



2019 Toronto Hydro Environmental Performance Report

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Toronto Hydro Corporation

The City of Toronto (the City) is the sole shareholder of Toronto Hydro Corporation (THC). THC is a holding company which wholly owns two subsidiaries: Toronto Hydro-Electric System Limited (THESL), which owns and operates an electricity distribution system; and Toronto Hydro Energy Services Inc. (TH Energy), which provides street lighting and expressway lighting services in the City of Toronto. (THC, THESL and TH Energy on a consolidated basis are referred to as “Toronto Hydro” or the “Company”).

The City requires the Company to uphold certain objectives and principles set out in the City’s Amended and Restated Shareholder Direction relating to Toronto Hydro Corporation. This report describes how the Company conducts its affairs in accordance with environmentally related objectives set out in the Shareholder Direction by operating in an environmentally responsible manner, while supporting the City’s energy, climate change, urban forestry, and utilization of emerging green technologies as appropriate.

Toronto Hydro operates an integrated Environment, Health and Safety (EHS) Management System facilitating efficiencies to be realized by eliminating duplication and redundant processes. In October 2019, Toronto Hydro passed an external audit to upgrade its Health and Safety Management System to the International Organization for Standardization’s (ISO) 2018 Standard for Occupational Health and Safety Management Systems (ISO 45001:2018). ISO 45001:2018 replaced the Occupational Health and Safety Assessment Series Standard for Occupational Health and Safety Management Systems (OHSAS 18001:2007) as the internationally recognized standard for Occupational Health and Safety Management Systems.

The audit also confirmed that Toronto Hydro has effectively maintained its Environmental Management System certification in accordance with the ISO’s 2015 Standard for Environmental Management Systems (ISO 14001:2015). This marks the seventh consecutive year that Toronto Hydro has been certified to stringent internationally recognized standards for environmental and occupational safety management systems by independent third-party auditors.

In addition to the ISO 14001:2015 certification, Toronto Hydro is one of eight electrical utilities in Canada to have earned the prestigious [Sustainable Electricity Company™ designation](#) awarded by the Canadian Electricity Association (CEA) following a comprehensive evaluation by the CEA. Also, three of Toronto Hydro’s four work centres have been certified as meeting the Building Owners and Managers Association of Canada’s (BOMA Canada) requirements for building environmental standards (BOMA BEST).

Overall, Toronto Hydro continues to strive to achieve zero injuries and remain a sustainable electricity company. The Company regularly monitors and assesses all aspects of its environmental performance in an effort to reduce its environmental footprint and improve efficiency. Toronto Hydro also enables customers to be part of the shift to a sustainable economy by connecting renewable power and energy storage to the grid; encouraging the use of electrified transportation; and offering online billing to reduce paper consumption.

As a testimony of its long-standing commitment to sustainability, Toronto Hydro was awarded thirteenth place by Corporate Knights Magazine on its Best 50 Corporate Citizens ranking. The Best 50

Corporate Citizens ranking is a prestigious, annual ranking that is recognized internationally, designed to showcase Canada's sustainability leaders.

Energy Use and Greenhouse Gases

Through its TransformTO strategy, the City of Toronto established targets to reduce greenhouse gas (GHG) emissions within the city over the coming decades¹. Toronto Hydro is supporting these goals by reducing its own GHG emissions associated with its fleet, facilities, line losses, releases of sulphur hexafluoride (SF₆) gases, and partnering with the City on efforts to achieve its emissions reduction targets in TransformTO.

GHG emission reductions associated with Toronto Hydro's solar photovoltaic (PV) project investments are covered in the Development Projects section of this report.

GHG Inventory

Toronto Hydro's GHG inventory includes Scope 1 and 2 emissions (explained in more detail below), quantified in accordance with national and provincial GHG reporting guidelines² and the GHG Protocol – Corporate Accounting and Reporting Standard³. The organizational boundary of this GHG inventory includes all Toronto Hydro-owned and controlled (i.e. leased) facilities.

Scope 1 emissions consist of direct emissions from stationary combustion (natural gas combustion for facilities and propane combustion used for tools and heating the aggregate shed), mobile combustion (fuel combustion for fleet) and fugitive sources (releases of SF₆ and refrigerant gases). Scope 2 emissions include indirect emissions from the use of purchased electricity (facilities and line losses)). Scope 3 emissions consist of all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions. Scope 3 emissions are not included in the Toronto Hydro GHG inventory.

The emission factors used to calculate the GHG emissions are the provincial values⁴ representative of Ontario's energy supply mix and measured in tonnes of carbon dioxide equivalent emissions (tCO_{2e}) per gigawatt-hour.

Organizational Boundaries

Toronto Hydro's organizational boundaries include all Toronto Hydro-owned equipment and vehicles, as well as occupied buildings. There were no significant changes in 2019 to Toronto Hydro's organizational boundaries.

¹ <https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/>

² Environment and Climate Change Canada, Technical Guidance on Reporting Greenhouse Gas Emissions, available at <http://www.ec.gc.ca>; Ontario Ministry of the Environment, Conservation and Parks, Guideline for Quantification, Reporting and Verification of Greenhouse Gas Emissions, available at <https://www.ontario.ca/page/ministry-environment-conservation-parks>.

³ The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard (World Resources Institute and World Business Council for Sustainable Development), available at <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>

⁴ Emission factors published in Environment Canada's National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada.

Data Sources and Assurance

Facilities Energy Data – Energy consumption data (electricity and natural gas) is gathered from utility providers for all Toronto Hydro-owned and controlled work centres. Building-specific energy consumption data is populated in a database (the “Sustainability Performance Indicators” database). Facility energy billing data is comprised of digital files for electricity, paper bills from utility companies for natural gas, and consolidated billing files from third-parties for leased buildings.

