Climate Action:

2023 Year-End Status Report

TORONTO HYDRO® Corporation

Executive Summary

Toronto Hydro is pleased to play an important role in helping the City of Toronto achieve its net-zero goals, and to provide this Climate Action: 2023 Year-End Status Report to highlight our recent contributions.

With approximately 75 per cent of the City of Toronto's TransformTO Net Zero Strategy dependent on investments by Toronto Hydro, the company is actively investing to support economy-wide electrification and play a key role in helping customers decarbonize their homes, vehicles and businesses. To meet the climate challenge and ensure electrification remains an option for everyone, Toronto Hydro must expand and modernize the grid and invest in helping residents and businesses decarbonize.

In 2021, we developed a Climate Action Plan to support the City's net-zero vision, and we were proud to receive our mandate and then a Memorandum of Understanding for expanded climate action from Toronto City Council in May 2023 to help us facilitate a coordinated, collaborative approach to advance decarbonization aligned with the City of Toronto's goals. Our Climate Action Plan and the mandate from the City of Toronto provided a key foundation for our 2025–2029 grid and operations investment plan to expand, modernize and sustain the local electricity grid so that power continues to be readily available as more and more customers electrify their homes and businesses. This multibillion dollar plan includes investments to ready Toronto Hydro's grid and operations for an anticipated doubling in customer electrical demand in the coming decades, while modernizing the grid to improve system performance, enable greater customer choice in renewable energy use and reduce costs.

2023 was a foundational year for Toronto Hydro, as we accelerated investments in the people and partnerships necessary to deliver electrification programs at scale. In our first year with a new climate action mandate and dedicated Climate Action team, we helped remove barriers to over 900 solar, heat pump and electric vehicle projects — at no charge to customers.

This report highlights a dozen projects that demonstrate our commitment to respond to the increasingly urgent need for climate action. Six of these projects highlight how we're readying the grid for an electrified future, while the six others demonstrate how we're working with our partners to make it faster, easier and more affordable for customers to adopt clean energy technologies. These projects are a sample of the many initiatives underway to electrify buildings and transportation, build solar and storage capacity, and help dependable cleantech companies grow the products and services that are integral to Toronto's shift to a sustainable economy.

Toronto Hydro is proud to be a cornerstone partner in helping the City of Toronto achieve its net-zero 2040 vision.

Table of Contents

1. Climate Action at Toronto Hydro

1. Climate Action at Toronto Hydro

1.1 Toronto Hydro's Expanded Climate Action Mandate

Toronto Hydro-Electric System Limited (Toronto Hydro) owns and operates the electrical distribution system that serves Canada's largest and North America's second-fastest growing city.[1] The utility serves over three million residents, 28 million visitors annually, 100,000 businesses, more than 35 hospitals and post-secondary institutions, and the country's financial centre. Toronto Hydro distributes approximately 18 per cent of all electricity consumed in Ontario.

While Toronto Hydro's demand has been largely flat for two decades — a result of investments in conservation and energy efficiency that helped offset significant growth in Toronto — market evolution, public policy and changing preferences are shifting this trajectory. Governments have adopted greenhouse gas (GHG) emission targets and introduced incentives and requirements for fuel-switching to clean energy sources. In particular, the City of Toronto (City) has adopted an accelerated climate action strategy — the TransformTO Net Zero Strategy — to reduce community-wide GHG emissions to net zero by 2040.[2]

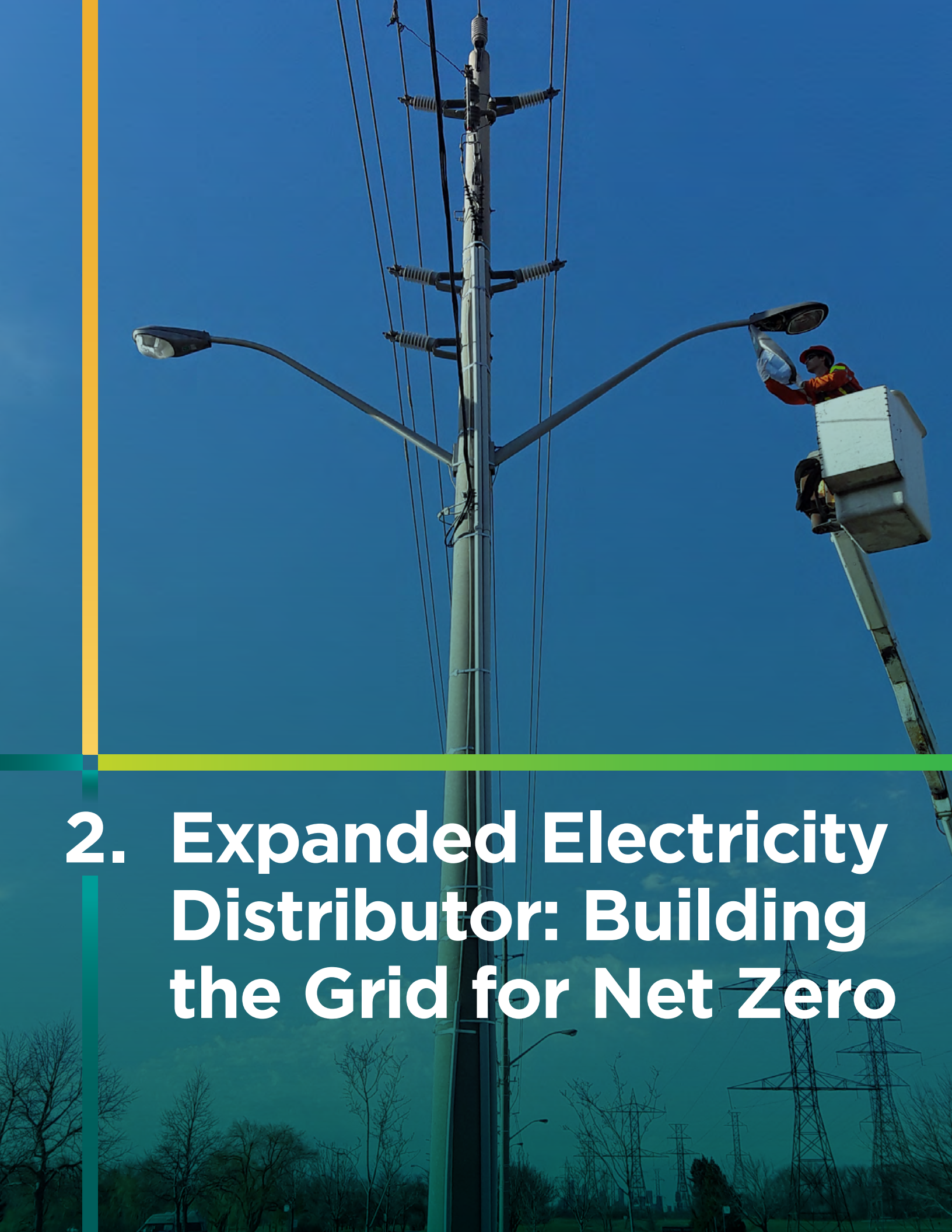
In turn, customers are increasingly adopting advanced electrified technologies — such as electric vehicles (EVs), solar panels, home energy storage, heat pumps and electric water heaters — increasing both demand and customer service expectations.

In light of Toronto Hydro's foundational role in building and operating the distribution system that will support this electrified future, Toronto Hydro developed an industry-leading Climate Action Plan (CAP) to help facilitate the City's net-zero 2040 vision.[3] Toronto Hydro's CAP identified two key areas of focus:[4]

1. **Expanded Electricity Distributor:** Toronto Hydro must substantially expand and modernize its existing, regulated electricity distribution business to build a grid capable of supporting the City's TransformTO Net Zero Strategy. Significant investments in non-wires alternatives and intelligent grid technology will optimize existing grid capacity. Expanding investments in poles and wires will improve reliability and enable the electrification of transportation and buildings at an affordable cost. The Expanded Electricity Distributor initiative is focused on direct action Toronto Hydro can take to support local climate goals.

2. **Climate Advisory Services:** This area involves working closely with customers, cleantech companies, funders (such as Natural Resources Canada) and other stakeholders to remove barriers and enable efficient electrification of critical sectors, such as transportation and buildings. This initiative is focused on Toronto Hydro facilitating action by customers and other third parties to support local climate goals.

