Annual Planning Outlook

Ontario's electricity system needs: 2026–2050

April 2025

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Powering Tomorrow.

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Executive Summary

Note on *Annual Planning Outlook* timing:

The IESO's *2025 Annual Planning Outlook* analysis was completed prior to ongoing threats of U.S. tariffs on Canadian goods first signed into executive order on Feb. 1, 2025. At the time of publishing the *2025 Annual Planning Outlook*, there remains significant uncertainty around Canada-U.S. trade policy and potential economic impacts. The IESO is continuing to monitor developments and will reflect any impacts to electricity demand forecasts in the next outlook.

Given the magnitude of growth expected over the next 25 years — and the number of aging and retiring assets on the system — currently planned resource adequacy actions are still needed. The IESO's iterative planning and resource adequacy cycles are purposefully designed for flexibility, and allows the province to assess and respond to changing conditions and system needs as necessary.

The IESO will also evaluate the impact of tariffs in future planning and procurement cycles, and will consider those impacts as part of forthcoming resource adequacy decisions.

The growth of Ontario's electricity system must accelerate at an unprecedented pace. Over the next 25 years, the Independent Electricity System Operator (IESO) anticipates electricity demand to ramp up more quickly than previously forecast due to economic growth, electrification, and evolving technologies. To ensure reliable and affordable electricity is available where and when it is needed, the IESO is moving forward with ambitious plans to build a significant amount of new supply and transmission infrastructure, as well as expand energy efficiency programs.

The IESO's *2025 Annual Planning Outlook* forecasts system-level net annual energy demand to grow 75 per cent — to 262 terawatt-hours (TWh) by 2050 — which is a significantly higher increase than the 60 per cent growth forecast in the *2024 Annual Planning Outlook* within the same timeframe.

Over the current forecast horizon, demand grows at an average compound annual growth rate of 2.2 per cent driven by electric vehicle production, supply chain operations, and other projects in the pipeline; strong interest from data centres powering artificial intelligence; electrification projects across the economy; and higher population growth and household formation estimates. Ontario remains on track to become a dual-peaking system — where summer seasonal system peaks and winter seasonal system peaks reach similar magnitudes — by 2030 primarily due to growing greenhouse lighting and electric vehicle charging.

With respect to supply-side resources that power Ontario, there are several actions being undertaken to ensure there is adequate electricity to meet the province's needs. This includes the development of new generating resources, addition of storage, re-contracting of existing resources, as well as the refurbishment and expansion of the province's nuclear fleet.

Actions to date are projected to meet Ontario's capacity and energy needs until 2029 through upgrades to hydroelectric and uprates at nuclear generating units; the combined results of the first long-term procurement and Same Technology Upgrades Solicitation; and capacity sharing agreements with Hydro-Québec. The IESO's annual Capacity Auction will target 1,800 megawatts (MW) for summer 2026 and 1,200 MW for winter 2026–2027 obligation periods, with gradual growth to 1,900 MW for the summer 2029 and 1,400 MW for the winter 2028–2029 obligation periods. The IESO's second medium-term procurement to recommit a portion of facilities with expiring contracts between 2026–2029 is expected to award five-year contracts in Q2 2025.

To satisfy needs emerging in 2029, the IESO has initiated its second long-term procurement that targets new resources to be in service between 2029–2034 on 20-year terms. This will include annual submission windows under distinct streams to ensure that eligible resources gradually enter the electricity system to meet needs. An energy stream will secure up to 14 TWh of annual generation from new energy-producing resources, and a capacity stream will secure up to 1,600 MW of new capacity resources. These targets support resource adequacy requirements if additional risks materialize, prepare for significant needs that begin in 2035, better position the province to accommodate load growth above what is currently forecast, and can support future government energy strategies and policy directions.

Small modular reactors developed by Ontario Power Generation are also expected to be brought online at Darlington Nuclear Generating Station during this timeframe, and the IESO is looking to design and develop a separate procurement for acquiring long lead time resources that can be in service by the 2030s, which could include both long duration energy storage and new hydroelectric generation.

By 2034, capacity needs grow to 2,100 MW and unserved energy needs are approximately 7 TWh. To align future acquisitions with evolving system needs beyond 2035, the IESO will continue to undertake a regular cadence of competitive procurements that allows for reassessment of targets when required, and the ability to leverage advances in technology and cost reductions. Future government policy, nuclear development — including the exploration of up to 10,000 MW of new generation in Port Hope — and actions under the Resource Adequacy Framework will be addressed in subsequent *Annual Planning Outlooks*.

Throughout the entire outlook period, the IESO will leverage energy efficiency and demand-side management as a reliable and low-cost resource. Initiatives funded by electricity rates and the federal government are underway, with energy efficiency continuing to offer customer choice, deliver significant ratepayer and system savings, and reduce energy and capacity needs.

Overall, the level of annual electricity demand savings from all electricity demand-side management programs in Ontario is forecasted to fluctuate between 16 TWh and 18 TWh from 2026–2050, as savings decrease from expiring measures implemented under past programs and savings increase from new programs.

This forecast does not include increased savings expected under new programs and incentives that were introduced via a new 12-year electricity Demand-Side Management Framework, announced in January 2025 and in effect to 2036. The new framework will help meet the needs of Ontario's electricity system cost-effectively, support reliability with targeted approaches that address regional and local electricity system needs, and manage the gradual electrification of Ontario's economy. Higher savings from the new framework will be reflected in future *Annual Planning Outlooks*.

To maintain the steady flow of electricity across Ontario, the IESO anticipates significant transmission expansion, reinforcement, and renewal within the outlook period. Projects will support load growth occurring across the province and, increasingly, will play a role in ensuring the transmission system allows for the connection of needed future system resources. These efforts include protecting land corridors for transmission projects; and working collaboratively with municipalities, Indigenous communities, and sector stakeholders to develop the transmission infrastructure needed to maintain a reliable supply to support economic growth and electrification.

The IESO’s *Annual Planning Outlook* is vital to electricity planning as it drives and guides sector activities and investments; and adds clarity to various needs, such as capacity, energy, transmission, and operability.

Expanding the provincial electricity grid enables growth, innovation, and security. The IESO will continue to take action to secure Ontario’s shared energy future through a robust planning process, and strengthen engagement and collaboration with present and future partners to successfully plan, site, build, and operate resources essential to meeting system needs.

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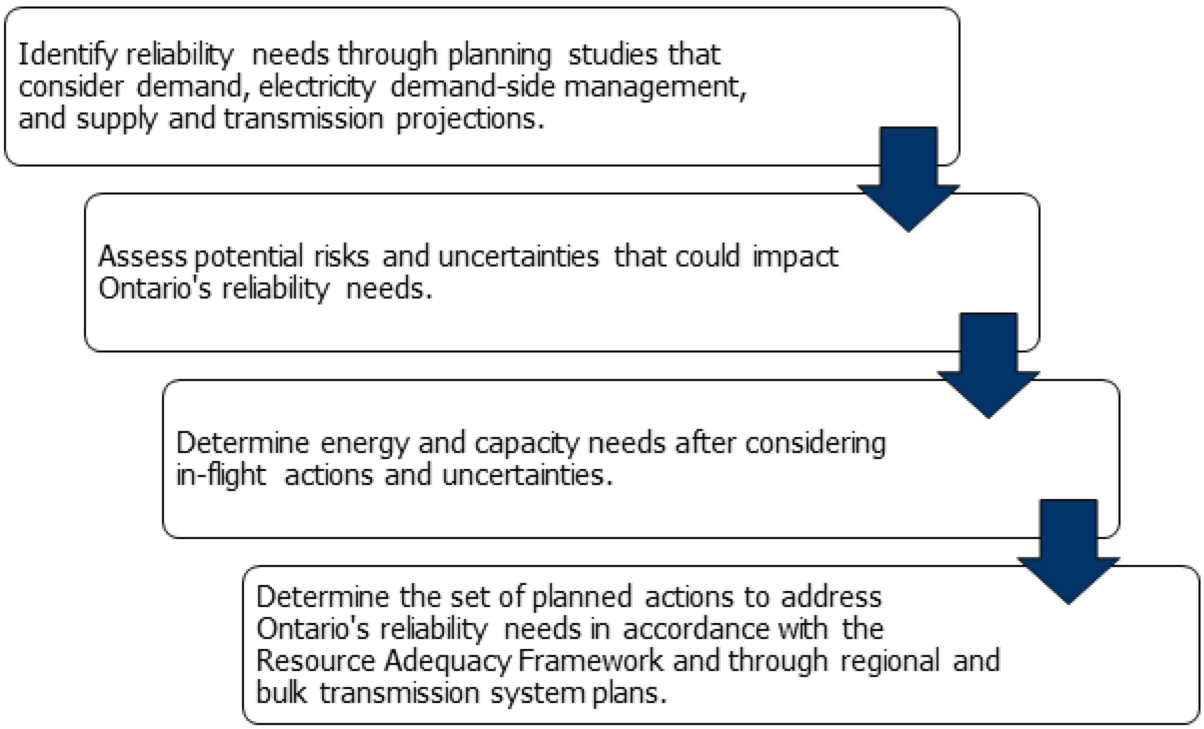
1. Introduction

1.1. Purpose

The IESO's *2025 Annual Planning Outlook* (APO) uses data and market intelligence to identify system needs over the 2026–2050 outlook period. The APO also describes factors that influence these needs; and planned actions required to prepare for a reliable, cost-effective, and sustainable electricity future in Ontario that includes upcoming acquisitions within the Resource Adequacy Framework.