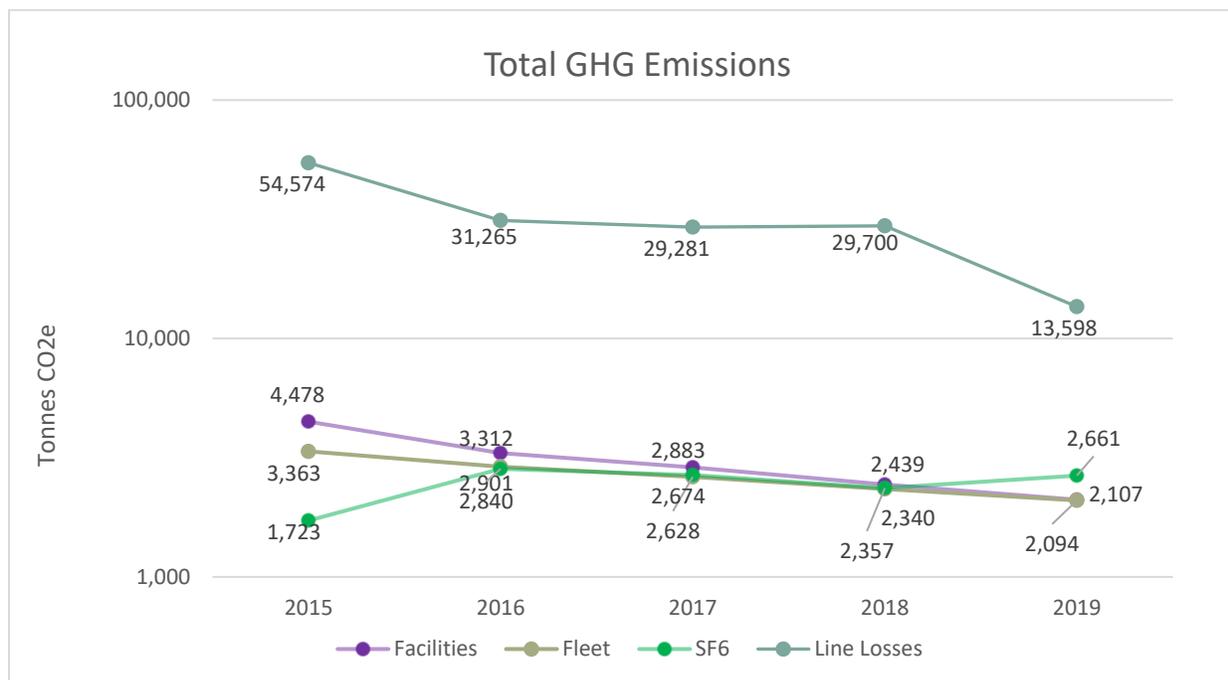
GHG emissions from stationary air conditioning and refrigeration equipment (refrigerant leaks), and emissions from propane combustion were deemed not material (<0.05% of emissions) and are not included.

Fleet Fuel Data – A similar process to the facilities energy data collection and assurance is used for the fuel consumption data of the motor vehicle fleet. The Sustainability Performance Indicators database is populated from various datasets acquired from fuel suppliers and through paper billing statements.

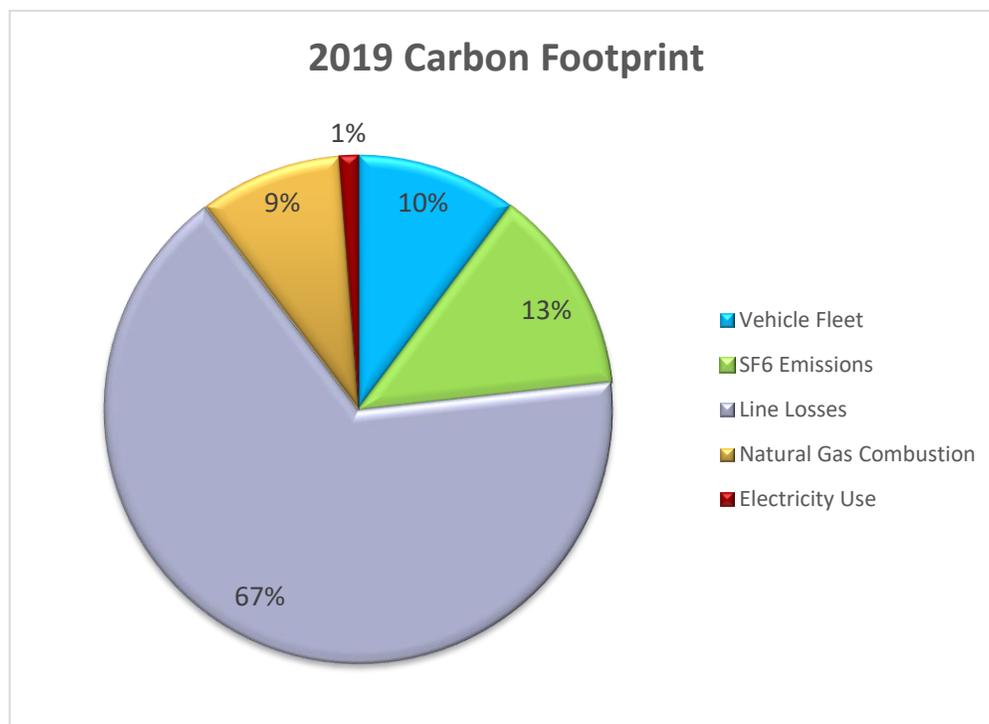
SF₆ Emissions Accounting Process – Toronto Hydro gathers SF₆ emissions data by tracking the amount of SF₆ used to refill equipment and the amount of SF₆ released from decommissioned and repaired equipment.

Results and Analysis

Toronto Hydro’s 2019 GHG emissions were 20,461 tCO₂e, a decrease of 44% relative to 2018. Below is the historical data on Toronto Hydro’s GHG emissions by source (i.e. facilities, fleet and line losses).



The following diagram shows the make-up of the carbon footprint. In summary, 67% of the emissions are attributed to line losses, 13% are from SF₆ emissions, 10% are from facilities (electricity and natural gas use) and 10% is attributed to fleet emissions.



The fleet fuel consumption and associated emissions decreased by approximately 11% relative to 2018 and by approximately 38% relative to 2015. The decrease is attributed to continued efforts to reduce the number of vehicles and optimize their use (see details in “Fleet Related Initiatives” section below), the implementation of the Idle Management System (Governor to Reduce Idle and Pollution - GRIP), as well as the creation of satellite work sites in close proximity to capital project locations. Additional benefits, such as reduction in idling time, fuel use and kilometres travelled, are included in the Environmental Initiatives section.

Total emissions from electricity use and natural gas combustion in Toronto Hydro facilities decreased by 56% and 1%, respectively from 2018. These improvements were partially due to optimization of the building automation systems at Toronto Hydro work centres. Additionally, three of Toronto Hydro’s work centres have achieved BOMA BEST Certification as a recognition of the resource efficiency and environmental programs implemented (discussed further in the Environmental Initiatives section).

The 56% decrease in total GHGs from electricity use, is partially attributed to the lower provincial emission factor (the electricity mix in Ontario was less GHG intensive in 2019 relative to 2018).

Environmental Initiatives

Fleet-Related Initiatives

Toronto Hydro operates a fleet of vehicles, which are a potential source of environmental impacts. Vehicle operation inevitably leads to waste, such as waste vehicle fluids and waste vehicle components (e.g. batteries, engine parts, etc.) and the emission of GHGs. In order to reduce this waste, Toronto Hydro decreased its fleet size by approximately 10% in 2019. Toronto Hydro also undertook a number of

initiatives to help reduce engine operation, thereby decreasing the associated waste and emissions while increasing the life cycle of vehicles. These initiatives provide value to the residents of Toronto by reducing pollution, engine noise, odours and aim to increase value to the shareholder and ratepayers by extending the life cycle of vehicles and reducing repair and maintenance costs.