In June 2022, Toronto Hydro received universal support from City Council to pursue these focal areas and take on a new, expanded mandate for climate action. In May 2023, City Council unanimously approved the corresponding Memorandum of Understanding (MOU) on Climate Advisory Services to coordinate the City and Toronto Hydro's outreach to customers.[5] Toronto Hydro has since turned this mandate into action by establishing a permanent Climate Action team, achieving early climate wins and developing programs to support customers with their own climate action initiatives.



2. Expanded Electricity Distributor: Building the Grid for Net Zero

2. Expanded Electricity Distributor: Building the Grid for Net Zero

2.1 Toronto Hydro: A Critical Player in Climate Action

To meet the climate challenge, Toronto Hydro must expand and modernize the grid to ensure electrification remains an option for everyone. Through its Expanded Electricity Distributor initiative, Toronto Hydro is committed to making the necessary investments to enable the cost-effective electrification of critical sectors of the economy without compromising reliability.

The City's TransformTO Net Zero Strategy recognizes that most GHG emissions come from two sources: natural gas for space and water heating in buildings (56 per cent) and gasoline/diesel for personal and commercial vehicles (35 per cent).[6] To electrify these sectors, Toronto Hydro must make significant investments to grow and modernize the distribution system in addition to investments that support a growing city.

Toronto's population is projected to grow by approximately 23.8 per cent between 2021 and 2031, a significant rise from the 6.8 per cent growth over the previous decade (from 2011 to 2021).[7] The city will need new housing, transit solutions and infrastructure, all of which will be serviced by Toronto Hydro's grid. Toronto Hydro's Future Energy Scenarios modelling suggests that the system peak may shift to winter in the 2030s as buildings begin to electrify heat, and that electricity demand overall may double by 2050.[8]

Whether the supply to meet these needs comes from large facilities outside Toronto (e.g., nuclear power plants, hydro-electric dams, wind farms, energy storage) or within its borders (e.g., rooftop solar panels, battery energy storage), the importance of more and smarter local distribution infrastructure cannot be overstated. This infrastructure is essential to ensuring that electricity is efficiently transported from where it is generated to where it is needed every instant of every day. Approximately 75% of the City's TransformTO Net Zero Strategy relies on these investments by Toronto Hydro, underscoring the utility's pivotal role in achieving net zero.[9]

Toronto Hydro has recently implemented a series of measures to protect the environment and work towards achieving net-zero emissions in its own operations by 2040.[10] The utility is replacing fossil fuel-powered cars, trucks, furnaces and hot water heaters with equipment that operates on clean electricity.[11] As a testament to Toronto Hydro's dedication to climate action, the company has implemented corporate key performance indicators directly linked to its emissions reduction goals, in addition to other important measures such as health and safety, reliability, responsiveness to customers, and financial performance.[12]

2.2 Past Investments: Ready for Electrification

Toronto Hydro is well prepared to take on the challenge of rapid, economy-wide electrification. Through steady investments over the past two decades to sustain, expand and modernize the grid, the average length of customer outages has been reduced by 26 per cent and the utility has the capacity available through its system today to handle customer electrification requests through to the end of this decade.

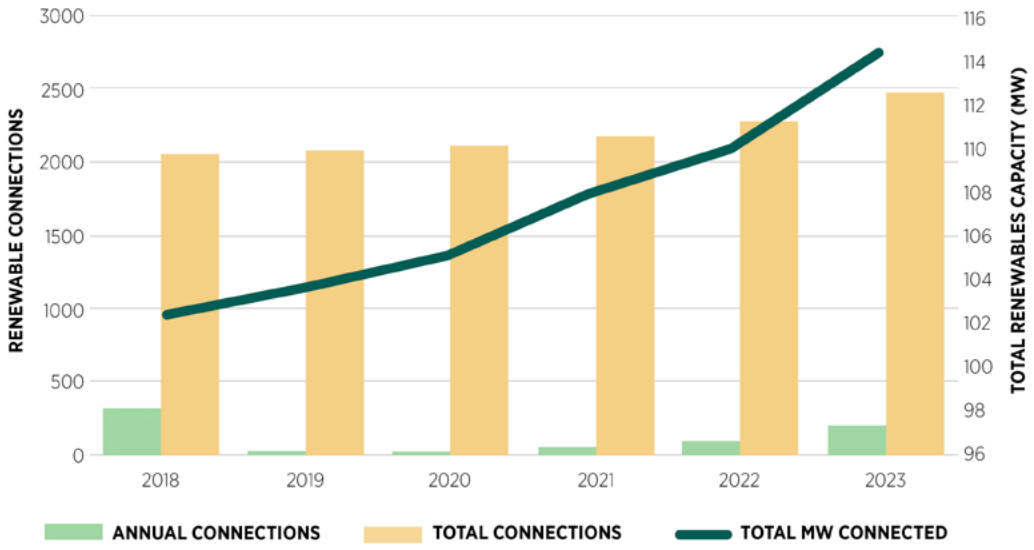
The most significant part of Toronto Hydro's recent investment plans has been to renew aging and deteriorating infrastructure and bring equipment up to modern standards. These foundational investments are critical to maintaining system performance; mitigating safety, reliability and environmental risks; serving a growing city; and enhancing the grid's capacity to connect electrified technologies such as EVs, heat pumps, solar panels, batteries and hot water heaters.

In addition to renewing the grid's physical infrastructure, Toronto Hydro has also invested in modernizing the grid's technology systems. The utility's grid modernization strategy has focused on accelerating the deployment of digital field and operations technologies that can deliver future benefits to customers, including better outage restoration capabilities, improved grid resilience and enhanced operational flexibility to manage increasing loads and bi-directional power flows.

Toronto Hydro's Smart Grid program, first developed approximately two decades ago, was a series of initiatives designed to enhance grid visibility and communication, and prevent problems before they occur. For example, the Network Condition Monitoring and Control initiative, launched between 2015 and 2019, has sought to improve the monitoring of network vaults through early identification of potential concerns. Over the last two years, sensors have triggered over 100 alarms that have helped prevent potentially catastrophic vault flooding and other failures, such as oil spills. Additionally, deploying over 400 smart switches from 2020 to 2022 has enabled control room operators to better manage electricity flow and reroute power when faults occur, reducing the number and length of customer outages. These investments pave the way for a more interactive grid that empowers customers to store, buy and sell power while laying the foundation for further future automation. The utility has also supported the growth of new residential and small business solar installations, which have roughly doubled each of the last three years for a total increase of approximately 760 per cent from 2020 to 2023.

Continued investments in grid modernization are not only critical for integrating the 2,400 solar projects currently connected to Toronto Hydro's grid, but also for the thousands more that are anticipated over the next decade.

Figure 1: Renewable Connections by Toronto Hydro



Part of Toronto Hydro's grid modernization strategy includes using technologies and practices that enable optimized use of existing infrastructure. These "non-wire solutions" (such as demand response) enable the utility to defer certain upgrades by reducing system constraints at times of maximum demand. These practices, often deployed in partnership with customers or enabling third parties (i.e., aggregators) aid in alleviating capacity constraints in high-growth areas of the grid in a cost-effective way. First established in its 2015–2019 Distribution System Plan, Toronto Hydro has targeted 10 MW of demand response capacity around two stations in Etobicoke.[13] In its 2025–2029 Distribution System Plan currently before the Ontario Energy Board (OEB), Toronto Hydro has proposed procuring up to 30 MW of demand response capacity at six stations across its service area.[14]

2.3 Future Investments: Stewardship, Modernization and Further Growth

While recent investments in sustaining and expanding the system have served the utility and its customers well, getting to net-zero emissions demands not only a bigger grid, but a more efficient, resilient and intelligent system as well.

Toronto Hydro's 2025–2029 investment plan[15] proposes billions in investments to expand, modernize and sustain the electricity grid so that power continues to be readily available as more and more customers plug in their new heat pumps, EVs and other equipment as part of the broader societal push towards electrification and decarbonization.[16]

With significant increases in peak demand anticipated in the early 2030s and knowing that many system investments have long lead times, Toronto Hydro must plan and invest now to ensure that the distribution system can deliver reliable power to its customers in the future. For example, to accommodate future growth in the Downsview area of Toronto, the utility must begin developing a new 174 MW transformer station now, even though the station will not be ready to serve customers until 2033. Overall, Toronto Hydro plans to add hundreds of megawatts of capacity in new projects over the next decade.[17]

Toronto Hydro's new Grid Modernization Strategy is a significant step towards transforming the existing grid into a technologically advanced distribution system. Comprising of three pillars — Intelligent Grid, Grid Readiness and Asset Analytics — this strategy is designed to enhance reliability, resiliency and monitoring. It also aims to efficiently integrate the expected surge in customer-owned renewables and leverage advanced data analytics for better decision-making. By implementing this strategy, Toronto Hydro is not only preparing for the future but also ensuring a more reliable and efficient power supply for its customers, an important benefit of this initiative.