The process to develop the APO is described in Figure 1.

Figure 1 | Process to Determine Planned Actions to Address Reliability Needs



The APO provides sector participants, governments, municipalities, Indigenous communities and electricity consumers, amongst others, with data and analyses to make informed decisions; and communicates valuable information to policymakers and others interested in learning more about the developments shaping Ontario's electricity system.

The assumptions underpinning the APO are based on current system conditions and the best available information about demand, supply, transmission infrastructure, and other factors that may influence these studies. The IESO acknowledges that there may be uncertainties that impact the outlook. The APO does not speculate on future changes: it only includes changes to Ontario's demand forecast and supply mix if they are expected to result from the latest available economic data projections; committed government policy; or announced actions by the IESO, government or sector participants. Significant changes to the factors underpinning the APO are expected during the outlook period. The outlooks presented should, therefore, be interpreted with this expectation in mind. By updating and publishing the APO regularly, and performing other studies on a regular basis, the IESO can better capture the evolving nature of Ontario's electricity system.

1.2. Report Contents

Section 2: Demand Forecast explores long-term demand, providing insight into the changing composition of electricity demand by sector and the resulting effect on overall demand in the province. It also examines the projected impact of electricity demand-side management (eDSM)[1] programs, building codes and equipment standards, and the Industrial Conservation Initiative (ICI) on reducing demand.

Section 3: Supply and Transmission Outlook indicates the availability of resources over the outlook period. This section also covers transmission projects expected to come into service within the outlook period that are considered in the base case for resource adequacy and transmission security assessments.

Section 4: Resource Adequacy provides a comparison of the demand forecast with anticipated resource performance and transmission constraints. This section also examines Ontario's reserve margins, and capacity and energy adequacy[2].

Section 5: Transmission System Needs explores system needs arising from the requirement to meet transmission planning standards, as well as the impact of government policy. These transmission system needs inform planned actions, including a schedule of transmission plans to be initiated.

Section 6: Operability describes some of the operability assessments that are currently being conducted to determine the ability of the system to respond to conditions in real time, and provides the results of the IESO's regulation needs assessment.

Section 7: Uncertainties describes factors that could impact Ontario's electricity system needs, which were considered in developing the set of planned actions in this APO.

Section 8: Integrated Reliability Needs builds on the resource and transmission needs described in Sections 4 and 5 by considering in-flight actions, as well as the potential impact of uncertainties described in Section 7.

Section 9: Planned Actions specifies actions to address needs in the near and medium term, and provides a view of the capacity, energy, and transmission system needs emerging in the 2030s.

1.3. Changes and Updates Since the 2024 APO

This outlook supersedes the outlook published in March 2024.

Major changes to the demand forecast included a substantial number of new data centres and electric vehicle (EV) supply chain large step loads, updated agricultural forecasts, and updated

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[1] In alignment with the language of the Nov. 7, 2024 directive to the IESO regarding a new energy efficiency framework for 2025-2036, this APO uses the term "electricity demand-side management (eDSM)" replacing "conservation and demand management (CDM)" used in previous APOs.

[2] "Energy" in the APO refers to either electricity or electrical energy, measured in watt-hours.

energy efficiency savings. The demand forecast for the 2025 APO was released in October 2024; no updates were made between its release and the publication of this outlook.

The supply outlook includes new and existing resources, including resources committed through actions undertaken by the IESO and/or informed by government policy at the time of development.

This APO also provides an update on in-flight transmission projects referenced in previous APOs; identifies new transmission needs as informed by on-going bulk planning and resource procurement activities; and provides an updated Schedule of Planning Activities. The 2025 APO schedule provides a snapshot of the several IESO's bulk system plans covering the next three–five years.

As with the 2024 APO, the 2025 APO does not use a proxy resource to address system requirements; instead, capacity and energy needs are represented "as is" (i.e., considering existing and committed resources, including resources committed through actions undertaken by the IESO and/or informed by government policy, until contract or commitment period end). This helps to identify system needs to establish resource acquisition targets and incremental planned actions.

The purpose of the APO is to identify system needs and serve as a guide for upcoming competitive procurements, which are driven by a technology-agnostic approach and structured to ensure the most cost-effective proposals are chosen. The APO does not speculate on a future supply mix as it depends on resources secured in future procurements, government policy, and other factors. As a result, forecasting a composition of Ontario's supply mix in advance of procurement outcomes and policy decisions is impractical. However, to complement the needs and planned actions outlined in this APO, a new module — Capacity Expansion Scenario, Costs, and Emissions — has been introduced to share the IESO's most recent analysis on a potential future supply mix. This is intended to serve as a scenario to help stakeholders understand one possible resource portfolio and its impact on interjurisdictional trade, marginal costs, and emissions of the electricity system.

Moving forward, the IESO is committed to updating the APO each year to continue sharing its view of Ontario's electricity system during the energy transition. This includes incorporating actions taken after the government's *Powering Ontario's Growth* plan, *Ontario's Affordable Energy Future: The Pressing Case for More Power*, and future policy.

2. Demand Forecast

In the 2025 APO, electricity demand is forecast to ramp up more quickly and grow at a faster pace than the 2024 demand forecast in the near and medium terms of the outlook period. Overall, system-level net annual energy demand is projected to grow from 151 TWh in 2025 to 262 TWh in 2050, a growth of 75 per cent, which is a significantly higher increase compared to the 60 per cent growth forecasted in the 2024 APO outlook period. This is driven by newly announced industrial EV production and supply chain projects and project pipelines; strong interest from new commercial artificial intelligence service-providing data centres; incremental decarbonization/electrification projects across the economy; and higher population growth and household formation.

Electricity demand growth in Ontario is tempered by an increased eDSM program energy demand savings forecast[3], a softening of overall growth in agricultural sector greenhouses, increased costs of living, and elevated levels of economic uncertainty. Continuing trends highlighted in prior outlooks include the adoption of the Toronto Green Standard, expected strong growth in electric vehicle adoption and charging, steady growth in the residential and commercial sectors, and the continued delivery of eDSM programs.

This outlook aligns with previous forecasts indicating a dual-peaking system (with summer seasonal system peaks and winter seasonal system peaks reaching similar magnitudes) by 2030 through to 2050.

The IESO's forecasts of long-term electricity demand incorporate uncertainties about future events, including economic growth, changing customer preferences, and a rapidly evolving policy environment. The uncertainties associated with forecasts will naturally increase with the length of an outlook period and reflect the interdependencies of underlying assumptions. The IESO's long-term electricity demand forecast (the "Forecast") presented in the 2025 APO, covering the period 2026–2050, includes the most current economic and demographic projections as well as announced projects and policies known at the time of forecast modelling.

2.1. Overview

The Forecast anticipates the level of electricity demand required to be met from supply and transmission; and is an input into the multi-year process required to plan, site, build or refurbish energy resources to meet system needs. The Forecast also informs system reliability assessments

[3] For clarity, the increase in the eDSM program forecast from the 2024 APO reflects updated information on program results under the 2021–2024 framework. Due to when the 2025 APO demand forecast was finalized, it does not reflect the savings targets approved under the new 2025–2036 framework. The new targets will be captured in the demand forecast for the 2026 APO.

and investment decisions; and sets the context for the APO, resource procurements, and bulk power system plans.

Future demand is affected by many factors that include, but are not limited to, the state of the economy, population, demographics, technology, energy prices, input fuel choices, equipment-purchasing decisions, consumer behaviour, government policy, and long-term commitments to eDSM incentive programs.

This year's Forecast continues to reflect economic expansion, as well as electrification initiatives that began in 2021, leading to higher electricity demand in the near, medium and long term, relative to today's levels.