Anti-Idling Technologies

In 2019, Toronto Hydro continued its use of the Governor to Reduce Idle and Pollution (GRIP) technology on Toronto Hydro vehicles. The GRIP system functions by shutting the engine off after one minute of idling, in accordance with the City of Toronto bylaw, and switching to the auxiliary battery power source requiring long-lasting batteries in order to fully optimize the GRIP system's use.

The GRIP technology was installed on five bucket trucks in 2019. In total, 29 cube vans, 24 bucket trucks and five pickup trucks have been equipped with GRIP since the use of the technology began in 2014. This led to an approximately 31% decrease in idling time for cube vans compared to other cube vans without the GRIP technology.⁵ Two pickup trucks were upgraded to a newer version of GRIP in 2019 to provide more granular data for analysis. The settings in all GRIP vehicles were reviewed and enhanced based on past data trends. This helped increase idling reduction in GRIP pickups by 25% compared to 2018.

Toronto Hydro identified that increasing battery life through the introduction of lithium ion batteries can lead to further idling reductions. Lithium ion batteries last longer than the current lead acid batteries. This reduces the emissions associated with idling by optimizing the performance of the GRIP system to allow vehicles to operate off the battery for a longer period of time. The lithium ion batteries also have a longer lifespan compared to the lead acid batteries, which reduces the amount of wasted batteries. Toronto Hydro undertook a two-phase pilot project in 2017 and 2018 to test the effectiveness of lithium ion batteries in vehicles in conjunction with our existing GRIP system to determine if we could further reduce idling. At this time, this technology will not be adopted as a wide standard across the fleet of cube vans due to cost considerations. Toronto Hydro continues to pursue emerging technology to help reduce the idling time and emissions generated from fleet vehicles.

Bio-diesel

Toronto Hydro uses combined bio-diesel and standard diesel to reduce the emissions from its fleet. Bio-diesel generates approximately 8% less GHG emissions upon combustion than standard diesel. In total, the use of bio-diesel eliminated approximately five tCO₂e in 2019.

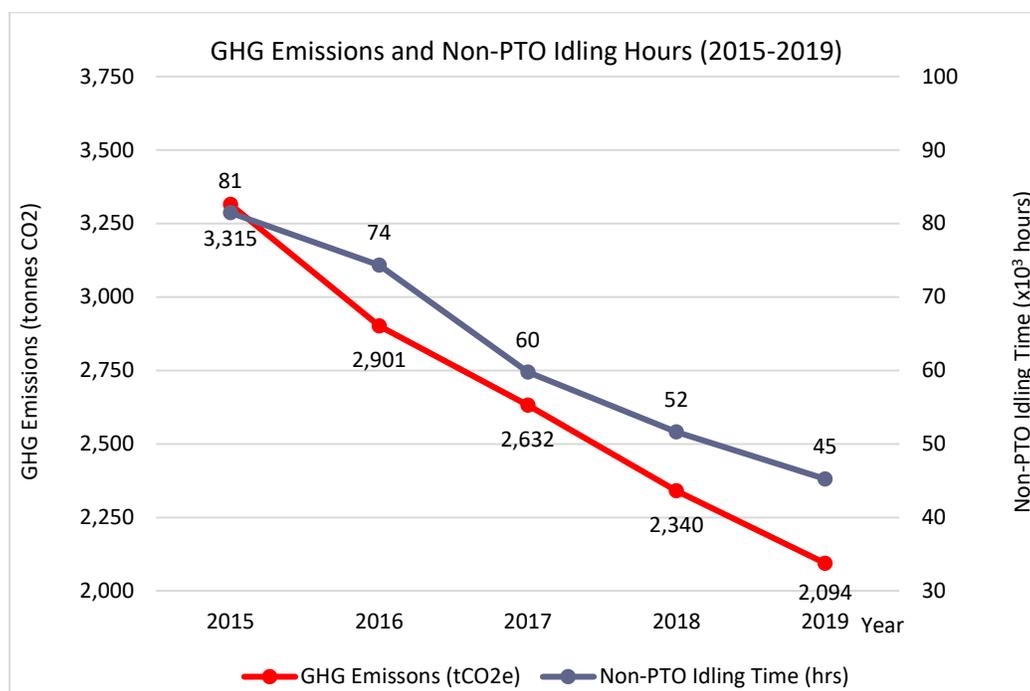
Cumulative Benefits

As a result of the fleet related initiatives, Toronto Hydro saw a 10% reduction in fuel use (92,000 L) saving about \$110,000 and a reduction in GHGs of 246 tCO₂e, in 2019 relative to 2018.

The savings associated with the fleet related initiatives mentioned above, compared to 2015, are: 37% reduction in total fuel consumed (approximately 480,500 L); 37% reduction in GHG emissions (1,221 tCO₂e); 35% reduction in kilometres travelled (approximately 1,291,100 km); and 44% reduction in total non-PTO⁶ idling hours (approximately 36,200 hours). The graph below illustrates the correlation between the decrease in idling time and GHG emissions from vehicles.

⁵ The GRIP technology was installed on new cube vans and no historical data was available.

⁶ Some of Toronto Hydro's vehicles (e.g. bucket trucks) require engines to be kept on (idling) in order to charge and operate the vehicle hydraulics. This is referred to as PTO idling time.



Smart Commute

Metrolinx and the City of Toronto work together with businesses to promote the Smart Commute program to make commuting easier, healthier, and more enjoyable. The program also strives to reduce traffic congestion, improve air quality and take action on climate change.

Recognizing the importance of sustainable workplace commuting, Toronto Hydro has collaborated with Smart Commute since 2015 to provide programs and services to support efficient and sustainable commuter options to employees at the 14 Carlton and 500 Commissioners work centres. In 2018, Toronto Hydro expanded the program to include the David M. Williams Centre and the 715 Milner Ave. work centre. All four Toronto Hydro work centres are now included in the program.

In 2019, employees completed questionnaires to provide insight into their commuting practices and preferences. Employees identified carpooling and public transit as the top two alternative modes of travel they may be interested in trying. However, overall interest in carpooling was significantly greater than interest in the other two modes of travel, with approximately 40% of employees who responded expressing willingness to try carpooling.

In 2019, Toronto Hydro initiated the following campaigns related to the sustainable commuting options employees were the most interested in:

- A workshop to assist employees with carpool matching
- A communications campaign encouraging participation

Electric Vehicles

Vehicles are one of the largest sources of GHGs in Toronto. In fact, the City of Toronto stated that approximately one-third of the GHG emissions in Toronto are from vehicles.⁷ The City also indicated that the transition to electric vehicles is one of the primary actions from the City's plan to achieve the 2050 goal of reducing emissions to net zero. Toronto Hydro supports the transition to electric vehicles by increasing the availability of charging stations for electric vehicles to the residents of Toronto, as well as Toronto Hydro employees.