One key investment in Toronto Hydro's plan is the introduction of the next generation of smart meters, also known as Advanced Metering Infrastructure 2.0. These new smart meters are solar-ready by default and support two-way power flows. This means that customers who install solar and energy storage systems can do so without the need to upgrade their meter, thereby reducing connection time and costs. The smart meters will also work in tandem with new sensors strategically deployed across the distribution grid to provide detailed insights into customer and grid-side power flows. This will offer a more accurate view of the grid, enabling Toronto Hydro to make more informed decisions and replace hundreds of thousands of residential, small commercial and industrial meters by the end of the decade.[18]

Toronto Hydro is strategically planning new investments to enhance our customers' ability to connect renewables to the grid while continuing to ensure their safety and reliability. These investments, amounting to tens of millions of dollars, will remove grid constraints that currently hinder the connection of customer solar and energy storage systems.[19] Additionally, the utility is set to install hundreds of new monitoring and control systems, which will significantly improve our awareness and control of large distributed energy resources (greater than 50 kW) and enhance radio communications between distributed energy resources facilities and Toronto Hydro's Control Centre. As part of this plan, two-way radio communications started to be installed in 2020 and have already been completed at more than 100 sites.[20]

Toronto Hydro recognizes that significant changes are coming to the electricity sector, partly due to evolving technologies and changing customer preferences. To ensure that the utility is ready to adapt and can benefit from these changes, Toronto Hydro has asked the OEB for permission to allocate approximately $16 million from 2025 to 2029 to set up a Technology Innovation Fund.[21] If approved by the regulator, the fund will be overseen by a steering committee of senior leaders through phases of pilot selection, design, execution and evaluation. Projects under initial consideration include pilots to explore areas such as flexible connections for customer-owned renewables and storage, managed charging of commercial EV fleets, EV demand response, coordinated operation of EV fleets, and advanced microgrid concepts.[22]

2.4 Project Profiles

The following projects are examples of initiatives underway within Toronto Hydro's electricity distribution business to expand and modernize the grid, thereby enabling the TransformTO Net Zero Strategy. These initiatives demonstrate Toronto Hydro's commitment to getting more use out of existing equipment and building a smarter, more efficient and reliable grid to enable customer electrification.

Accelerating solar and energy storage

Load and hosting capacity map

Renewable-enabling battery energy storage

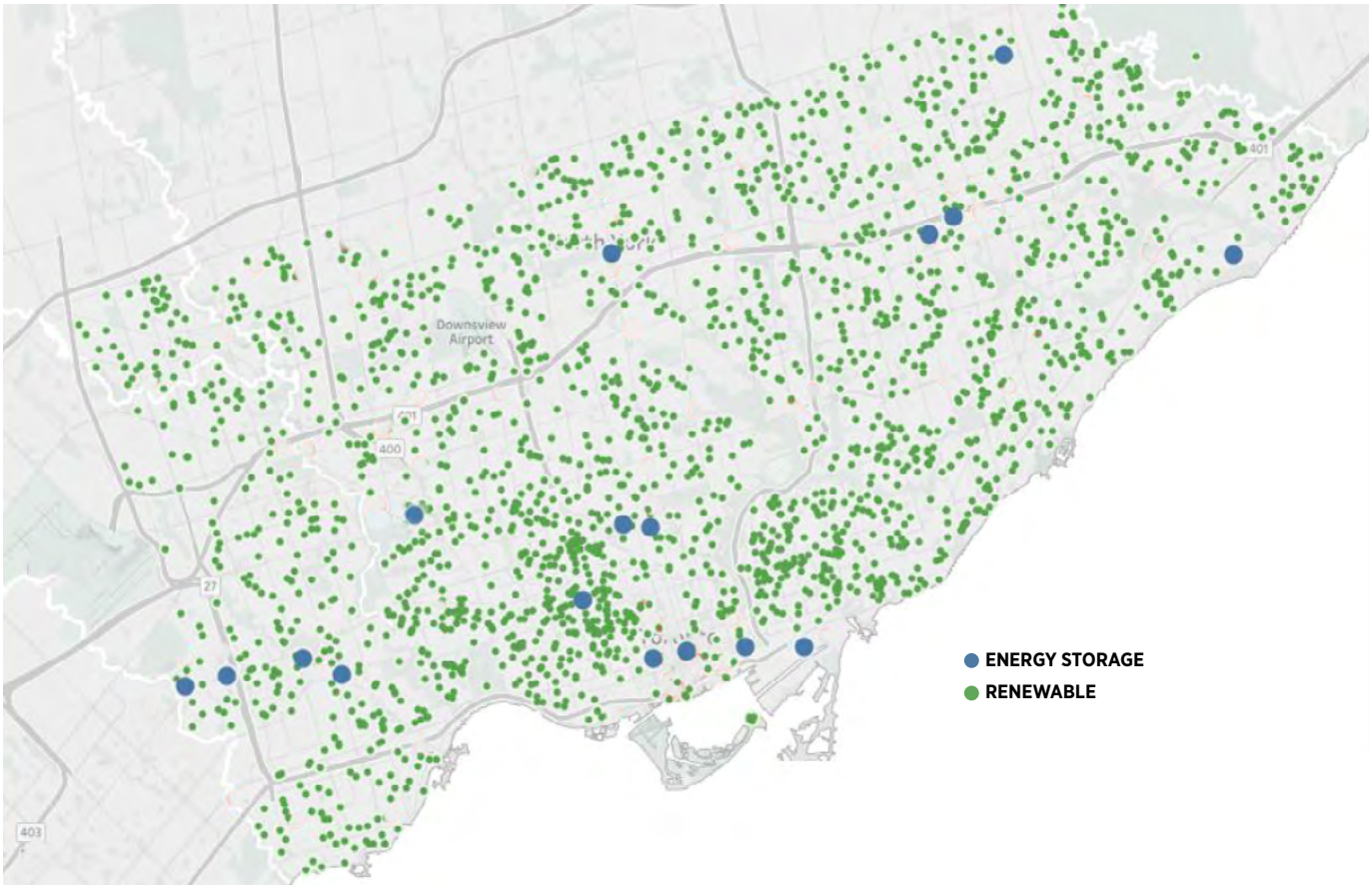
Automated power restoration

Flexibility services

New dedicated support for customer connections

PROJECT PROFILE

Accelerating Solar and Storage



Toronto Hydro is committed to streamlining the solar and energy storage interconnection process to make it faster, cheaper and easier for customers to connect. Recent efforts to improve the connection process for customers include:

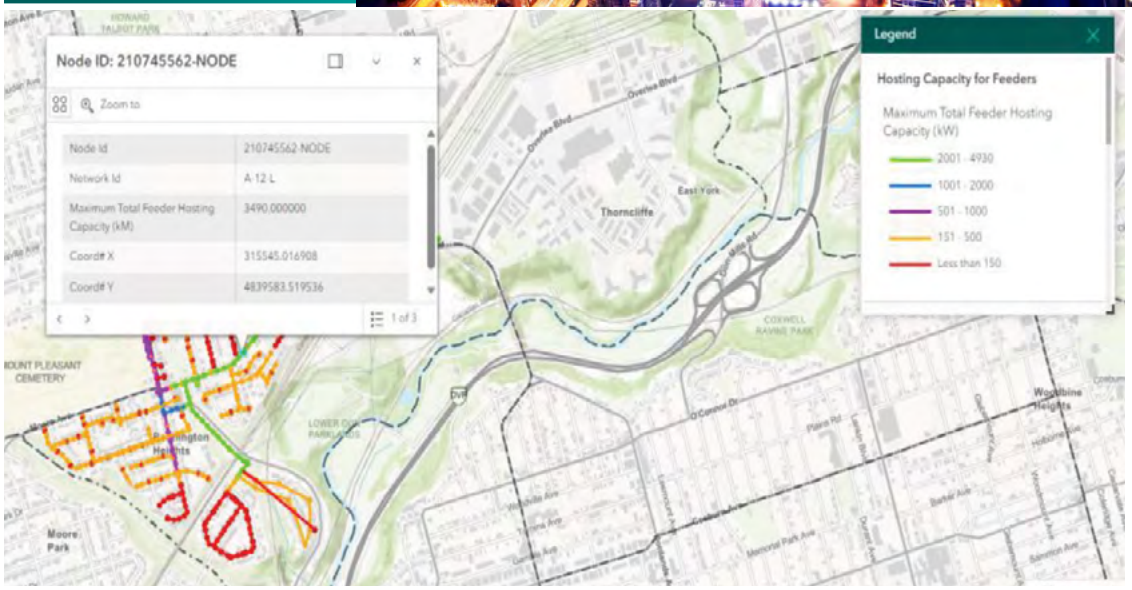
- Removing solar and energy storage system size restrictions for almost all customers
- Reducing application and Connection Impact Assessment costs by as much as $1,000 for systems between 10 kW and 250 kW
- Conducting webinars to increase customer interest and knowledge in rooftop solar and net-metering billing

Toronto Hydro has also started installing bi-directional meters for all customers so that every home and business can connect solar or storage more quickly and cheaply.