The Forecast exhibits strong growth through the end of the 2020s, and continuing growth through the 2030s and 2040s at incrementally moderate levels driven by population and economic growth and societal electrification. In particular:

- In the near term (years 1–5 or 2026–2030), significant electricity demand growth is forecasted in industrial mineral extraction and processing, primary metals (by way of steel production electrification), and chemical production (by way of battery materials processing and hydrogen production) sub-sectors.
- In the medium term (years 6–10 or 2031–2035), significant electricity demand growth is forecasted in the industrial EV production and supply chain sub-sector and commercial data centre sub-sector.
- In the long term (years 11+ and 2036–2050), electricity demand growth is forecasted to return from the mineral extraction and processing sub-sector as a long-term growth cycle is expected.
- In general, residential and commercial buildings and transportation sector electrification is expected to increase demand in all years of the outlook period.
- Factors that mitigate increasing electricity demand include softening growth in agricultural sector greenhouses (compared to previous forecasts), and higher energy efficiency program savings forecasts since the 2024 APO Forecast.

Overall, system-level net annual energy demand is projected to grow from 157 TWh in 2026 to 262 TWh in 2050. The compound annual growth rate for system-level net annual energy demand over the forecast period is 2.2 per cent.

System-level net summer seasonal peak demand is projected to grow from 24 gigawatts (GW) in 2026 to 36 GW in 2050, a difference of 12 GW, or 48 per cent in 24 years, with a compound annual growth rate of 1.7 per cent. System-level net winter seasonal peak demand is projected to grow from 23 GW in 2026 to 37 GW in 2050, a difference of 13 GW, or 57 per cent in 24 years, with a compound annual growth rate of 1.9 per cent. In this and each subsequent Forecast sub-section, all calculation summaries may not match exactly due to rounding.

Figure 2 illustrates the forecasted changes in energy demand over the planning horizon. Figure 3 shows summer and winter peak demand.

Figure 2 | Annual Energy Demand

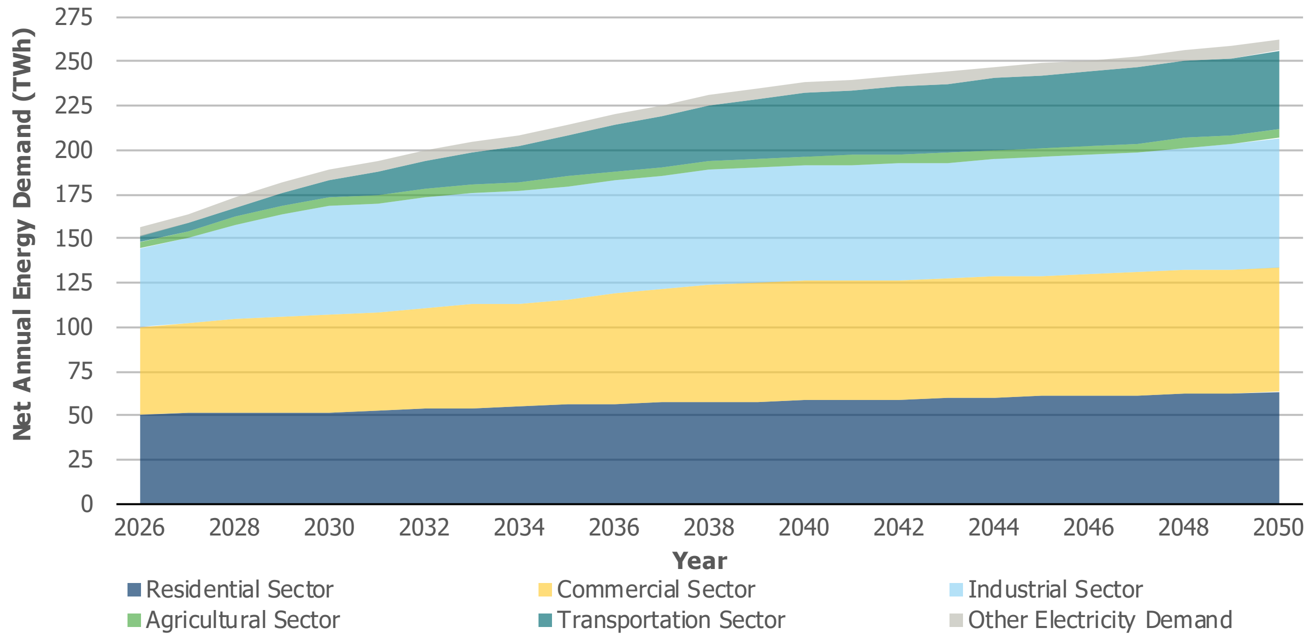
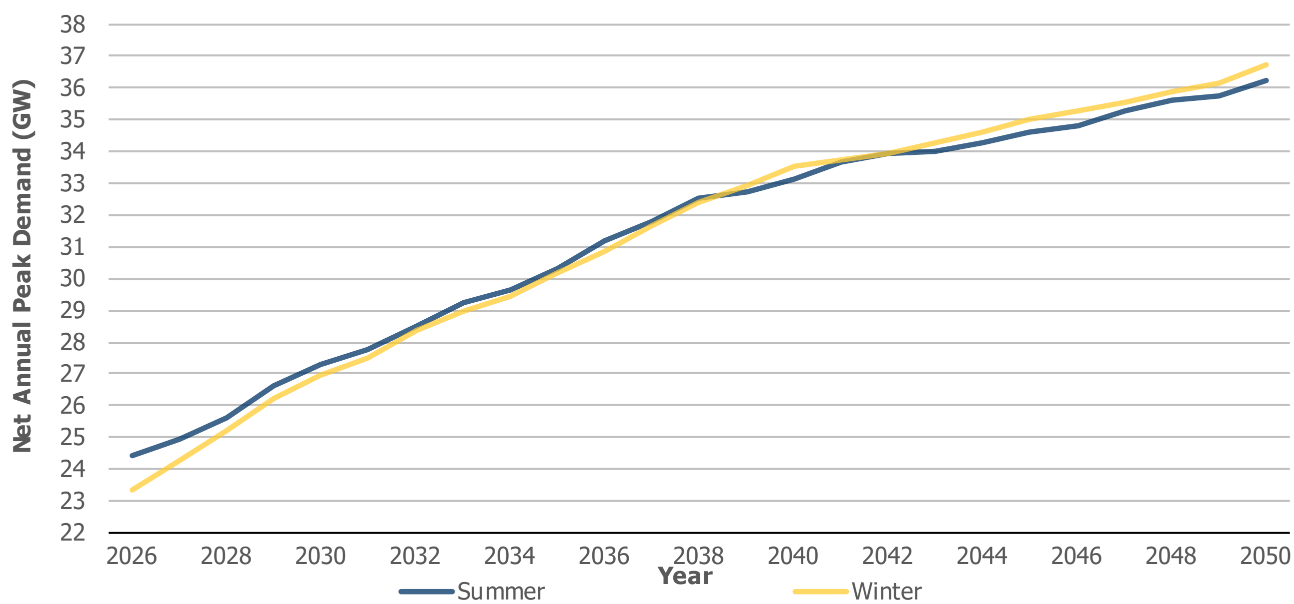


Figure 3 | Seasonal Peak Demand



A significant change in system demand forecasted over the outlook period continues to be a change in system peak demand seasonality and daily system load profiles, attributed to substantial differences in electricity consumption patterns. A variety of forecasted changes will influence the season of the annual system seasonal demand and shape of the daily demand curve, including winter-season EV battery charging and an increase in winter-season electric space heating, especially in the city of Toronto, in terms of volume and seasonal peak coincidence. These factors result in heightened demand in the evening to overnight periods and flattened daily load profiles.

Agricultural sector greenhouse consumption will also affect the daily demand profile. Additionally, the connection of multiple large commercial data centre and industrial manufacturing facilities will cause demand to grow with a relatively flat daily load shape in conjunction with a higher daily minimum level of electricity demand.

Figure 4 and Figure 5 illustrate the forecasted changes in hourly energy demand in a typical mid-summer and mid-winter business day over the outlook period. This includes the range of forecasted hourly demand over the period, and the forecasted hourly demand of the median peak day over the period.

