and air pollution. As part of its organizational mission, TAF provides financing to entrepreneurs whose product or service can significantly cut emissions in Toronto, and developers and property owners who are making their buildings more energy efficient. Its ultimate goal – reducing Toronto's GHG emissions by 80 percent by 2050 – informs all its actions, including investment decisions. TAF's vision is that Toronto becomes a “climate-smart city” that is a leader among urban centres around the world. <http://taf.ca/about-us/>

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Efficiency Capital (EC): This privately held Canadian corporation offers financing of energy-efficiency retrofits for multi-unit residential, commercial, industrial and institutional buildings through its insured energy-savings warranty program. EC enables property owners and asset managers to increase overall building profit by realizing savings on operating costs and achieving significant declines in GHG emissions associated with energy consumption. EC earns back its capital and its professional services investment by sharing the clients' utility cost savings.

<http://efficiencycapitalcorp.com/>

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City of Toronto Home Energy Loan Program (HELP): HELP is a financing option offered by the City of Toronto. Low-interest loans are available to local homeowners

who are interested in improving the energy and water efficiency of their home. Through HELP, the City provides the funding required to complete the improvements, and homeowners repay the loan over time through installments on their property tax bill.

<http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=7e00643063fe7410VgnVCM10000071d60f89RCRD>

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Green Investment Fund (GIF): Created to support the objectives of Ontario's *Climate Change Action Plan*, this \$325-million fund will support projects that will fight climate change, grow the economy and create jobs. These investments are part of the government's plan to secure a healthy, clean and prosperous low-carbon future. GIF projects will: help homeowners use less energy; support more electric vehicle charging stations across Ontario; retrofit social housing developments; help businesses reduce emissions; help fund local environmental organizations; and help provide Indigenous communities with training, tools and infrastructure to address climate change.

<https://www.ontario.ca/page/green-investment-fund>

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IESO funding programs: While not exclusively focused on CDM, the IESO offers a number of funding programs to help different groups participate in the energy sector. The Education and Capacity Building Program is intended to support First Nation and Métis communities and organizations, co-ops, municipalities, public sector entities, registered charities and not-for-profit organizations. These projects help equip communities and organizations with knowledge and training, creating opportunities for them take part in the energy economy. <http://www.ieso.ca/get-involved/funding-programs/education-and-capacity-building-program/overview>

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The Aboriginal Community Energy Plan Program helps Indigenous communities find ways to use less electricity, manage energy costs and explore opportunities for renewable energy solutions. <http://www.ieso.ca/en/get-involved/funding-programs/aboriginal-community-energy-plans/overview>

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SMART Green: This program, offered by the Canadian Manufacturers & Exporters (CME) in partnership with Government of Ontario, helps small- and medium-sized manufacturers reduce GHG emissions and improve their energy efficiency. It provides assistance in the form of non-repayable grants of 50 percent of eligible costs up to \$200,000 and is intended to improve the competitiveness of the Ontario manufacturing supply chain by not only delivering value to eligible manufacturers, but also by contributing to Ontario's 2020 targets for GHG emissions reduction.

<https://cmeweb.crm.eperformanceinc.com/smartgreen/>

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High-rise Retrofit Improvement Support Program (Hi-RIS): This is a three-year pilot program now offered by the City of Toronto to help residential property owners pursuing energy and water efficiency and conservation improvements. The multi-residential stream of the program has a \$10-million funding envelope with a participation target of approximately 10 buildings.

<http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=e206c94d3dc4f410VgnVCM10000071d60f89RCRD>

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Guelph Energy Efficiency Retrofit Strategy (GEERS): As part of the GEERS program, Guelph homeowners are encouraged to make energy-efficiency improvements to their homes, including insulation, windows, weatherizing, climate control devices, furnaces, air conditioners, heat recovery systems and solar panels. The upfront costs of the retrofits are paid through the pilot program, and homeowners repay these costs over a period of up to 25 years at low interest rates through special monthly charges known as Local Improvement Charges, which are collected through property taxes. <http://guelph.ca/plans-and-strategies/community-energy-initiative/geers/>

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Indigenous Conservation and Energy Efficiency Programs

On-Reserve

CMHC On-reserve Housing Retrofit Initiative: This federal program offers financial assistance to First Nations for renovations and general improvements of housing under existing CMHC agreements. Retrofits to increase energy efficiency are among the eligible costs. <https://www.cmhc-schl.gc.ca/en/first-nation/financial-assistance/renovation-programs/upload/on-reserve-housing-retrofit-initiative.pdf>

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Hydro One First Nation Conservation Program: This program for First Nation communities provides funding for energy-efficient upgrades that can help save energy and make homes more comfortable.

<http://www.hydroone.com/MyHome/SaveEnergy/Pages/FNCP.aspx>

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Hydro One Remotes Program: This portfolio includes a Commercial Lighting Retrofit Program that helps customers make upgrades to lighting systems in existing buildings; a Street Lighting Retrofit Program that helps customers who have existing low- or high-pressure sodium street lights make the transition to light-emitting diode (LED) streetlights; and a Mail-In Rebate Program.

Off-Reserve

FIMUR – Homeowner Repair Program: This program helps low- to moderate-income Indigenous homeowners make eligible home repairs. This program is offered to First Nations, Métis or Inuit households that own their own home off-reserve and has five funding priorities, one of which is energy efficiency. This program will run annually until March 31, 2020. <http://www.ontarioaboriginalhousing.ca/programs/>

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