We're also working with the City and The Atmospheric Fund to identify opportunities to accelerate the deployment of solar and batteries across the city.

PROJECT PROFILE

Load and Hosting Capacity Maps



Toronto Hydro is committed to developing a system-wide mapping tool so customers can quickly check if the grid can connect their solar, storage or electrification project. This visualization of available capacity will assist customers in planning their projects while allowing the utility to optimize planning, costs, and lead time for renewables and load growth. Toronto Hydro completed a best practice review of solar, storage and load capacity tools in 2023 and is planning to launch an initial hosting capacity address lookup tool in Q1 2025.

Hosting capacity maps can better inform the proper siting of projects to optimize the network and reduce grid upgrade costs. However, many of the initial solar and storage capacity maps published by utilities suffer from inaccurate data, undermining user confidence. Toronto Hydro has applied for Natural Resources Canada funding with federal government research centre CanmetENERGY to create a map prototype to improve quality, reduce implementation costs and promote an intelligent, demand-responsive grid.

PROJECT PROFILE

Renewable-Enabling Battery Energy Storage

Building on nearly a decade of experience in battery energy storage systems, Toronto Hydro is advancing plans to use batteries to support the growth of customer-owned renewables. While Toronto Hydro is encouraging customers to connect renewables, certain parts of the grid can become destabilized when there is a significant amount of generation on a feeder. The targeted installation of battery energy storage systems can correct these issues by balancing loads, allowing more customers to install renewables.

From 2025 to 2029, Toronto Hydro plans to invest in nine battery projects in critical areas (including one in 2025) with a combined capacity of 10.2 MW to address the current and forecasted impact of solar systems on the grid.

Toronto Hydro is also working to optimize battery energy storage deployment by leveraging its corporate-academic partnership with the Toronto Metropolitan University Centre for Urban Energy.

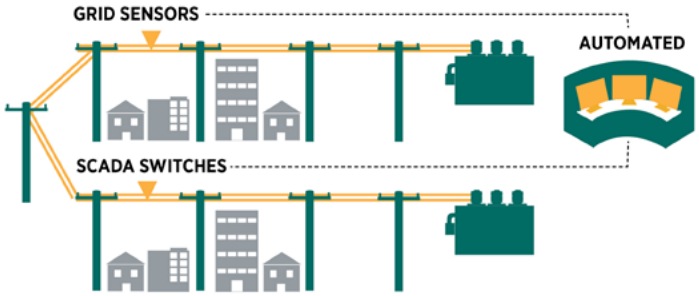
PROJECT PROFILE

Automated Power Restoration

As part of its grid modernization strategy, Toronto Hydro is advancing towards automated power restoration by investing in grid sensors, automated switches and controls, and Fault Location, Isolation and Service Restoration (FLISR).

Once fully deployed, this technology will significantly minimize the frequency and duration of customer outages, and repair crews will be able to pinpoint exact outage locations.

Toronto Hydro has implemented the first phase of controlled FLISR deployment at two stations. Plans are underway for subsequent deployment across all stations to fulfill automated system deployment in the horseshoe areas of the grid (outside the downtown core) in the 2030s.



FLISR is a centralized software system that manages switches and controls to automatically detect the location of a fault (power outage), isolate the affected section and reroute power so that as many customers as possible can have power while the system is being repaired.

PROJECT PROFILE

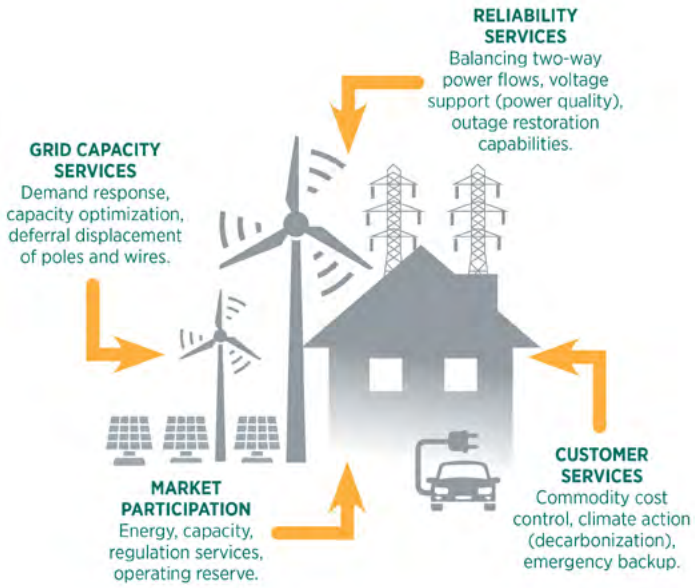
Flexibility Services

Building on its operating experience in local demand response since 2018, Toronto Hydro will be broadening customer participation in these programs by introducing an online capacity registration and offer platform.

The development of a web-based capacity registration and offer platform by our partners at Toronto Metropolitan University's Centre for Urban Energy will allow Toronto Hydro to competitively procure demand response services across its service area.

This platform will create a simple way for customers and aggregators to participate in Toronto Hydro's demand response program. It will also create a financial incentive for customers to install batteries or develop demand response capabilities where they can assist in alleviating grid capacity constraints.

Additionally, in 2025, Toronto Hydro is exploring expansion of its demand response programs from the current four-hour blocks to shorter two-hour blocks, thereby enabling participation from a wider variety of customers.



PROJECT PROFILE

New Dedicated Support for Customer Connections

In March, Toronto Hydro began using a dedicated team of Customer Connection Associates to guide customers of all types through our connection processes.

Customer Connection Associates will be the single point of contact for connecting customers, centralizing the customer intake process and serving as the main point of contact for customers on questions related to the status of their connection request.

The aim of this change is to provide customers with a more consistent experience as well as a knowledgeable contact to resolve any issues that might arise in the connection process.

This initiative, along with a new customer connection portal, is part of Toronto Hydro's ongoing effort to make it easier for customers to electrify their homes and businesses.

3. Climate Advisory Services: Getting Customers to Net Zero

3. Climate Advisory Services: Getting Customers to Net Zero

3.1 Removing Barriers and Scaling Up Climate Action in Toronto

Toronto Hydro's Climate Advisory Services involves partnering with customers and local cleantech businesses to accelerate the adoption of clean technologies to achieve the following goals:

Delivering nationally significant emissions reductions.

Stimulating and facilitating the local cleantech economy.

Advancing social equity in Toronto.

To achieve these goals, Toronto Hydro's Climate Action team works directly with customers — free of charge — to encourage and help them to find personalized, sustainable energy solutions. This offering helps make it easier, faster and more affordable for customers to adopt clean energy technologies. It also helps dependable cleantech companies grow by promoting their products and services to customers. In short, Toronto Hydro is enabling projects in Toronto that electrify buildings and transportation, build solar and storage capacity, and enhance energy efficiency to accelerate the shift to a sustainable economy.

Toronto Hydro has a proven track record of achieving significant environmental outcomes at scale. During the 14 years when it had a provincial mandate to implement conservation programs, Toronto Hydro helped deliver over one million projects worth approximately $1.9 billion that produced 3.06 Terawatt hours (TWh) of electricity savings for customers. Through Toronto Hydro's efforts and those of its climate action partners, it now aims to spur electrification on a wide scale by assisting with over 400,000 building and transportation electrification projects by 2040 (see Figure 2). These critical emission reduction projects will eliminate natural gas, gasoline and diesel costs by electrifying buildings, cars and trucks, resulting in customers spending less of their income on energy over the long term.