In an effort to remove some of the barriers to electric vehicle ownership for employees, Toronto Hydro installed charging stations at three work centres. While users are required to pay for the use of these stations, the availability of charging infrastructure removes a major barrier to the adoption of electric vehicles. Four charging stations are currently operational at the 500 Commissioners and 715 Milner Ave. locations, while ten are available for employees at the David M. Williams Centre.

Toronto Hydro also demonstrates leadership in the electrification of transportation through a project initiated to replace small cars in the Toronto Hydro fleet with fully electric vehicles. Currently, Toronto Hydro's fleet includes nine fully electric light duty vehicles. In addition to the environmental benefits, the transition to electric vehicles is expected to provide financial savings from decreased fuel consumption and reduced vehicle maintenance.

Toronto Hydro works with various industry associations and government to enable the adoption of electrified transportation. At the municipal level, Toronto Hydro partners on the development of electrified transportation projects with agencies such as the Toronto Parking Authority and the Transportation Services division of the City of Toronto. Toronto Hydro also supported the City of Toronto's electric vehicle strategy through work with the Environment and Energy division. At the Federal level, Toronto Hydro provides input to electric vehicle forums facilitated by Natural Resources Canada and actively engages with the CEA on federal electric vehicle advocacy. Participation in various electric vehicle projects and associations has allowed Toronto Hydro to establish a leadership position in the electrification of transportation.

Electric Buses

Toronto Hydro is supporting the Toronto Transit Commission's (TTC) move to electric buses. To meet the City of Toronto's TransformTO climate change targets, the TTC plans to eliminate emissions from its entire fleet by 2040⁸. Transportation currently is the largest source of greenhouse gas emissions in Ontario. With Ontario's relatively clean electricity generation mix, electric transportation provides an environmentally sound alternative to fossil fuel-based transportation.

Toronto Hydro has assisted the TTC with the technical requirements for adopting electric buses and with the selection of the first locations for the electric bus program. The first TTC garages that will be used for charging (Arrow Garage, Eglinton Garage and Mount Dennis Garage) were selected considering their geographical location as well as the available electrical capacity. All charging equipment was installed and in use by the end of 2019. At least 20 electric buses were in service by the end of 2019 and a total of up to 60 buses are expected to be in service in 2020. This will make up one of the largest mini-fleets of electric buses in North America.⁹

⁷ Pg 2 of <https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf>

⁸ Pg 60 of <https://www.toronto.ca/wp-content/uploads/2019/06/90de-TransformTO-Implementation-Update.pdf>

⁹ https://www.ttc.ca/News/2019/October/25_10_19NR_eBus.jsp

Toronto Hydro is also assisting the TTC in implementing energy management and energy storage projects at TTC facilities. Design and procurement of 1MW/4MWh energy storage systems at each of the first three garages was completed in 2019 with construction starting early 2020. The commissioning of energy storage is expected to be completed in 2020. Once in service, the energy storage will allow the TTC to balance its electrical load throughout the day and increase the overall reliability at the garages.

Toronto Hydro will accommodate the future growth of electric buses by enhancing the electrical infrastructure required for new bus charging equipment.

Tree Planting

Toronto Hydro hosts an annual Tree Planting Event with the non-profit organization, Local Enhancement & Appreciation of Forests (LEAF) and the Parks, Forestry and Recreation division of the City of Toronto. The purpose of this event is to engage employees in the improvement of the natural environment in Toronto. In 2019, Toronto Hydro employees and family members planted 350 trees and shrubs at South Humber Park. Since 2004, more than 5,010 trees have been planted across the city through this partnership.

Reducing Hazardous and Non-Hazardous Waste

Similar to most electrical utilities in Canada, Toronto Hydro owns and operates equipment that has oil containing polychlorinated biphenyls (PCBs). The operation of this equipment is compliant with the current PCB Regulations under the *Canadian Environmental Protection Act, 1999*. In preparation for legislation coming into effect in 2025, Toronto Hydro is proactively removing and arranging for the safe destruction of equipment and oil at risk of containing PCBs at a concentration greater than 50 parts per million (ppm) to ensure compliance with the new legislation is achieved.

The removal and destruction has accelerated in recent years and has been enabled by proactive inspections of equipment suspected of having oil containing PCBs and testing of oil in equipment for the presence of PCBs. In addition, Toronto Hydro completed a capital program to replace submersible transformers in the distribution system that were manufactured prior to 1986 (i.e. submersible transformers suspected of containing oil with PCBs). The objective of the program was to eliminate the risk of submersible transformers leaking oil containing PCBs into the natural environment.

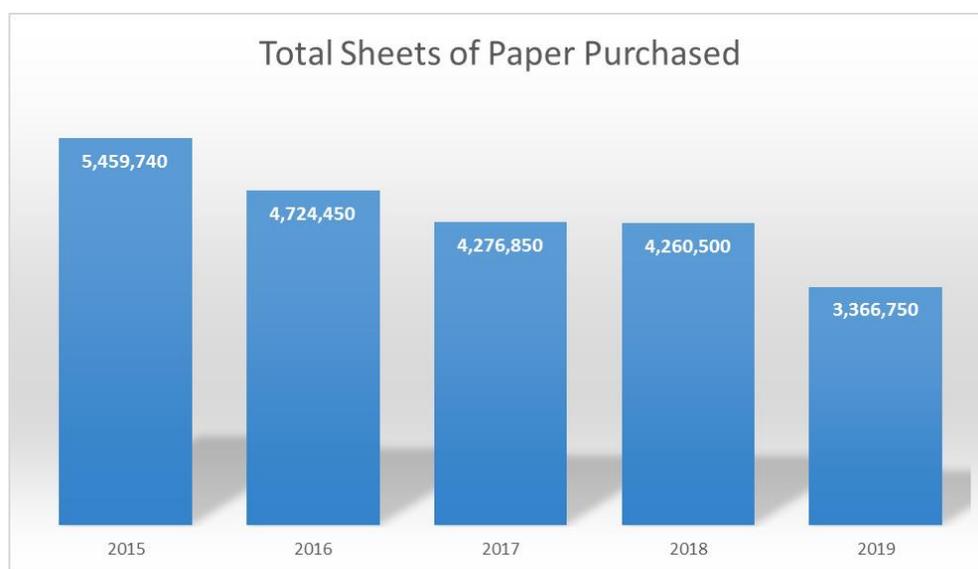
The formal submersible transformer replacement program was completed in 2018. As a result, the total amount of PCB material shipped for safe destruction in 2019 decreased by approximately 20,000 kilograms compared to 2018. In total, approximately 7,000 kilograms of solid material and 3,500 litres of liquids containing PCBs were shipped for destruction in 2019.

A recycling rate is the percentage of total waste generated that is sent for recycling. Toronto Hydro measures two recycling rates and tracks both as key performance indicators. The first is the recycling rate of the waste included in *O. Reg. 103/94: Industrial, Commercial and Institutional Source Separation Programs*. Thanks to committed employees, effective source separation has led to an improvement in this recycling rate from 57% in 2013 to 65% in 2019. Recycling bins have been installed throughout buildings and in the yards at work centres to allow materials such as coffee cups, plastic bottles, metal cans, plastic shopping bags, paper towels, and recyclable plastic material from the field to be diverted from landfill.