Figure 4 | Mid-Summer Business Day: Hourly Profile

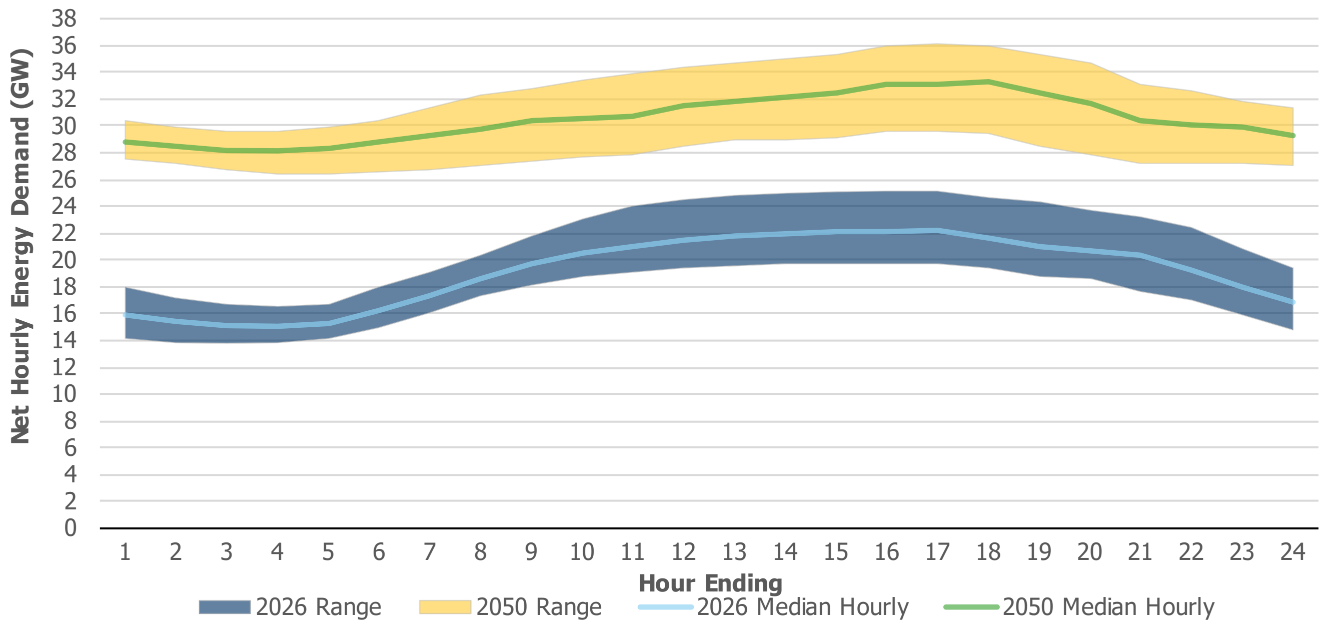
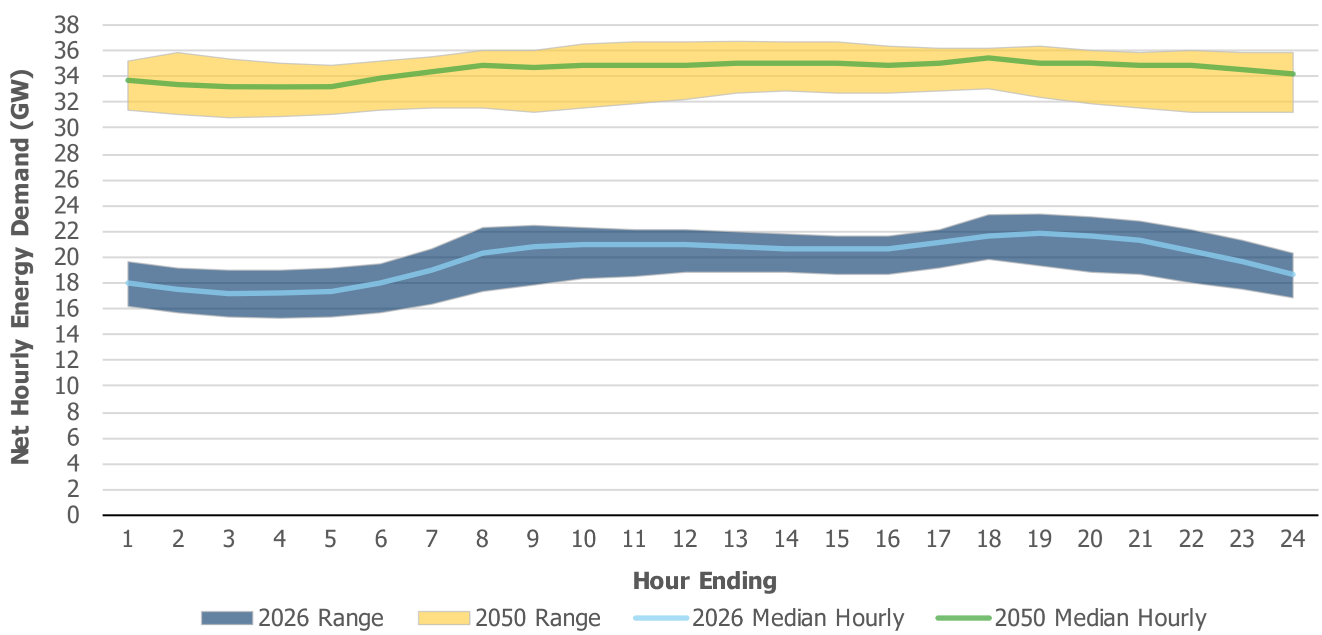


Figure 5 | Mid-Winter Business Day: Hourly Profile

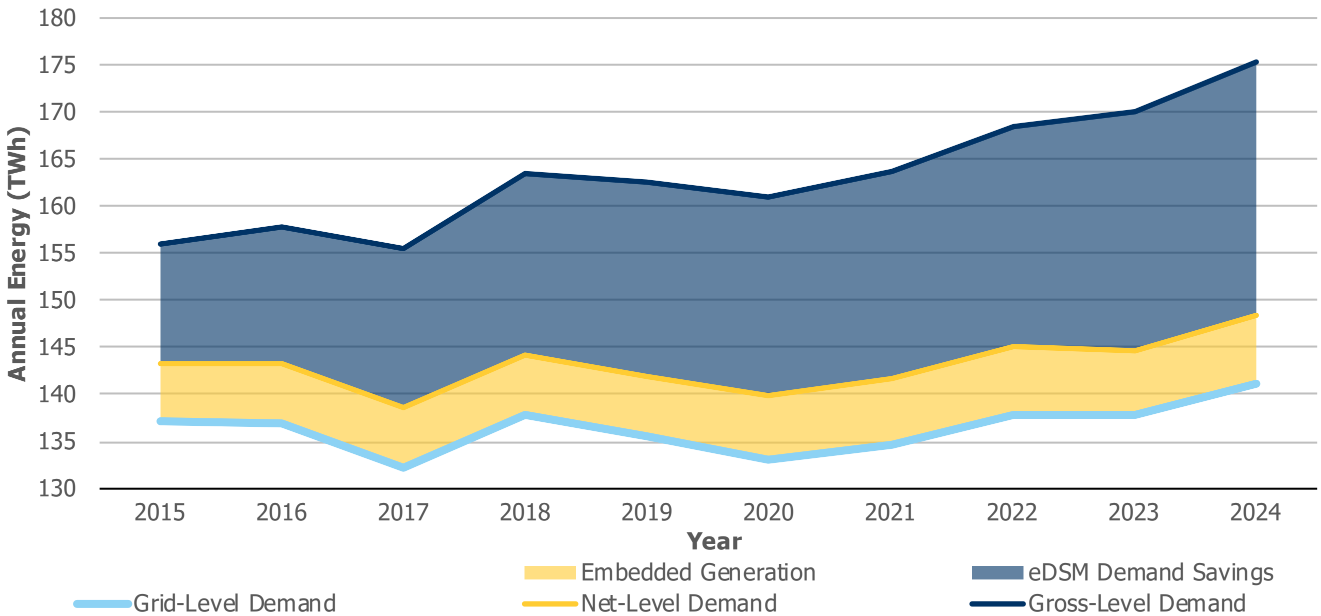


2.2. Historical Energy Demand

Grid-level demand[4] over the past 10 years (2015–2024) has been mostly flat, ranging between 132 TWh and 140 TWh, as shown in Figure 6[5]. This is primarily the result of changes in Ontario's economic composition, eDSM savings from programs and regulations, and embedded generation[6], all of which reduced the need for grid-supplied energy. In particular, over the last decade, the energy-intensive sectors' share of the economy has decreased while the less electrically demanding sectors has grown in comparison. EDSM savings from programs and regulations have grown from approximately 13 TWh a year to approximately 27 TWh a year, while embedded generation has supplied approximately 5 TWh to 7 TWh of energy each year.

Figure 6 illustrates the grid-, net- and gross-level energy demand observed over the last 10 years.

Figure 6 | Historical Energy Demand



[4] Gross-level demand is total demand for electricity services in Ontario prior to the impact of demand-side management (including programs and regulations) but includes the effects of naturally occurring conservation (energy savings that occur without the influence of incentives or education programs and regulations). Net-level demand is gross-level demand minus the impact of conservation. Grid-level demand is net-level demand minus the demand met by embedded resources. It is equal to the energy supplied by the bulk power system to wholesale customers and local distribution companies.