Figure 2: Summary of Climate Advisory Services Business Profile

Technology	Value-Added Climate Action Offerings Include	Program Size		Impact 2040
	Support customer access to products and services *Connect customers with trusted cleantech service providers* *Enable access to funding* *Help build personalized climate action plans* *Low-income program support* *Cleantech Services Network*	60,000+	Air source heat pumps + electric hot water heaters	15% of all buildings
		50,000	Chargers	Serving 1 million+ EVs
		300	Megawatts (MW) of local generation	300,000 projects

3.2 Year-in-Review

2023 was a foundational year for Toronto Hydro, as it received an expanded climate action mandate from the City in May[23] and invested in the people and partnerships necessary to deliver electrification programs at scale over the coming decades. Since then, Toronto Hydro has established a dedicated Climate Action team to support our customers and implement climate action initiatives throughout the company. This team actively encourages and enables customer emissions reduction projects and works with internal Toronto Hydro staff as well as key external partners, such as the City, to help achieve net-zero emissions.

While Toronto Hydro has been focusing on laying the groundwork for future success, the company is always committed to measuring its progress. Toronto Hydro is proud to report that it recently removed barriers for over 900 solar projects, heat pumps and EV chargers. In 2023, Toronto Hydro supported a major financial institution and a significant commercial developer with multiple solar rooftop projects across the city. Toronto Hydro also assisted the Toronto Community Housing Corporation in procuring assessments of 800 kW in solar power. The utility also helped a condominium board evaluate decarbonization options and replace existing gas-fired boilers with heat pumps. These accomplishments and the climate action initiatives described in **Section 3.4 Project Profiles** demonstrate Toronto Hydro's ability to mobilize and deliver quick and valuable results in collaboration with key partners.

3.2.1 Partnerships

In its 2021 Climate Action Plan, Toronto Hydro recognized that it would need to forge partnerships with cleantech companies, community organizations, funding partners and, most importantly, the City of Toronto to achieve significant emissions reductions. Accordingly, Toronto Hydro reached out to cleantech companies, academic institutions, banks, not-for-profits and others to identify opportunities for collaboration. Toronto Hydro has now established working relationships with approximately 50 partners on research initiatives and to deliver various programs/events focusing on increasing electrification knowledge among customers and industry stakeholders.

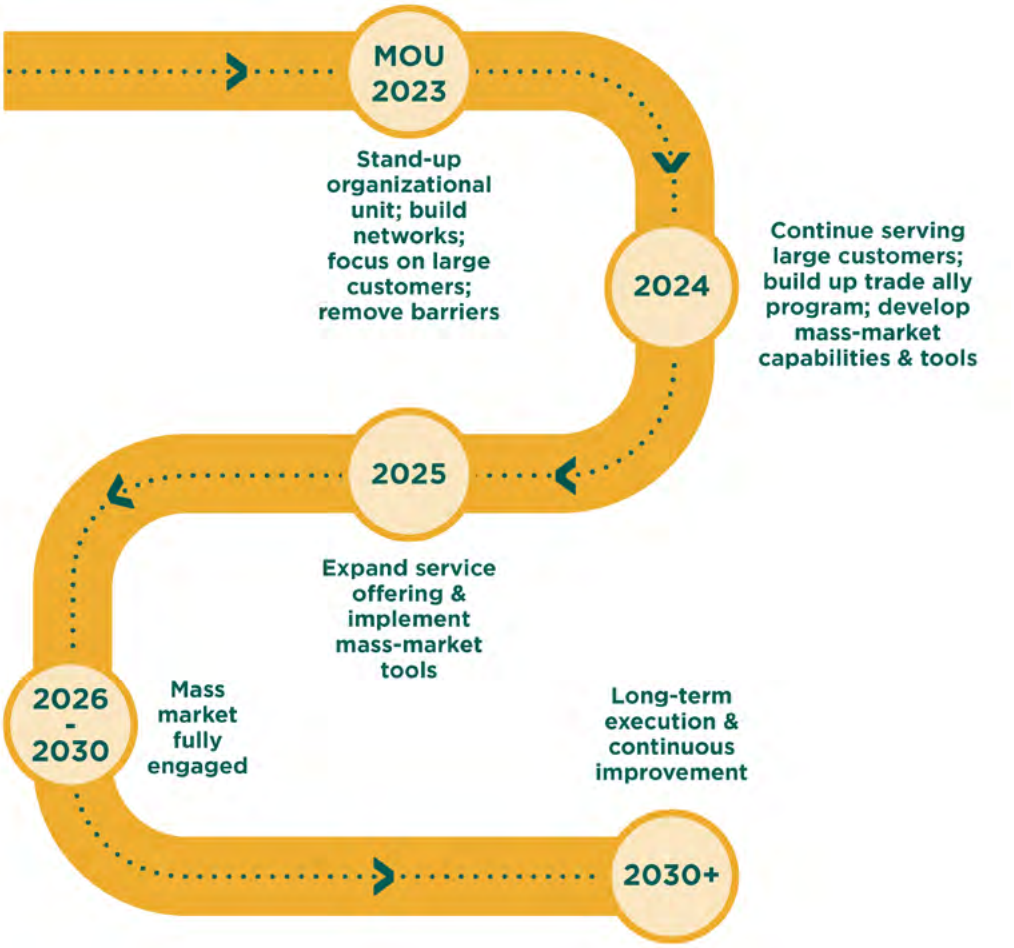
The City is the cornerstone partner of Toronto Hydro's efforts to spur customers to electrify their homes and businesses. Following the MOU being signed early in 2023,[24] Toronto Hydro and City staff now work together daily at a climate change project level to coordinate efforts, learn from each other and deliver maximum value to ratepayers and taxpayers. Toronto Hydro is a member of the City's Net Zero Climate Leadership Table and has monthly meetings with senior members of the City's Environment and Climate Division as well as regular engagements on specific topics such as solar, EVs and building decarbonization.

Other key partnerships include longstanding allies such as Plug'n Drive and Toronto Parking Authority (TPA), industry stakeholders such as the Building Owners and Managers Association (refer to **Decarbonization Accelerator Program**) and community organizations such as Toronto Home Retrofits (refer to **Toronto Home Retrofit Collaboration**). Toronto Hydro has also established foundational partnerships with the federal government to increase knowledge on heat pump technology through collaborations with the Privy Council and National Resources Canada. These partnerships have enabled Toronto Hydro to establish research agreements and train contractors on heat pump resources.

3.3 Next Steps for Climate Action at Toronto Hydro

In 2023, Toronto Hydro developed a multi-year business plan to set out how to encourage and support customers as they electrify. The business plan governs how Toronto Hydro's Climate Action team ramps up its resources and offerings, identifies and targets key market segments, and leverages relationships to reduce emissions as quickly and cost-effectively as possible. Figure 3 provides a high-level roadmap of the business plan and how Toronto Hydro plans to shift its focus from developing its internal capacity to larger customers, to residential and small business customers.

Figure 3: Climate Advisory Services Development Roadmap



In 2024, Toronto Hydro will move to subsequent phases of the development roadmap to focus on connecting customers as they electrify their homes and businesses. To be successful at scale, Toronto Hydro must broaden its outreach among large customers and develop mass-market capabilities for outreach to its residential and small business customers.

From 2024 to 2026, and in collaboration with several partners, Toronto Hydro plans to contact the owners of 10,000 large- and medium-sized buildings to encourage them to participate in the Decarbonization Accelerator Program. As described in the project profile, this program aims to assist multi-unit residential, industrial, commercial and institutional customers in assessing and understanding their options for decarbonization and electrification.

Toronto Hydro will also launch its Cleantech Services Network in late 2024 to match interested customers with trusted cleantech companies to accelerate the deployment of clean energy technologies and decarbonization efforts. Over the next two to three years, Toronto Hydro plans to expand its Cleantech Services Network to cover the full breadth of clean energy trades necessary to support EVs, heat pumps, electric hot water, renewables and storage. For transportation electrification, plans to prioritize collaborations with EV fleet providers. For residential and small business customers, efforts in 2024 will centre on gaining insights into customers' needs and barriers to action. This work will lay the foundation for the data-driven deployment of mass-market programs in 2025 and beyond. Ongoing efforts include field trial deployments (refer to **Heat Pump Field Trial**), home visits to understand the experience of electrifying customers (refer to **Toronto Home Retrofits Collaboration**) and the development of self-assessment tools, such as panel size calculators. A vital component of this work is education and communication through website content, webinars, participating in community events such as the Toronto Home Show, and targeted use of social media.