For the second recycling rate (i.e. the corporate recycling rate), Toronto Hydro includes metals from transformers and cables, wood poles removed from service, fluorescent lights, batteries and electronic waste (e-waste). The corporate waste recycling rate was developed in 2017 to account for this broader pool of waste streams. The purpose of the corporate waste recycling rate is to provide a more comprehensive picture of the diversion efforts of the company. An annual target is established for the corporate recycling rate and performance is monitored on a monthly basis. Toronto Hydro exceeded the 2019 target of 90% with a year-end corporate waste recycling rate of 92%.

Reduction of Paper Consumption

The key to reducing waste is eliminating consumption of the materials that generate waste. Toronto Hydro has implemented numerous initiatives to reduce the amount of paper used. Toronto Hydro has reduced annual consumption of paper by approximately 38% or 2,093,000 sheets in 2019 compared to 2015. This equates to savings of approximately 85 tCO₂e¹⁰ of associated GHG emissions and approximately \$15,800¹¹ in 2019 when compared to 2015. These savings do not include other costs such as storage and transportation of paper records.



BOMA BEST Gold Certification

In 2018, Toronto Hydro achieved BOMA BEST Gold Certification at the David M. Williams Centre (71 Rexdale Blvd.) and the 715 Milner Ave. work centre from the Building Owners and Managers Association of Canada (BOMA Canada). The construction of these two work centres required the remediation of former industrial sites. In 2017, the Toronto Hydro facility at 500 Commissioners St. achieved BOMA BEST silver certification. BOMA BEST certification is a nationally recognized voluntary framework for assessing the environmental performance and management of existing buildings of all sizes. The independent third-party certification assesses the policies, programs and procedures in place at a building through a document review and onsite verification.

¹⁰ Environmental impact estimates were made using the Environmental Paper Network Paper Calculator Version 4.0. For more information visit papercalculator.org.

¹¹ Cost from Staples = \$3.78/ream of 500 sheets 8.5 x11

Energy Conservation and Demand Management (CDM)

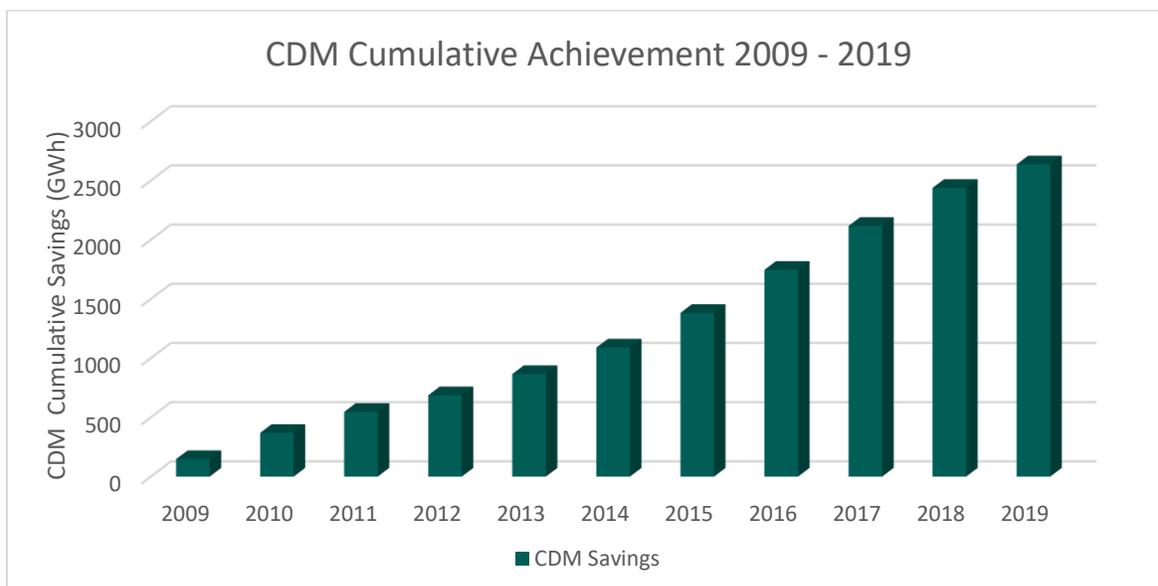
The City's Sustainable Energy Strategy¹² includes targets to reduce electricity system demand by 550 MW and increase renewable generation by 550 MW by 2020. Toronto Hydro supports the achievement of these targets through a variety of programs involving municipal and provincial governments, regulatory bodies, industry representatives and customers.

Conservation Results

The Government of Ontario made changes in 2019 to the conservation programs in Ontario and directed the Independent Electricity System Operator (IESO) to centrally deliver CDM programs. Agreements for the CDM programs in place prior to the changes will remain in effect and Toronto Hydro will remain responsible for its obligations under the agreements. Participants will have until December 31, 2020 to complete the projects. Ontario businesses will continue to have access to incentives for retrofits and other energy-efficiency projects to help lower their energy costs.

In 2019, Toronto Hydro worked with residential, small business, industrial and commercial customers to implement energy-efficiency projects that had been initiated prior to the changes described above. Toronto Hydro's 2019 CDM programs led to an estimated energy savings of more than 198,000 MWh and reduced peak demand by 34 MW. These initiatives also helped to reduce GHG emissions in the city by 3,366 tCO₂e¹³ since 2018.

Through Toronto Hydro's CDM initiatives, customers have reduced electricity consumption by a cumulative 2,637 GWh¹⁴ and GHG emissions by a cumulative 134,353 tCO₂e¹⁵ since 2009. During the same period, Toronto Hydro's CDM programs helped customers reduce their peak demand by a cumulative 408 MW¹⁶, representing 74% of the City's 2020 goal.



¹² The Power to Live Green: Toronto's Sustainable Energy Strategy (October, 2009).

¹³ Estimate using 2017 Ontario emission factors published in Environment Canada's National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada.

¹⁴ The energy and peak demand savings represent cumulative totals but do not account for savings persistence.

¹⁵ Estimate using the Ontario emission factors published for each year between 2009-2017 in Environment Canada's National Inventory Report.

¹⁶ The peak demand savings do not include achievement from demand response programs.

Renewable Energy

Toronto Hydro supports renewable generation across Toronto through enabling infrastructure and direct project investments. The initiatives described in the following section demonstrate Toronto Hydro's support of the City's renewable energy goal of installing 550 MW of renewable generation by 2020, including 166 MW of solar PV generation.¹⁷

Enabling Infrastructure

Toronto Hydro's connection process for renewable generation resources is governed by the Ontario Energy Board's Distribution System Code.