5 Historical energy demand presented is actual observed demand based on actual weather and has not been weather normalized.

6 Embedded generation describes generators that are not registered participants in the IESO-administered wholesale electricity market, which are typically but not necessarily distribution-connected and which reduce demand through the bulk electricity system.

While historical energy demand has been presented on an actual, realized-weather basis and shown at the grid, net and gross levels, the Forecasts presented are on a normal weather scenario basis and at the net level. Some end-use-specific energy demand and fuel-specific generation is weather sensitive (e.g., building space heating, building space cooling, lighting, solar resources, wind resources). Historical actual weather energy demand and embedded generation are observed values affected by actual realized weather conditions. For example, lower demand in 2017 is attributed in part to extreme mild weather seen in that year. Normal weather refers to expected average weather conditions for the related geographic region. Normal weather scenario energy demand and embedded generation production are the median energy levels and peak demand level results from weather simulations under historical weather data[7]. Actual resulting weather in the year can be random and may vary in temperature, precipitation, sun exposure, wind and/or humidity — each potentially affecting energy demand and/or production.

2.3. Forecast Summary

The IESO's Forecast focuses on understanding the causes of future changes in electricity demand by examining demographic, economic, sector and end-use level trends. However, forecasted changes in demand also reflect many dependencies and uncertainties that increase with the length of the outlook period. The Forecast considers several factors: all known demographic projections; expected changes in each market sector in Ontario; economic announcements and trends; fuel cost forecasts; current statuses and projections of large commercial and industrial sector projects with significant electricity demand (e.g., large step loads); actual grid-connection request queues; and committed policy. In this year's Forecast, the IESO continues to include demand from significant future unconfirmed industrial projects that have a reasonable probability of being completed, with estimates of such demand adjusted for the assumed uncertainty. Inputs for the Forecast were finalized in July 2024, and any changes since then will be considered in future APOs.

With the economy transforming due to factors such as electrification, economic development, and government policy, a high level of uncertainty is present in the latest Forecast. These uncertainties are outlined in Section 7.1.

The Forecast covers the period 2026–2050. It includes a reference year of 2025 with forecasted grid-level annual energy demand of 144 TWh and a net-level annual energy demand of 151 TWh, 4 TWh higher than the 2024 APO demand forecast reference year. This increase is attributable to the inclusion of year 2023–2024 actual observed demand levels; an additional year of population, economic, and electricity demand growth; and further inclusion of additional large step loads. Sector-level forecasts have been calibrated with the latest available data from sources including the IESO's Smart Meter Data Repository, the Ontario Energy Board's (OEB) Yearbooks of Electricity Distributors, as well as the IESO's own sector-level wholesale demand data sources.

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[7] Normal weather accounts for weather based on historical climate only, not climatic change. For more information on weather normalization, see the 2025 APO Demand Forecast Methodology.

2.4. Forecast Drivers

All sectors of the economy — residential, commercial, industrial, agricultural, transportation, and other — contribute to province-wide electricity demand. This Forecast has been developed using sector-level segmentation and corresponding individual assessments and calibrations where available.

Projected increases in the Forecast are supported by climate change mitigation and economic development policies, stable electricity rates, and increasing natural gas rates, which include rising greenhouse gas (GHG) emission costs, over this outlook period.

2.4.1. Residential Sector

The IESO forecasts demand from the residential sector to show steady growth over the outlook period based on current housing supply policies, similar to the 2024 APO demand forecast. Several factors support this growth, including:

- National immigration policies (tempered by interprovincial emigration);
- A supportive provincial policy environment for new home construction;
- Persisting levels of full and hybrid work-from-home trends, which result in higher daily household occupancy;
- Continued increases in the adoption of electronic appliances; and
- The planned implementation of the Toronto Green Standard, version 6, in 2028, which would change municipal permit requirements to require buildings constructed in Toronto on or after 2030 to be near-zero emissions.

Factors mitigating near-term demand growth include increasing costs of living trends and the current economic climate.

Other updates to the residential sector forecast include updated household count forecasts that further expect increased home concentration in urban areas, such as the Toronto and Ottawa zones; calibrated residential building type shares; and calibrated current and forecasted electric space heating - heat pump installation counts, accounting for concluded programs such as the Canada Greener Homes Grant and the Ontario Clean Home Heating Initiative. Heat pump adoption remains modest in the latest reference outlook, increasing from around 2.5 per cent of households to 6.3 per cent by 2050, driven mostly by the Toronto Green Standard, natural uptake, the Canada Greener Homes Affordability and Natural Resources Canada Oil to Heat Pump Affordability programs.

Policy and economic factors impacting residential sector electricity demand identified above reflects the best available information at the time of the Forecast's finalization but are constantly evolving. The IESO notes changes in factors as they occur and will account for impacts of updates in its next Forecast and APO.

Overall, residential sector level net annual energy demand is projected to grow from 51 TWh in 2026 to 63 TWh in 2050, a difference of 13 TWh, or 25 per cent in 24 years, with a compound annual growth rate of 0.9 per cent.

2.4.2. Commercial Sector

The IESO expects commercial sector demand to be largely consistent with levels forecasted in the previous two Forecasts, except for significant growth in the commercial data centre sub-sector.

Economic conditions and electricity demand forecasts remain broadly in line with the 2024 APO: a continued general societal shift to the digital economy, which includes hybrid work models, online shopping, and meal delivery affecting respective commercial retail, hospitality, office sub-sectors; and increasing demand for institutional services (health care and education). The commercial sector will also be affected by the Toronto Green Standard's expected change to municipal permit requirements for building-energy intensity and emissions levels.

Overall, total commercial sector level net annual energy demand is projected to grow from 50 TWh in 2026 to 71 TWh in 2050, a difference of 21 TWh, or 42 per cent in 24 years, with a compound annual growth rate of 1.5 per cent.

2.4.2.1. Data Centres

An emerging trend observed globally is a sudden rise in interest to construct, connect, and operate large and electricity-intensive commercial data centre facilities to power artificial intelligence and cloud computing applications. This is an uncertain area of electricity demand growth, in terms of the number of projects, expected locations, operation dates, and demand levels and profiles. Several data centre projects in Ontario have active IESO System Impact Assessments underway and/or initiated construction in 2024. The IESO is actively monitoring this rapidly changing environment and participating in multiple forums across North America to better understand the sector, which includes assessing active and prospective projects under development; each project's probability of successful implementation; and overall impacts on electricity demand. More information on data centres and uncertainty related to them is discussed in Section 7.1, and further discussed in a technical paper on data centres.

Overall, commercial data centre sub-sector level specific net annual energy demand is projected to grow from 3 TWh in 2026 to 16 TWh in 2050, a difference of 13 TWh, or 423 per cent in 24 years, with a compound annual growth rate of 7.1 per cent.

2.4.3. Industrial Sector

The IESO expects the industrial sector to grow more than previously forecasted with several factors contributing to electricity demand growth, such as province's growing EV production and supply chain sub-sector, which includes the Honda Canada Inc. EV assembly and battery production facilities in Alliston announced on April 25, 2024. Increased electricity demand is forecasted to materialize in the late 2020s. Other incremental potential projects accounted for in the demand forecast (adjusted for uncertainty) include incremental expansion and decarbonization in the primary metals sub-sector, and other economic expansion projects in the chemical production sub-sector.

The IESO continues to expect automobile production sub-sector electricity demand attrition and mining sub-sector electrification and growth in the long term. As Ontario's automobile production sub-sector transitions from the production of internal combustion engine-based vehicles with complex mechanical supply chains to electric motor-based vehicles with relatively simpler supply chains, the sub-sector will experience some attrition over the longer term since potentially less energy is required. In the mining sub-sector in northern Ontario, the IESO expects the adoption of industrial process electrification in existing mines to improve operational economic efficiencies and reduce GHG emissions. The IESO also expects a resumption of a long-term growth cycle starting in the 2040s, requiring development of new extraction and processing facility projects of currently unidentified mineral deposits. Both mining sub-sector assumptions have been informed by studies conducted by the IESO since the 2022 APO.

The newly identified projects for the latest Forecast, in addition to previously identified projects[8] in prior Forecasts, represent a small number of projects with high levels of uncertainty in terms of annual levels of energy and peak demand, daily and seasonal load profiles, implementation timelines, and project realization. Due to the number of unknowns, the industrial sector continues to possess the highest levels of forecast uncertainty compared to other sectors. With each year's Forecast — and as each project's implementation milestone nears — levels of forecasted risk decrease as these details become more certain. Expectations continue for slow growth in all other sectors (e.g., petroleum, plastic, rubber, paper, etc.).