3.4 Project Profiles

Toronto Hydro's potential to affect real change by working directly with customers can already be seen in some early successes. The following projects are examples of the initiatives Toronto Hydro is designing, developing and delivering.

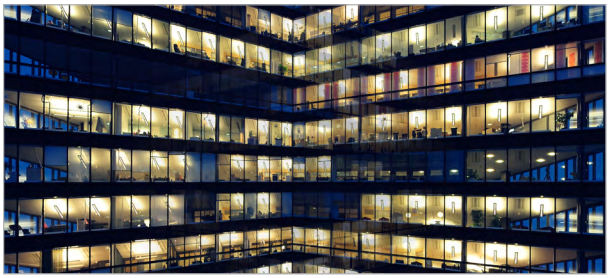
Heat pump field trial

Cleantech Services Network

Toronto Home Retrofits (THR) collaboration

Toronto Parking Authority (TPA) EV chargers

Climate Action Kiosk



Decarbonization Accelerator Program

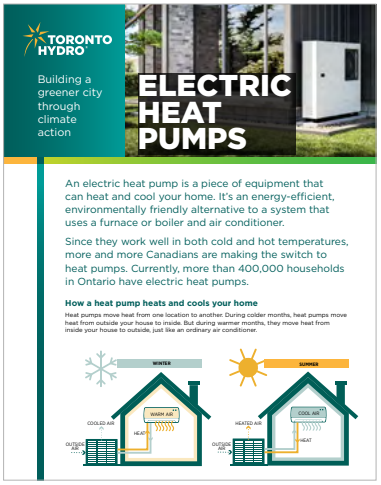
PROJECT PROFILE

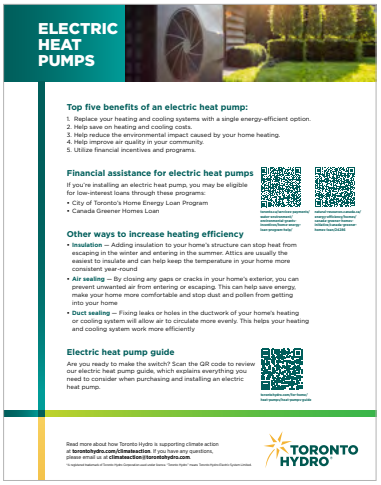
Heat Pump Field Trial

Toronto Hydro is collaborating with behavioural scientists in the federal government's Privy Council Office to test the effectiveness of different messages to encourage heat pump interest and installation.

- Toronto Hydro established a new heat pump web page and engaged 80,000 households
- Each customer was randomly assigned to receive an email framing the advantages of heat pumps in one of five different ways, namely:
  - Functionality (heat pumps equipped with both warm and cool air)
  - Social norms (they are becoming more popular)
  - Environment (they reduce reliance on fossil fuels)
  - Air quality (they improve it)
  - All of these combined
- Toronto Hydro will assess changes in heat pump uptake after one year

Compared to the other concepts, participants who opened the email were more likely to click the "Learn more" option in the emails highlighting heat pumps' functionality (11.1 per cent) and social norms conditions (9.4 per cent). Toronto Hydro plans to continue this research by sending more emails to gauge public interest in heat pumps.





PROJECT PROFILE

Cleantech Services Network

Toronto Hydro is developing a Cleantech Services Network to match customers with trusted cleantech companies to expedite the deployment of clean energy technologies and accelerate decarbonization efforts. Efforts in 2023 focused on program design, with the program expected to launch later this year. Through this program, pre-qualified service providers will connect directly with customers to develop customized climate action plans and support building electrification. The program will also provide contractor training to improve their capacity to engage in electrification projects.

Toronto Hydro recently conducted a full-day training session with Heating, Ventilation and Air Conditioning (HVAC) contractors on heat pump sizing, selection and installation in collaboration with Natural Resources Canada Local Energy Efficiency Partnerships. The session concluded with a deep dive into strategies for configuring hybrid systems that use heat pumps and furnaces to optimize energy savings, reduce GHG emissions and lower costs.

Toronto Hydro will expand the Cleantech Services Network over the next two to three years to cover the full breadth of clean energy trades necessary to support EVs, heat pumps, electric hot water, renewables and storage.

PROJECT PROFILE

Toronto Home Retrofits (THR) Collaboration

Toronto Hydro is partnering with the local non-profit Toronto Home Retrofits (THR) to overcome barriers and accelerate the decarbonization of single-family homes.

- THR uses a “neighbours helping neighbours” volunteer-led model to assist homeowners in retrofitting their homes
- Toronto Hydro is providing seed funding for THR to hire staff and expand its retrofit coordination service across Toronto
- Toronto Hydro has also embedded a staff member into THR who will accompany the team on home visits to better understand the realities of customers attempting to electrify

PROJECT PROFILE

Toronto Parking Authority (TPA) EV Chargers

Since 2020, Toronto Hydro has supported the Toronto Parking Authority (TPA) in installing and connecting on- and off-street EV chargers.

- In 2023, the TPA (with the support of Toronto Hydro) installed 193 off-street and 50 on-street charging stations, which will be energized and operational in 2024

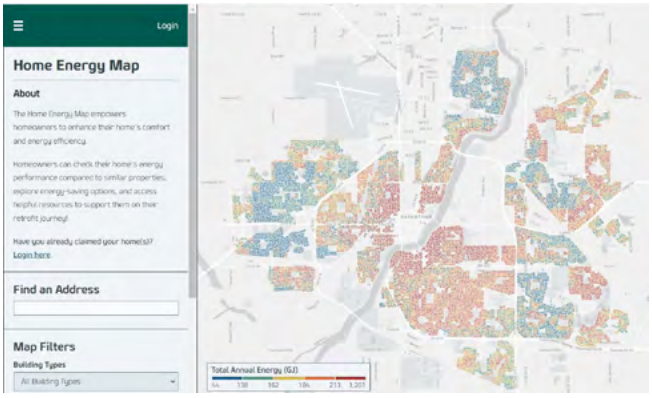
- Toronto Hydro also sold its 32 off-street and 47 on-street public charging stations to the TPA to add to its Green P parking network

Toronto Hydro continues to assist the TPA in adding charging stations to Green P parking lots.

PROJECT PROFILE

Climate Action Kiosk

Toronto Hydro and the City of Toronto's Environment & Climate Division are developing a digital tool to support carbon awareness, education and engagement with Toronto residents. The tool intends to:



- Visualize annual GHG emissions from low-rise residential buildings
- Help customers develop personalized climate action plans based on individual customer needs
- Integrate with resources such as Toronto Hydro's **Cleantech Services Network** and the City's retrofit programs (e.g., Home Energy Loan Program)

Toronto Hydro is supporting the City with program development and technical expertise with the aim for the tool to go live in 2025. This initiative is focused on reducing emissions from the building sector and meeting the City's net zero by 2040 target.

PROJECT PROFILE

Decarbonization Accelerator Program

Toronto Hydro is collaborating with Building Owners and Managers Association (BOMA) Canada, The Atmospheric Fund and the City's Environment & Climate Division on the design and implementation of a new decarbonization initiative targeted at mid-sized customers (50 kW and 999 kW of peak demand).

- The program will identify eligible customers based on geography and customer type, and proactively reach out to 10,000 customers to encourage them to decarbonize through targeted newsletters, emails and in-person consultations
- Participants will receive support through an online tool that will provide a customized step-by-step plan to decarbonize their own buildings
- For customers actively looking to decarbonize, Toronto Hydro will centralize the customer's electricity, gas and water consumption data in the industry standard Energy Star Portfolio Manager tool and benchmark their performance

This effort aims to equip customers with knowledge about their building and possible solutions for decarbonization, which are critical precursors for climate action. The program, to be launched in mid-2024, will reduce emissions while building the cleantech industry's capacity to advise and deliver on decarbonization capital projects for mid-sized customers.