Toronto Hydro provides support including pre-assessments, connection impact assessments and commissioning and engineering support for renewable generation interconnections with its grid. Additionally, Toronto Hydro offers net metering for solar installations where the amount of energy produced by the solar panels is metered and used to offset the owner's electricity bill.

Toronto Hydro enabled approximately 2,070 renewable generation interconnections totalling approximately 200 MW between 2009 and 2019, representing 38% of the City's 2020 renewable energy generation goal, and approximately 127% of the City's 2020 goal for solar PV generation. Assuming a specific yield of 1,100 kWh/kWp¹⁸, these projects would produce 220 GWh and displace approximately 3,740 tCO₂e¹⁹ annually.

Development Projects

In addition to connecting customers' renewable energy projects, Toronto Hydro directly invests in renewable generation and energy storage projects.

Investment

Toronto Hydro jointly invested with the City in solar PV projects on city-owned facilities. These projects were separated into three groups (Group A, B and C). Group A consists of 10 installations and has an installed capacity of 1 MW. The construction of these projects was completed between 2012 and 2013. In 2019, these projects generated 1,290 MWh and displaced approximately 21.9 tCO₂e. Group B consists of 10 installations with a combined capacity of 1.5 MW constructed between 2015 and 2016. These installations generated 1,771 MWh and displaced approximately 30.1 tCO₂e in 2019. Toronto Hydro has majority ownership of the Group A projects, while the City of Toronto has majority ownership of the Group B projects (both are split 51%/49%).

Group C consists of significantly more installations than the previous two projects. Feed-in Tariff (FIT) contracts for 52 projects (36 FIT, 16 microFIT) were secured in 2016. The construction of all 16 microFIT and 36 FIT installations were completed by the end of 2018. Toronto Hydro worked closely with the City of Toronto to ensure these installations were completed. The City of Toronto owns the majority of the Group C installations, with the exception of two installations at Toronto Hydro owned facilities, the David M. Williams Centre and 715 Milner Ave. Toronto Hydro owns 51% of these two installations, each with a 500 kW capacity. The installation at the David M. Williams Centre generated 667 MWh in 2019

¹⁷ The Power to Live Green: Toronto's Sustainable Energy Strategy (October, 2009).

¹⁸ kWp represents kilowatt peak, the maximum output of the system.

¹⁹ Estimate using 2017 Ontario emission factors published in Environment Canada's National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada.

and displaced approximately 11.3 tCO₂e, while the installation at 715 Milner Ave. generated 660 MWh in 2019 and displaced approximately 11.2 tCO₂e.

Toronto Hydro previously invested in two other renewable generation projects (Better Living Centre Solar and 500 Commissioners St. Solar) which, together, have an installed capacity of 0.5MW, generated 746 MWh and displaced approximately 12.7 tCO₂e in 2019.

Combined Solar and Energy Storage – Toronto Hydro worked with the City of Toronto in 2019 to pilot a combined solar and energy storage project at a Toronto Paramedic Services station. This was the first time that either Toronto Hydro or the City piloted a project of this nature. The project involved the installation of roof and wall-mounted solar panels on the station, which are connected to a battery to store the generated electricity. The solar panels have a generation capacity of over 8kW and the batteries are capable of storing up to 27 kWh. A sufficient amount of electricity can be stored in the batteries to operate the critical loads in the station during a power outage. The excess generated electricity can be connected to Toronto Hydro's distribution grid and used to offset the cost of electricity at the station. The project helps improve the ability of the station to respond to emergencies and provides a financial benefit to the City. The system was operational in 2019 and generated 5,212 kWh in 2019.

A second combined solar and energy storage project was initiated in 2019, building on the success of the project at the Paramedic Services station. The second project involved the installation of solar panels with a capacity of 120 kW and energy storage of up to 220 kWh at the Waterfront Neighbourhood Centre at 627 Queen's Quay W. The design and material procurement were completed in 2019 and construction is expected to be completed prior to the end of the 2020. This project will be representative of a typical community centre in Toronto and will serve as a proof of concept for combined solar and energy storage at these types of buildings.

Bulwer Battery Energy Storage System (BESS) Project - The Bulwer BESS project is a 2MW/2MWh BESS that will be located at Bulwer Municipal Station (MS), a retired 4.16kV Toronto Hydro electrical substation located in downtown Toronto. This location was chosen as downtown Toronto is a highly populated area with ever increasing demands for electricity that lead to eventual strain on Toronto Hydro's infrastructure. The BESS allows electricity to be provided to customers when there is an outage, and is thereby expected to increase reliability of service to customers. The BESS also reduces peak loads on distribution equipment, which enables the utility to defer more costly infrastructure investments, which would otherwise be required to maintain electricity services for customers. The project is being completed with *Renewable Energy Systems Canada* and is expected to be completed in 2020.

GHG Reductions Summary

In 2019, Toronto Hydro achieved a reduction in GHG emissions as a result of its CDM projects, renewable energy generation and operational initiatives (related to fleet and facilities) compared to 2018.

	Energy Saving	GHG Reduction ²⁰
CDM Projects 2009-2019	2,637 GWh	134,353 tCO ₂ e
CDM Projects 2019	198 GWh	3,366 tCO ₂ e
	Energy Generated ²¹	GHG Reduction ²²
Renewable Energy Generation Projects 2019	220 GWh	3,740 tCO ₂ e
	Energy Reduction	GHG Reduction ²³
Facilities Energy-Efficiency Projects 2019 (Electricity)	945 MWh	16 tCO ₂ e
Facilities Energy-Efficiency Projects 2019 (Natural Gas)	10,098 m ³	19 tCO ₂ e
	Fuel Reduction	GHG Reduction
Fleet Fuel Efficiency Projects 2019	92,000 L	246 tCO ₂ e
		GHG Reduction
Total 2019 GHG Reduction		7,387 tCO ₂ e

Energy Security and Supply

Toronto Hydro is working to help ensure adequate distribution capacity is available in Toronto. This work also supports the City's objective of ensuring infrastructure resiliency. Toronto Hydro collaborates with Hydro One to mitigate the potential impact of high-risk events that could result from the unplanned loss of critical transmission supply points for central Toronto, supporting key financial and hospital customers.

Investing in the grid - Capital Expenditure Plan

Renewing the grid and replacing aging, deteriorating, obsolete and failing distribution equipment, while meeting the needs of a growing city, is a costly and complex endeavour. To address these challenges, Toronto Hydro develops and implements capital expenditure plans, which outline investment needs and explain how planned investments will achieve outcomes that deliver value for customers.

On December 19, 2019, the OEB issued its rate decision and on February 20, 2020, the OEB issued its rate order, both in relation to Toronto Hydro's 2020-2024 rates application filed on August 15, 2018. In its rates application, Toronto Hydro requested approvals to fund capital expenditures over the 2020-2024 period. The 2020-2024 capital plan continues Toronto Hydro's effort to harden the distribution system to make it more resilient when extreme weather hits.