Overall, industrial sector level net annual energy demand is projected to grow from 44 TWh in 2026 to 73 TWh in 2050, a difference of 28 TWh, or 64 per cent in 24 years, with a compound annual growth rate of 2.1 per cent.

2.4.4. Agricultural Sector

Demand for electricity from Ontario's agricultural sector continues to grow (primarily in the West of London area) driven by greenhouse expansion and the proliferation of supplemental lighting in greenhouses producing fruits, vegetables, flowers, and cannabis. However, increasing construction and operational costs contribute to growth levels projected to be slower than in the 2024 APO. Energy demand for this sector continues to be significantly higher in the winter than summer, affecting the system's seasonal peaking patterns.

Overall, agricultural sector level net annual energy demand is projected to grow from 3 TWh in 2026 to 5 TWh in 2050, a difference of 2 TWh, or 53 per cent in 24 years, with a compound annual growth rate of 1.8 per cent.

2.4.5. Transportation Sector

In 2022, the Government of Canada introduced the 2030 Emissions Reduction Plan that focused on a shift to cleaner fuels for vehicles to decarbonize the transportation sector. Additionally, several rail transit electrification projects are underway across Ontario. EV and rail transit projects are the two categories of transportation electrification assessed in this Forecast.

Overall, transportation sector level net annual energy demand is projected to grow from 3 TWh in 2026 to 44 TWh in 2050, a difference of 41 TWh, or 1,382 per cent in 24 years, with a compound annual growth rate of 11.9 per cent.

[8] Algoma Steel's electric arc furnace in Sault Ste. Marie, ArcelorMittal Dofasco's electric arc furnace project in Hamilton, LG and Stellantis's EV battery factory in Windsor, Volkswagen EV battery factory in St. Thomas, and several mineral extraction projects in northern Ontario.

2.4.5.1. Electric Vehicles

By the end of 2024, there were more than 200,000 EVs registered in Ontario, representing about 2 per cent of all vehicles in the province. As the federal government rolls out initiatives and strengthens plans to decarbonize the transportation sector, it is projected that there will be significantly more EVs on the road in Ontario by mid-century.

The Government of Canada published regulations in December 2023 that require manufacturers and importers to meet annual zero-emission sales targets for new light-duty vehicles (weighing less than or equal to 4,536 kilograms): at least 20 per cent in 2026, increasing to at least 60 per cent in 2030 and 100 per cent in 2035. The IESO's EV adoption forecast is in line with these regulations. It is projected that the number of light-duty EVs in Ontario will increase from nearly 400,000 in 2025 to 11.5 million in 2050. Policy measures, improved technology, matured production, and consumer preference continue to contribute to the shift from internal combustion engine vehicles to EVs.

Currently, most automobiles in the province are light-duty vehicles. Medium- and heavy-duty vehicles (weighing more than 4,546 kilograms) combined represent less than 3 per cent of total vehicles in the province. Various technologies continue to progress and compete in the decarbonization of medium- and heavy-duty vehicles. It is assumed that adoption of battery-powered medium- and heavy-duty vehicles will lag light-duty EVs, reaching 90,000 units by 2050, and comprise 23 per cent of total medium- and heavy-duty vehicles. No electricity demand was assumed for other technologies. Medium- and heavy-duty vehicles are operated almost exclusively for business with a variety of unique usage patterns and requirements that may make electrification more challenging. There is also uncertainty around future market shares of catenary, battery-electric, hydrogen fuel cell, bio-based diesel, and other technologies in the medium- and heavy-duty vehicles segment.

Besides EV adoption, which determines the quantities and types of vehicles, fuel efficiency and driving distance are two other factors determining the electricity demand levels. On-road transportation sub-sector electricity peak demands are largely influenced by charging patterns and how EV demands interplay with non-EV demands. The system peak is determined by all end uses and how their profiles coincide with each other. EV charging patterns, which are generally determined by EV owners' behaviour and preference, carry a high uncertainty: they evolve over time and can be influenced by rate structures and other programs. A modelled EV charging profile, which assumes continued charging management initiatives, is used for the APO's Forecast.

Further discussion on demand uncertainties is found in Section 7.1, including links to the IESO's technical papers that explore specific areas such as EVs.

2.4.5.2. Rail Transit Electrification

Mass rail transit electrification is also underway across southern Ontario. GO Transit rail corridor electrification projects, local light-rail transit projects and subway projects are at various stages of planning, construction and operation. Their electricity demands are high-level estimates and will continue to be refined and updated in future outlooks as more information becomes available.

The IESO is monitoring the High Frequency Rail project that is proposed for the Quebec City–Toronto corridor and will capture the project in future outlooks as it proceeds, and more information becomes available.

2.4.6. Other Electricity Demand

The IESO's Forecast accounts for all electrical energy and peak demand in the province. However, certain areas of demand do not fall under any of the previously discussed sectors and are, therefore, classified as "other electricity demand." These include:

- Connection of remote communities over the outlook period;
- Electricity generators[9];
- Street lighting; and
- Municipal water treatment.

Demand from remote communities that were connected to the IESO-controlled grid at the time of Forecast development is included in the appropriate sector-level forecasts. Remaining remote community system connections over the course of the outlook period will have their respective forecasts included into explicit sector-level forecasts in future APOs as they are connected. Demand from street lighting and municipal water treatment has been updated to reflect the latest population and household projects.

Overall, the other electricity demand component's net annual energy demand is projected to grow from 5 TWh in 2026 to 6 TWh in 2050, a difference of 1 TWh, or 18 per cent in 24 years, with a compound annual growth rate of 0.7 per cent.

2.4.7. Demand-Side Management

Energy efficiency delivered through demand-side management is a key resource for maintaining a reliable, affordable, and sustainable electricity system in Ontario. As electricity demand is forecasted to grow rapidly across the province and as existing resources retire or enter refurbishment, the value of eDSM to the system increases as a low-cost, non-emitting resource that can respond to changing system needs.

The scope and scale of energy efficiency and demand-side management supports economic growth in communities across the province, with a strategic focus on reducing demand on the grid and broadening the types of incentives to meet changing customer needs. Strategic investments into demand-side management helps offset growing demand amid an energy transition that are consumer-friendly; and encourages wise energy-use that can save costs for government, businesses, industry, and ratepayers.

The IESO's Forecast accounts for the expected impact of eDSM programs and efficiency regulations in reducing demand.

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[9] Electricity generators such as gas, oil and nuclear generating stations themselves can experience electricity demand through their facilities' initiation of operations, as well as lighting and heating, ventilation and air-conditioning loads.

2.4.7.1. Demand-Side Management Programs

EDSM programs continue to play an increasingly important role in the power system. Initiatives funded by provincial and federal agencies are underway, achieving energy and peak demand savings and, in turn, reducing energy and capacity needs.

At time of the 2025 APO demand forecast development, the IESO-managed 2021–2024 Conservation and Demand Management Framework was the central existing initiative and delivered to consumers under the IESO's Save on Energy brand. On Sept. 29, 2022, the IESO received a Ministerial Directive in connection with the framework to enable additional programming through a budget increase to a total of $1 billion, and updated annual energy savings target of 3.8 TWh by 2025. It is assumed that the annual savings of new programs beyond 2024 will be consistent with levels forecasted for savings delivered during the enhanced 2021–2024 framework, on a proportion of gross demand basis. As the latest program update projected higher savings than projected when developing the previous APO Forecast, long-term savings from new eDSM programs are forecasted higher.

In October 2024, the government posted a proposal for a longer term 2025–2036 framework on the Environmental Registry of Ontario and directed the IESO to begin preparations for continued program delivery while the new framework is finalized. In January 2025, the government announced a new twelve-year eDSM Framework, and the IESO published a program plan that specifies an energy savings target of 4.6 TWh, peak demand savings target of 900 MW, and a budget of $1.8 billion for the initial three years of the new framework spanning 2025–2027. The impact of the new framework's higher targets will be reflected in the demand forecast for the next APO.

As a vital component to energy planning, the IESO will take a long-term approach to optimize the full value of demand-side management:

- Provide Ontario homes and businesses with continuing opportunities to manage their electricity costs.
- Give access to free energy-efficiency tips and other educational resources through Save on Energy to help residents better manage their home energy costs and to make smart buying decisions for energy-efficient appliances and equipment.
- Improve energy efficiency in on-reserve First Nations, and engage with Indigenous communities, to better understand barriers and priority areas for future Indigenous programming that takes into consideration the unique Indigenous experiences and insights learned through the delivery of past programs, market research, and engagement with communities, social service organizations, and other interested parties.
- Continue to run the Energy Affordability Program to help income-eligible consumers save money and improve their home's energy efficiency.
- Engage small business, commercial, industrial, agricultural, municipal, and institutional facilities to drive operational growth and support business competitiveness.
- Offer greater certainty to the marketplace that demand-side management programs will be available for the longer term.
- Enable greater consumer engagement on a regional level and allow programs to help address local distribution system needs through the involvement of local distribution companies.