4. Appendices

Appendix A: Climate Action Plan Chronology

On April 7, 2021, Toronto City Council requested that Toronto Hydro consider opportunities to respond to the climate emergency through climate action. The City requested that Toronto Hydro prepare a report on its current climate action and an action plan for what more it could do to support the objectives of the City's TransformTO vision and forthcoming Net Zero Strategy, including in the following areas:

- EV charging infrastructure
- Modernization of outdoor lighting and streetlighting
- Renewable energy and energy storage

The City also requested that Toronto Hydro explore non-rate funding, revenue, grants and financing. In the course of subsequent discussions, the City confirmed that Toronto Hydro should also report on building electrification and energy efficiency.[25]

In September 2021, Toronto Hydro delivered its Climate Action Plan to the City Manager. The Climate Action Plan sets out three climate action opportunities that Toronto Hydro can pursue to continue to improve Toronto's environment and help the City achieve its net-zero objective.

In November 2021, the City Manager issued his report to the Executive Committee on Toronto Hydro's Climate Action Plan.

In December 2021, City Council considered the City Manager's recommendations. It passed several resolutions, which included that the City Manager report back to City Council by the end of the second quarter of 2022 on recommendations regarding new climate action mandates for Toronto Hydro.[26] Further, City Council requested that Toronto Hydro and the City continue collaborating on the Climate Action Plan and Toronto's net-zero targets and provide recommendations concerning the three business opportunities outlined in the Climate Action Plan.

In December 2021, the City also adopted a more aggressive 2040 net-zero target, which superseded the net-zero 2050 target that guided Toronto Hydro's development of the Climate Action Plan.[27]

In January 2022, Toronto Hydro and City staff resumed collaboration to assess and maximize the alignment of the City's TransformTO Net Zero 2040 Strategy and Toronto Hydro's Climate Action Plan. The City and Toronto Hydro formed a joint City-Hydro Steering Committee, with senior representation from Toronto Hydro's dedicated Climate Action team and the City's Environment & Energy and Corporate Services divisions.

The joint City-Hydro Steering Committee managed a process through which:

1. City staff filed three rounds of written questions and received responses from Toronto Hydro.
2. The City and Toronto Hydro exchanged four outlines and drafts of their respective reports.
3. Topic-specific working groups examined and addressed detailed subjects requiring further discussion to establish the necessary awareness, understanding and alignment.

The collaboration between the City and Toronto Hydro leading up to the 2022 Status Report was substantial, with 39 meetings over six months.

In July 2022, City Council considered recommendations regarding new climate action mandates for Toronto Hydro as described in the 2022 Climate Action Plan Status Report. City Council approved the recommendations for two new unregulated climate action mandates (Climate Advisory Services and the LED streetlight conversion program) and deferred a decision on Climate Capital Investments.[28]

Specifically, City Council approved the following new climate action mandates for Toronto Hydro:[29]

Climate Advisory Services

2. City Council, on behalf of the City of Toronto as shareholder, request Toronto Hydro to expand its business activities beyond electricity distribution services by:
   a. establishing a new stream of non-rate regulated operations within its regulated business, specifically Climate Advisory Services (the climate action opportunity that excludes Toronto Hydro owning and operating assets), in keeping with the proposal set out in Toronto Hydro's Climate Action Plan received by City Council at its meeting on December 2021 and the Toronto Hydro Climate Action Plan Status Report; and
   b. working through the Council-approved Net Zero Climate Leadership Table to ensure coordination and enhanced investment while avoiding duplication with City programs and services, such as the Home Energy Loan Program and the Mayor's Green Will, when implementing Climate Advisory Services.
5. City Council, on behalf of the City of Toronto as shareholder, request Toronto Hydro to deliver publicly to the Executive Committee through the City Manager, the Chief Financial Officer and Treasurer, and the Deputy City Manager, Corporate Services, an annual report on the progress, key performance indicators, and next steps of Climate Advisory Services.

Climate Capital Investments: Streetlighting

6. City Council confirm its support in principal for proceeding with citywide LED street and expressway light conversion, including the related enabling infrastructure investments.
7. City Council request the General Manager, Transportation Services, in consultation with the Chief Financial Officer and Treasurer, and Toronto Hydro, to develop implementation options for the citywide LED street and expressway light conversion including applicable budget, and to report back with a recommendation by the end of the second quarter of 2023.

Climate Capital Investments: Other

9. City Council direct the Executive Director, Environment and Energy to continue to investigate with Toronto Hydro on other possible Climate Capital Investment opportunities (whereby Toronto Hydro owns and operates climate action assets such as EV chargers) to implement Transform TO Net Zero goals.

   Since receiving the new mandates, Toronto Hydro has established a new climate action department to shift the focus of its activities from planning to action.

   The collaborative relationship that supported the development of the 2022 Status Report is ongoing and is being guided by an MOU signed in April 2023, and presented to City Council in May 2023.[30] This MOU sets out how the two parties will coordinate communications and marketing to customers, align key performance indicators, and develop an implementation plan in an effort to collaborate and achieve net zero 2040.

Appendix B: Climate Adaptation Plan

Climate Change and Toronto Hydro

Climate change is a significant factor influencing Toronto Hydro's planning and operations. By 2050, Toronto's climate is forecasted to be very different than today. It is anticipated that in the coming decades, Toronto will experience significant changes in temperature, rainfall, snowfall, moisture content, wind speed and other climate parameters. For example, by 2050, days with a maximum temperature of 25°C or more are projected to increase from 87 to 110 times per year.[31, 32]

A warmer climate is expected to lead to more frequent and severe extreme weather events. These extreme events can cause major disruptions to Toronto Hydro's distribution system. Events such as heavy rainfall or high-wind days have increased over the past 25 years[33] and are expected to continue rising. By 2050, the number of extreme rainfall days (at least 10 cm of rain) is projected to increase by 20 per cent.[34] These events pose significant risks as parts of the underground system are vulnerable to flooding while the overhead system is susceptible to extreme winds, freezing rain and wet snow, resulting in damage and outages. Broken trees and the weight of ice and snow can bring lines, poles and associated equipment to the ground.

Extreme weather events are already impacting Toronto Hydro's distribution system. On May 21, 2022, a storm with wind gusts as high as 120 km per hour caused substantial tree damage, harming overhead distribution wires and equipment, leaving approximately 142,000 customers (18 per cent of Toronto Hydro's total customer base) without power. Similarly, three wind storms and one freezing rain event from April to July 2018 caused 382,286 customers to lose power.[35]

Climate Change Vulnerability Studies

Toronto Hydro has long considered the impacts of a changing climate on its operations. In 2012, the utility partnered with the Clean Air Partnership to hire AECOM and Risk Sciences International to evaluate climate change risks to its electricity distribution infrastructure. From 2013 to 2015,[36] this work was expanded to provide a complete climate vulnerability assessment of all Toronto Hydro-owned electricity distribution infrastructure as well as concrete and steel supporting structures.

This study adopted a systems-level approach to examine climate change risks, since different parts of the distribution system are interdependent and the failure of one piece of equipment can cause other parts of the system to fail as well. After analyzing how changes to 20 different climate parameters (e.g., high temperatures, heavy rainfall, freezing rain, high winds, etc.) could impact the performance of Toronto Hydro's distribution system between 2015 and 2050, the 2015 study identified five principal vulnerabilities:

1. **Stations and distribution lines are vulnerable to high temperatures**. Very hot days create system vulnerability, as they lead to high electricity demand for cooling and reduce the capacity of transformers and wires, which don't operate as efficiently at higher temperatures.
2. **Overhead stations and distribution lines are vulnerable to freezing rain, ice storms, high winds and tornadoes**. These events can put stress on stations, poles and wires that can cause them to fail.
3. **Underground distribution lines are vulnerable to extreme rainfall**. Floods can impair underground distribution lines. These vulnerabilities are concentrated mainly in central and northeast Toronto.
4. **Concrete and steel structures are vulnerable to snowfall and freezing rain**. High humidity and the use of de-icing salts accelerate degradation of the concrete and steel structures that house Toronto Hydro's distribution equipment.
5. **Overhead distribution lines are vulnerable to lightning**. Lightning is a significant source of distribution system outages and continues to be an area of vulnerability.