²⁰ Estimate using 2017 Ontario emission factors published in Environment Canada's National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada.

²¹ Based on renewable generation projects Toronto Hydro has provided interconnections and enabled infrastructure for connecting renewable generation resources.

²² Supra note 20.

²³ Supra note 20.

The capital expenditure plan consists of four main investment categories: system access, system renewal, system service and general plant.

1. **Investments in the System Access category** are driven by statutory and regulatory obligations to provide customers with access to Toronto Hydro's distribution system. This includes investments to connect renewable energy generation facilities, and metering-related investments to maintain compliance with regulations.
2. **Investments in the System Renewal category** target the renewal and refurbishment of distribution assets that have failed or are operating with an unacceptable level of performance risk. These programs focus on remediating assets that pose significant safety, reliability and environmental risks to customers, employees and the general public.
3. **Investments in the System Service category** target system-wide critical issues such as capacity and operational constraints, security-of-supply, safety, system reliability and other considerations for the effective operation of the distribution grid.
4. **Investments in the General Plant category** are essential to Toronto Hydro's 24/7 day-to-day operational activities. These investments include the renewal and upgrade of critical software and hardware systems, vehicles and associated equipment, and facilities.

Preventive Asset Maintenance and Vegetation Management

Toronto Hydro conducts proactive inspection and maintenance work to help mitigate a wide variety of risks. Each year, the Company inspects underground transformers to gather information about their condition and to help reduce the number of equipment failures that may adversely impact the environment. Information gathered through inspections has been used to develop a plan for the removal and replacement of transformers over the next five years. In addition, inspections in 2019 allowed Toronto Hydro to identify and proactively replace transformers that were in poor condition.

The specific maintenance and inspection tasks that Toronto Hydro conducts on its equipment and assets, and their frequencies, have been established using an engineering analysis framework called Reliability Centred Maintenance (RCM). At the heart of this framework is an emphasis on safe operations (both from the perspective of work crews and the public), environmental protection, compliance and equipment reliability. Toronto Hydro adopted this framework in the mid-2000s and periodically reviews and updates its RCM analyses.

To mitigate tree-related interference with Toronto Hydro wires, the Vegetation Management program employs modern arboriculture techniques, which are designed to ensure proper care of trees. For example, when trees adjacent to a distribution line are pruned, adjacent distribution lines are expected to experience a reduction in the number of tree-caused power outages. Tree pruning is conducted in accordance with the City of Toronto's Urban Forestry Tree Pruning Guidelines. On average, Toronto Hydro has been pruning approximately 45,500 trees annually that are adjacent to distribution lines in a manner that minimizes injury to the trees but helps improve system reliability. These vegetation management practices help protect the system against inclement weather by removing vulnerable sections of the tree canopy that may break during high winds or from the accumulation of ice and snow.

Climate Change and Adaptation

One of the core principles in Toronto Hydro's Environmental Policy is to mitigate the potential adverse effects of climate change on the organization. This is also a requirement of Toronto Hydro's ISO 14001:2015 certification. In 2019, Toronto Hydro continued to improve the system's resiliency to extreme weather events caused by climate change. Toronto Hydro also continued to collaborate on climate change adaptation with the City of Toronto and other agencies. The purpose of the improvements and collaboration is to reduce the impacts of climate change on the residents of Toronto.

Climate Change Adaptation – Integration in System Planning

In 2015, Toronto Hydro completed a vulnerability assessment study following the Public Infrastructure Engineering Vulnerability Committee (PIEVC) protocol developed by Engineers Canada. The study conducted a risk assessment for the various components and areas of the distribution system that would be affected by climate change, and the results were used to develop a road map on climate adaptation initiatives.

The majority of the road map was completed by the end of 2017 and since then Toronto Hydro has continued to integrate considerations regarding the impact of climate change and the risks it presents into its operations. As an example, Toronto Hydro implemented procedures requiring consideration of climate risk when planning new projects.

The consideration of temperature and climate projections is an example of climate risk inclusion in the planning process. Toronto Hydro continually reviews sources of climate data to verify that the projections used for planning purposes continue to be valid and widely accepted, particularly as government policy and economic factors continue to influence the direction of future climate. This review is currently completed on an ad hoc basis, however, the review will be a requirement of the system planning guidelines in the project planning process. For example, with this data, Toronto Hydro can use this information to mitigate climate risks to the grid by reviewing and updating equipment specifications, such as the use of tree-proof wire to reduce tree contact risks and associated outages.

Another climate change consideration included in the planning process is proximity of the project to urban flooding areas. Experts predict that flooding will continue to be an issue in the City of Toronto as extreme weather events become more intense and frequent.²⁴ To mitigate this risk, Toronto Hydro plans to install more resilient equipment and infrastructure if a project is planned in an urban flooding area.

Support of the City of Toronto's Resiliency Goals – Urban Flooding Resilience

In 2019, the City of Toronto released a resilience strategy to allow Toronto to adapt and thrive when presented with any challenge, including climate change. One of the components of the resilience strategy is to become a world leader in urban flooding resilience. Toronto Hydro contributed to the flooding section of the resilience strategy through the Urban Flooding Working Group. The working group includes many other organizations, including the University of Toronto, the City of Toronto and

²⁴ Pg 50 https://www.toronto.ca/ext/digital_comm/pdfs/resilience-office/toronto-resilience-strategy.pdf

the Toronto Transit Commission. One of the purposes of this working group was to identify how Toronto would be affected by future urban flooding events and develop recommendations to mitigate the impacts.

The Urban Flooding Working Group developed a number of recommendations including the development of city-wide modelling to identify flooding hazards, assess impacts and map vulnerabilities. This model will allow for a more efficient identification of problematic urban flooding areas. As noted above, Toronto Hydro will include consideration of urban flooding areas in the system planning guidelines. A more accurate model, including aspects such as the sewer infrastructure in Toronto, will allow Toronto Hydro to more effectively mitigate the impacts of flooding, thereby helping to reduce potential power outages. These recommendations were approved by the City of Toronto Council as part of the overall resiliency strategy.

Participation in Industry Discussions

Toronto Hydro continues to be a leader in industry discussions about the awareness of climate change impacts in the electricity generation, transmission and distribution sectors. Specifically, Toronto Hydro contributed to the CEA's Climate Change Adaptation Working Group and the Energy Working Group of Canada's Climate Change Adaptation Platform (organized by Natural Resources Canada). The purpose of these working groups is to help increase the resilience of the energy sector to the effects of climate change.

Additionally, Toronto Hydro is participating in a project led by the Canadian Standards Association (CSA) to develop climate change adaptation solutions within the framework of the Canadian Electrical Code Parts I, II and III. This project involves collaboration with many organizations across the industry and will continue into 2020.