- Provide sector partners increased opportunities to collaborate with the IESO on the promotion of programs and innovative offerings for consumers across all segments.

Other programs funded by the federal government are expected to result in additional electricity savings in Ontario. The Green Municipal Fund targets the commercial sector, with a goal of reducing energy consumption and GHG emissions from fossil fuels. The Canada Greener Homes Grant and the Canada Greener Homes Loan Program help homeowners across the country implement energy efficiency and GHG emission-reduction retrofits. The electricity demand savings in Ontario from these programs are estimated to increase to 0.1 TWh in 2026. In 2024, the Canada Greener Homes Grant stopped accepting new applications and the federal government announced that it would be shifting to a more targeted Canada Greener Homes Affordability Program in 2025. The IESO is monitoring developments of federal programs and will reflect any additional changes in future planning outlooks.

Overall, the level of annual electricity demand savings from all eDSM programs in Ontario is forecasted to fluctuate between 16 TWh and 18 TWh from 2026–2050. This accounts for the expiring savings as measures implemented under past programs reach end of life and are replaced.

2.4.7.2. Demand-Side Management Regulations

EDSM regulations, which consist of building codes and equipment standards that are both currently in effect and have a relatively high level of certainty of being implemented, are an effective energy-efficiency tool. These electricity demand savings estimates are based on expected improvements in codes for new and renovated buildings and the regulation of minimum efficiency standards for new equipment. The IESO estimates savings attributable to efficiency regulations by comparing the Forecast at the gross level with the Forecast adjusted for the impacts of the regulations. The IESO has identified savings since 2006 and thus uses that year as a base year. Most of the savings from increased regulations will be realized in the residential and commercial sectors.

The eDSM regulations savings forecast is similar to the recent APO Forecast. Minor updates to a handful of equipment standards have been reflected in the latest Forecast. Going forward, as changes to regulations are announced, the IESO will analyze their impacts and include them in forecasts and outlooks as they are published.

Overall, eDSM regulations annual energy demand savings since 2006 are projected to grow from 11 TWh in 2026 to 17 TWh in 2050, a difference of 7 TWh, or 62 per cent in 24 years, with a compound annual growth rate of 2 per cent.

2.4.8. Load Modifiers and Demand Measures

In addition to sector-level demand and eDSM forecasts, the Forecast is adjusted for load modifiers, initiatives and policies that affect demand or prices. These include the Industrial Conservation Initiative, and Save on Energy’s Peak Perks demand response program (a demand measure that is a controllable initiative). Both have material impacts on the forecasted seasonal peak demand of each year.

2.4.8.1. Industrial Conservation Initiative

ICI is a form of demand response that enables large customers — known as Class A customers — to reduce their electricity costs by curtailing electricity consumption during periods of system peak demand.

In the 2024 APO, the IESO revised its ICI forecasting methodology to better anticipate the impacts of the program in future years when system demand hourly profiles are expected to vary materially compared with current trends. This updated methodology remains unchanged in the 2025 APO. ICI forecasts are now created with a load-following methodology, with forecasted hourly ICI program response based on each day's unique forecasted hourly system demand.

Consistent with previous Forecasts, ICI levels are based on the latest observed program responses for the summer 2023 and winter 2024 seasons. The ICI forecast now assumes 15 ICI response days each year, with each individual ICI day's response modelled as commensurate with the ICI day's level of system peak demand relative to other ICI days in the same year, consistent with latest observed program responses. Annual ICI response is expected to change consistent with forecasted levels of demand from the industrial sector on a zonal and annual basis with ICI response expected to grow through the early 2030s, remain largely consistent until the late 2040s, and start to grow again thereafter. The IESO expects that ICI drivers, including customer ICI program investment and global adjustment levels, will inevitably change over time and, thus, ICI impacts on future Forecasts and ICI forecast methodology will be regularly reassessed.

Overall, peak ICI annual summer seasonal demand savings are projected to grow from 2,013 MW in 2026 to 2,518 MW in 2050, an increase of 505 MW, or 25 per cent, in 24 years, with a compound annual growth rate of 0.9 per cent. Peak ICI annual winter seasonal demand savings are projected to grow from 1,434 MW in 2026 to 1,795 MW in 2050, an increase of 360 MW, or 25 per cent, in 24 years, with a compound annual growth rate of 0.9 per cent.

2.4.8.2. Residential Demand Response

On May 25, 2023, the IESO launched Peak Perks to help families save money and reduce demands on the provincial grid. Peak Perks is a residential demand response program delivered by the IESO, pursuant to the Sept. 29, 2022 ministerial directive, targeting residential sector central air conditioning. The program is committed within the parameters of the 2021–2024 Conservation and Demand Management Framework. For the purposes of this Forecast, it is assumed to persist to the end of the outlook period, consistent with the long-term eDSM program assumptions.

With the benefit of experience from one year of participant enrollments and program activations, expected program impacts have been updated in this year's Forecast. Residential demand response is expected to reduce system demand by up to 152 MW in 2026 and is included in the Forecast for years 2025 to 2050 with growing impact commensurate with province-wide central air conditioning system adoption forecasts. Peak Perks is expected to be activated on the 10 highest system peak demand days each year during weekdays from June 1 to Sept. 30; have a maximum of one activation per day for three contiguous hours; and a peak response on the middle hour. Residential demand response capacity is forecasted to grow and match responses consistent with forecasted zonal residential air conditioning unit installations in Ontario.

Overall, annual peak demand savings from residential demand response are projected to grow from 152 MW in 2026 to 183 MW in 2050, a difference of 31 MW, or 20 per cent, in 24 years, with a compound annual growth rate of 0.8 per cent. As part of the recently approved 2025–2036 eDSM Framework, the IESO plans to expand Peak Perks to include small business customers and increase the peak savings targets for the program. This enhancement will be reflected in the next APO Forecast.

3. Supply and Transmission Outlook

Ontario's supply mix will undergo significant change over the next two and a half decades as available capacity from the nuclear fleet continues to be impacted by refurbishments and retirements and other resources reach end of life; and available generation and storage are expected to increase due to actions taken by the IESO and resulting from government policy. To support the growing supply fleet, a significant growth and expansion of transmission infrastructure across the province will be required to aid deliverability of new resources. This expansion of transmission infrastructure will also facilitate the economic development goals set out in *Powering Ontario's Growth* and considerations outlined in *Ontario's Affordable Energy Future: The Pressing Case for More Power.*

This section describes the availability of the province's existing supply resources over the outlook period; the ability of the bulk transmission system to continue to supply electricity where it is needed; and the various major transmission projects that are underway to maintain system reliability and enable growth.

3.1. Supply Outlook

This section provides an outlook for installed capacity, which is a resource's maximum output; and effective capacity, which considers factors such as fuel availability, ambient conditions and/or outages. Effective capacity is a more meaningful measure of a resource's ability to meet reliability needs in each season.

This year's APO presents one supply case consisting of existing and committed resources (including resources committed through actions undertaken by the IESO and/or informed by government policy) until their contract or commitment period ends. The major supply change between the 2025 APO and 2024 APO is the increase in storage resources, bioenergy generation, and natural gas generation resulting from the first Long-Term (LT1) Request for Proposal (RFP).

Consistent with the 2024 APO, the supply case in the 2025 APO excludes resources expected to be cleared from upcoming Capacity Auctions in order to better identify system needs and establish targets in response to those needs. Other resources that are expected to operate and contribute to the system as a result of in-flight procurements (i.e., resources expected from the second Medium-Term (MT2) RFP) are also excluded from the supply case. These resources are considered in an integrated reliability needs assessment to inform future planned actions, and further described in Section 8.

Figure 7 shows the total installed capacity by fuel type for the outlook period, which assumes resources under contract/commitments are not reacquired after their contract ends, aside from hydroelectric resources[10]. Installed capacity decreases from around 39 GW to 29 GW in the next decade, before levelling off at approximately 26 GW in the late 2040s.