Implementation of Adaptation Plans

Following the 2015 study, Toronto Hydro reviewed and updated major equipment specifications to adapt to a changing climate, including:

- Requiring all new submersible transformers to be made of stainless steel and testing their ability to operate when completely submerged
- Phasing out air-vented pad-mounted switches with more robust designs to mitigate risk of failure due to the accumulation of dirt and road contaminants
- Adopting breakaway links in tree-covered areas for residential customers with overhead service. These links are designed to break when falling trees and branches bring down powerlines, preventing more significant damage to service masts attached to homes. The breakaway links can be replaced quickly and cheaply, reducing the length of power outages and the cost of restoration

In 2022, Toronto Hydro engaged Stantec to determine if the adaptation measures from the 2015 study needed to be updated in light of new Intergovernmental Panel on Climate Change models published in 2021.[37] The 2022 study concluded that no significant changes were required and that Toronto Hydro should maintain its existing adaptation measures.[38]

Toronto Hydro continues to incorporate climate change considerations into its planning, operations and asset renewal practices. Toronto Hydro routinely uses climate data projections for temperature, rainfall and freezing rain to set equipment specifications and forecast future station loads. Furthermore, the utility strives to meet and surpass equipment regulations/standards, such as those issued by the Canadian Standards Association in February 2023.[39] These new standards include modifications to poles to accommodate extreme weather events and conversion of submersible transformers to the above-ground pad-mounted transformers in some residential areas at risk of flooding.

Adaptation measures also form an integral part of Toronto Hydro's proposed 2025–2029 distribution system investment plan currently before the OEB, which seeks funding to accelerate the replacement of older equipment with the new climate-ready designs previously described. The investment plan also proposes additional adaptation measures, including:[40]

- Reconfiguring and relocating assets away from the ravines and other heavily treed areas to reduce vulnerability to extreme weather and facilitate power restoration
- Installing water-tight protectors for specific vaults at risk of flooding
- Installing flood mitigation systems at stations vulnerable to flooding
- Improving outage restoration capabilities during extreme weather events

In addition to these system hardening measures, Toronto Hydro's 2025–2029 Grid Modernization Strategy (described in **Section 2.3**) seeks to improve long-term system reliability and resiliency in the face of pressures from both increased system uses and evolving climate impacts. The strategy is focused on deploying technology that ensures the utility's ability to address faults in real time, improve outage restoration capabilities and lay the foundation for future widescale grid automation.[41]

Endnotes

[1] Centre for Urban Research and Land Development, *Toronto Second Fastest Growing Metropolitan Area, City of Toronto the Fastest Growing Central City, in the United States/Canada in 2022* (2023), available at: **torontomu.ca/centre-urban-research-land-development/blog/blogentry7311/**

[2] City of Toronto, *TransformTO Net Zero Strategy: A climate action pathway to 2030 and beyond (2021)*, available at: **toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf**

[3] Toronto Hydro, *Climate Action Plan* (2021), available at: **torontohydro.com/documents/20143/74105431/climate-action-plan.pdf**. Please also see Appendix A to this year-end report, which provides a chronology of the creation of the CAP.

[4] Through the CAP, Toronto Hydro also provided analysis on two additional areas where it could support the City's net-zero vision, including through an LED retrofit on the streetlighting system and climate capital investments. The City elected not to pursue climate capital investments at this time, and the LED project is with City staff for further consideration in future planning cycles.

[5] Appendix A contains the City Council mandate from July 2022

[6] City of Toronto, *TransformTO Net Zero Strategy: Sector-Based Emission Inventory* (2023), available at: **toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/sector-based-emissions-inventory/**

[7] City of Toronto, *Toronto's Population Health Profile* (February 2023), available at: **toronto.ca/wp-content/uploads/2023/02/940f-Torontos-Population-Health-Profile-2023.pdf**

[8] Toronto Hydro, *Application for Electricity Distribution Rates: 2025-2029, at Exhibit 2B, D4, Appendix A, page 3 of 12*, available at: **toronto.ca/wp-content/uploads/2023/02/940f-Torontos-Population-Health-Profile-2023.pdf**

[9] Toronto Hydro, Climate Action Plan (2021), at page 3, available at: **torontohydro.com/documents/20143/74105431/climate-action-plan.pdf**

[10] Toronto Hydro's net-zero commitment.

[11] More than 90 per cent of the electricity system in Ontario is emissions-free as per the IESO, available at: **ieso.ca/en/Learn/The-Evolving-Grid/Decarbonizing-the-Electricity-Sector**

[12] Toronto Hydro introduced two new performance metrics on its corporate scorecard relating to environmental performance: Building Emissions Reduction and Fleet Electrification. Toronto Hydro, *2022 Environmental Performance Report* (2022), at page 6, available at: **torontohydro.com/documents/20143/134897762/2022-environmental-performance-report.pdf**

[13] Toronto Hydro, Climate Action Plan, 2023 Status Report (2022), at page 13, available at: **torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf**

[14] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 1B, Tab 3, Schedule 1, page 7 of 68, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[15] Subject to approval and currently before the Ontario Energy Board.

[16] For further details on Toronto Hydro's 2025–2029 rate application, including its investment plan, please see: **torontohydro.com/regulatory-information/2025-distribution-rate-application**

[17] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section E7.4.1, page 3 of 55, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[18] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, page 48 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[19] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section E5.5, page 18 of 52, and section E7 page 1 of 35, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[20] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section E5.5, page 17 of 22, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[21] Subject to approval and currently before the Ontario Energy Board.

[22] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 1B, Tab 4, Schedule 2 Appendix A, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[23] City of Toronto, T*oronto Hydro and City of Toronto Memorandum of Understanding for Toronto Hydro's Climate Advisory Services*, City Council Decision 2023. EX.4.2 (May 10, 2022), available at: **secure.toronto.ca/council/agenda-item.do?item=2023.EX4.2**

[24] City of Toronto, *Toronto Hydro and City of Toronto Memorandum of Understanding for Toronto Hydro's Climate Advisory Services*, City Council Decision 2023. EX4.2 (May 10, 2022), available at: **secure.toronto.ca/council/agenda-item.do?item=2023.EX4.2**

[25] City of Toronto, *Recommendations to Toronto Hydro on Climate Action*, City Council Decision 2021 EX22.5 (April 7, 2021), available at: **app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.EX22.5**

[26] City of Toronto, *Toronto Hydro Climate Action Plan and Next Steps*, City Council Decision 2021 EX28.1 (December 15, 2021), available at: **app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.EX28.1**

[27] City of Toronto, *TransformTO - Critical Steps for Net Zero by 2040*, City Council Decision 2021 IE26.16 (December 15, 2021), available at: **app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.IE26.16**

[28] City of Toronto, *Update: Toronto Hydro Climate Action Plan & Next Steps* (2022), at page 3, available at: **toronto.ca/legdocs/mmis/2022/ex/bgrd/backgroundfile-228414.pdf**

[29] City of Toronto, *EX34.9 - Update on Toronto Hydro Climate Action Plan and Next Steps* (2022), available at: **secure.toronto.ca/council/agenda-item.do?item=2022.EX34.9**

[30] City of Toronto, *Toronto Hydro and City of Toronto Memorandum of Understanding for Toronto Hydro's Climate Advisory Services*, City Council Decision 2023. EX.4.2 (May 10, 2022), available at: **secure.toronto.ca/council/agenda-item.do?item=2023.EX4.2**

[31] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, page 7 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[32] Toronto Hydro engaged Stantec to update its Climate Change Vulnerability Assessment, which is filed in the Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, Appendix A

[33] Government of Canada, Weather, Climate and Hazard Historical Data **climate.weather.gc.ca/historical_data/search_historic_data_e.html**; Weather data compiled using Toronto Lester B. Pearson INTL A for January 1998 to June 2013 and Toronto INTL A for July 2013 to December 2022.

[34] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D5, page 8 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[35] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, page 9 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[36] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, Appendix A, on sub–Appendix C, at page 1, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[37] 2021, the IPCC released the 6th Assessment Report (AR6) new climate data (CMIP6), which is an update to climate change projection data from CMIP5 (used in the 2015 study). As one of the recommendations from the 2015 study was to continue monitoring and evaluating climate change projection science, Toronto Hydro contracted Stantec to evaluate if the CMIP6 data will result in material changes to the 2015 study.

[38] For a detailed analysis of the 2015 Adaptation Study (and 2022 update), see Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, Appendix A, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[39] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, page 10 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[40] Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D2, page 11 of 52, available at: **torontohydro.com/documents/d/guest/consolidated-application**

[41] For a detailed overview of Toronto Hydro's 2025–2029 Grid Modernization Strategy, please see Toronto Hydro, *Application for Electricity Distribution Rates: 2025–2029*, at Exhibit 2B, Section D5, available at: **torontohydro.com/documents/d/guest/consolidated-application**