Extreme Weather

According to the City of Toronto's First Resilience Strategy, Toronto is getting "hotter, wetter, and wilder"²⁵ due to climate change. There is a greater number of longer lasting heatwaves and storms, and more extreme cold, wind, ice, and rain. The strategy calls for a need for the City and the critical infrastructure owners operating within it to adapt in the face of these chronic stresses and the acute shocks that they bring.²⁶

In 2019, Toronto Hydro reacted to four extreme weather events. The timely and effective response to these events has been attributed to the proactive work of dedicated employees, as well as to the significant improvements to Toronto Hydro's Disaster Preparedness Management (DPM) Program and processes that have been introduced to the company.

²⁵ Pg 54 of https://www.toronto.ca/ext/digital_comm/pdfs/resilience-office/toronto-resilience-strategy.pdf

²⁶ <https://www.toronto.ca/wp-content/uploads/2019/05/97c7-Toronto-Resilience-Strategy-One-Page-Brief.pdf>

Disaster Preparedness Management Program

In addition to increasing the physical resiliency of the grid to the impacts of extreme weather events, Toronto Hydro continues to develop its DPM Program to improve disaster/emergency response outcomes. The Program involves continued implementation of a comprehensive and industry-leading disaster readiness program that:

- Enhances Toronto Hydro's ability to plan for and operate during a large-scale emergency and/or disaster
- Ensures for effective communication with customers and external stakeholders in anticipation of, during, and following an incident
- Minimizes operational and financial impacts of disaster-related disruptions on Toronto Hydro's customers and operations

Grid Emergency Management (GEM) Team

Toronto Hydro's GEM Team are the custodians of the DPM Program. The team is responsible for:

1. Designing, developing, implementing, sustaining, and enhancing the program in the face of a changing risk environment in the City of Toronto, which includes:
 - a. Employee emergency response readiness
 - b. Facility/system emergency response readiness
 - c. Stakeholder relationship management
2. Coordinating program activities and aligning emergency management and business continuity activities internally and with external stakeholders (e.g. City of Toronto's Office of Emergency Management, Hydro One, the IESO, etc.).
3. Promoting a culture of resilience at Toronto Hydro.

Employee Emergency Response Readiness

Training and emergency exercises are critical for ensuring Toronto Hydro is ready to respond to an emergency. The GEM team has made it a priority to integrate Ontario's *Incident Management System* emergency response methodology into the company's Emergency Response Organization (ERO) framework. The majority of Toronto Hydro's senior management and professional employees have received formal training on their functions within the ERO and how Toronto Hydro would transition into incident response using the ERO under emergency conditions. The ERO framework has been tested through real-life scenarios, which has allowed Toronto Hydro to improve response and recovery efforts.

In 2019, five table-top exercises were conducted internally to provide senior leaders with opportunities to practise emergency response activities. These exercises tested specific training and processes and enabled Toronto Hydro to introduce improvements to company emergency response plans. Additionally, Toronto Hydro participated in three externally run exercises which are detailed below.

Facility/System Emergency Response Readiness

In 2019, GEM and the Distribution Grid Operations teams made several improvements to emergency facilities to make them more response-ready. This included introducing/optimizing several response information management systems to facilitate more effective exchange of real-time information during an event including:

- DisasterLAN system integration with the City of Toronto, enabling exchange of real-time emergency information with the City's Office of Emergency Management
- Streamlined phone queueing systems, to more effectively manage volume of work at our Local Incident Command Centres across the City

Stakeholder Relationship Management

Toronto Hydro maintains close working relationships with City and industry partners to ensure we have the cooperative structures in place to carry out safe and effective response. These include relationships with first responders and City agencies as well as with regional utility partners.

City Relationship Management

Toronto Hydro is a member of the City of Toronto's Emergency Management Program Committee and Emergency Management Working Group. As a member of these groups, we participate actively in planning/preparing for whole-of-community response to emergencies impacting the City of Toronto. The groups encompass all agencies, boards, commissions, and key partners who play a role in major emergency response within the City. Some of these include:

- City of Toronto Office of Emergency Management (OEM)
- Toronto Water
- Toronto Fire Services
- Toronto Police Services
- Toronto Emergency Medical Services
- Toronto Transit Commission
- Toronto Region Conservation Authority

In 2019, Toronto Hydro participated in two municipally-run emergency exercises: Mojave I and Mojave II. This two-part, operations-based functional exercise was conducted by the City's OEM and focused on a prolonged extreme heat event affecting the City of Toronto and southern Ontario, resulting in various social/public health impacts as well as impacts to critical infrastructure. Exercises Mojave I and II brought together 48-82 staff members representing 13 City divisions and six external agencies (both at the operations and senior management level). The exercises resulted in several key recommendations with respect to overall city response readiness and interoperability. Toronto Hydro is working collaboratively with the City's OEM to improve any aspects of heatwave response planning that are relevant to its scope of service.

Additionally, Toronto Hydro participated actively in the 2019 GridEx V exercise. The exercise was conducted by the North American Electric Reliability Corporation's (NERC) Electricity Information-Sharing and Analysis Center and provided the electricity industry with an opportunity to test out detection, response, and recovery protocols for severe and coordinated cyber/physical attacks. GEM and Toronto Hydro's Information Technology (IT) Security group tested the company's ability to respond to the simulated bulk system disruption that will affect the supply of power, cyber, and communication operations (internally and externally). The exercise provided Toronto Hydro's IT and operations groups with an opportunity to identify and close current process gaps, with a view to increasing the overall resiliency of the organization.

Utility Partner Relationship Management

Restoring power after a major storm is a complex task, and a speedy restoration requires significant logistical expertise, along with skilled line workers and specialized equipment. Electric companies affected by significant outages often turn to the industry's mutual assistance network—a voluntary partnership of electric companies from across the country—to help speed restoration.

Mutual assistance is an essential part of the electric power industry's service restoration process and contingency planning. The mutual assistance network is a cornerstone of electric utility operations during emergencies.²⁷ Toronto Hydro is a member of two major mutual assistance groups:

1. North Atlantic Mutual Assistance Group (NAMAG)
The NAMAG is a group of over 30 utilities from across northeastern North America. These utilities work together during major disruptive events to exchange resources and/or internationally during large-scale emergencies.
2. Ontario Mutual Assistance Group (OnMAG)
Toronto Hydro and Hydro One have partnered with the CEA to establish an Ontario-specific mutual assistance group for Ontario's Local Distribution Companies. The aim of this group is to bolster capabilities within the province to respond to province-specific emergencies. The OnMAG is currently in its pilot phase.

Emergency Preparedness for Customers

Emergency preparedness is a top priority for customers. In 2019, Toronto Hydro provided customers with emergency preparedness advice and tips through direct outreach campaigns via newsletters, brochures, and public relations campaigns. Additionally, Toronto Hydro distributed 190 emergency preparedness kits in 2019 to low income residents of Toronto.

²⁷ <https://www.eei.org/issuesandpolicy/electricreliability/mutualassistance/Pages/default.aspx>