Figure 7 | Installed Capacity

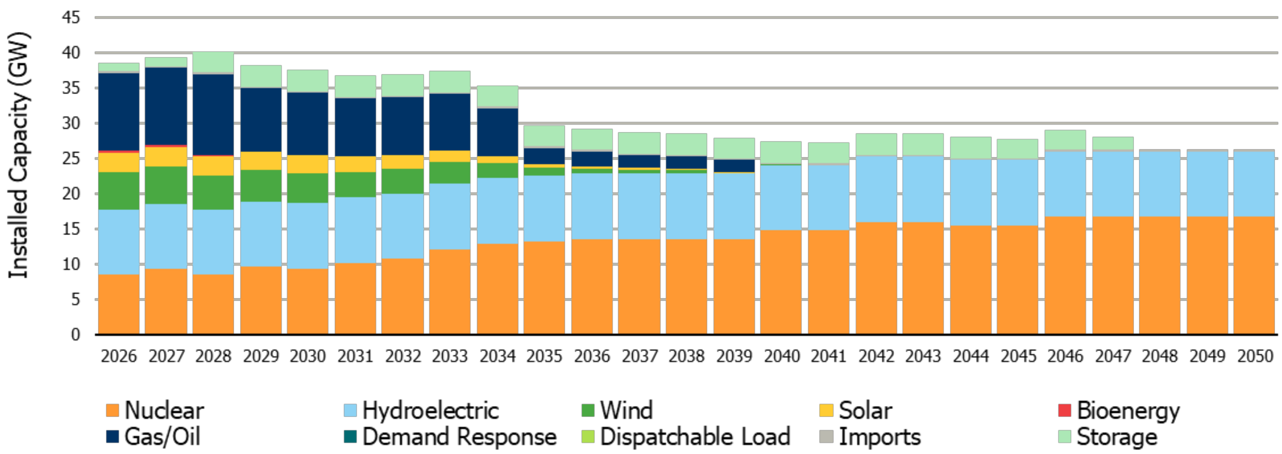


Figure 8 shows the summer effective capacities by fuel type for the outlook period. Summer effective capacity varies between 26 GW and 29 GW during the 2020s, due to the refurbishment of the nuclear fleet, and then levels off around 23 GW in the late 2040s due to contracts expiring.

Figure 8 | Summer Effective Capacity

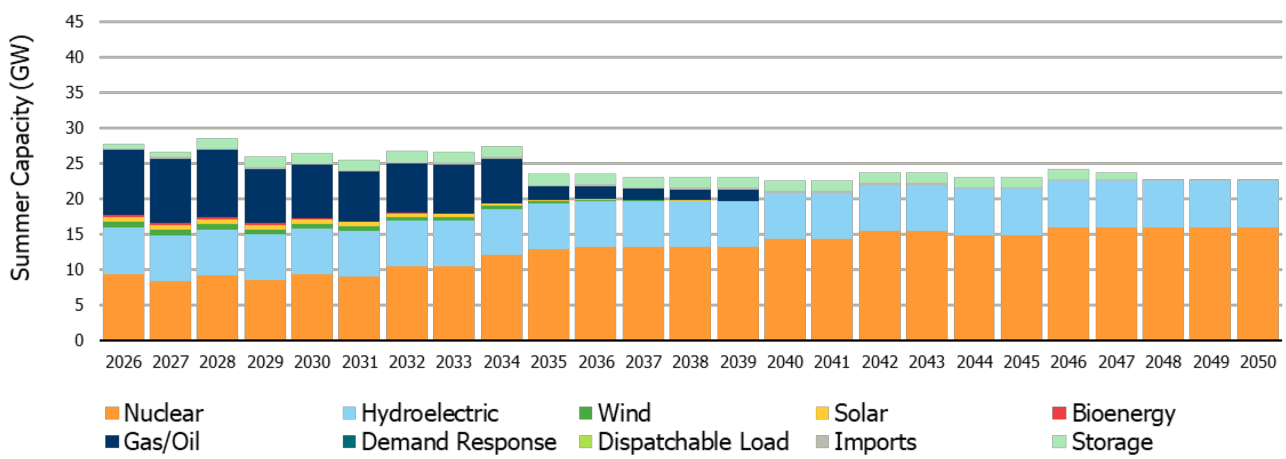
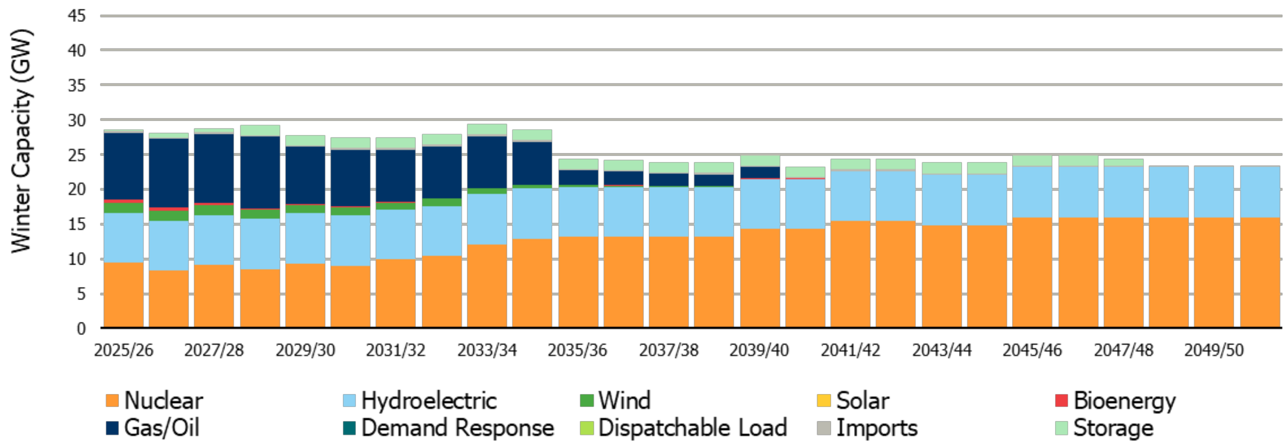


Figure 9 shows the winter effective capacities by fuel type for the outlook period. Winter availability of the fleet ranges between 27 GW and 29 GW in the next decade, levelling off at 23 GW in the long term due to contracts expiring.

[10] For the assessment, hydroelectric resources are assumed as perpetual assets and continue to operate, regardless of ownership, age of facility, etc.

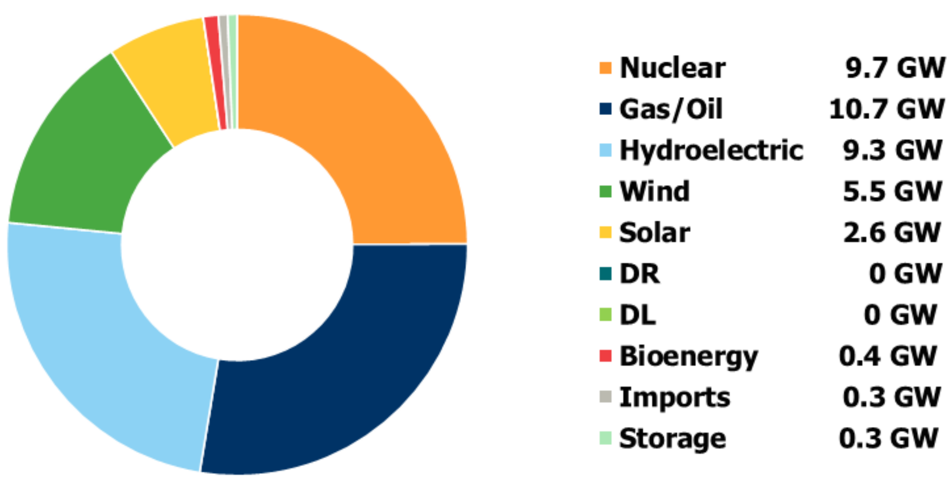
Figure 9 | Winter Effective Capacity



3.1.1. Installed Capacity

Ontario has 38.8 GW of installed capacity consisting of a diverse mix of resources, as shown in Figure 10[11]. The majority of Ontario's installed capacity comes from nuclear (25 per cent)[12], gas (28 per cent), and hydroelectric (24 per cent) resources. The remainder is made up of wind (14 per cent), solar (7 per cent), bioenergy (1 per cent), and non-firm imports (1 per cent)[13]. Energy storage's contribution (1 per cent) to the province's installed capacity is expected to increase as new storage resources come online over the next few years.

Figure 10 | 2025 Installed Capacity by Fuel Type



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[11] Includes both transmission- and distribution-connected resources visible to the IESO.

[12] Nuclear installed capacity does not include nuclear units on refurbishment.

[13] Non-firm imports are included in resource adequacy assessments and are consistent with the approach outlined in the APO Resource Adequacy and Energy Assessments Methodology. System and generator-backed imports cleared in the 2023 Capacity Auction are not considered as they do not contribute to the supply tabulation for 2025.

3.1.2. Nuclear Refurbishments and Retirements

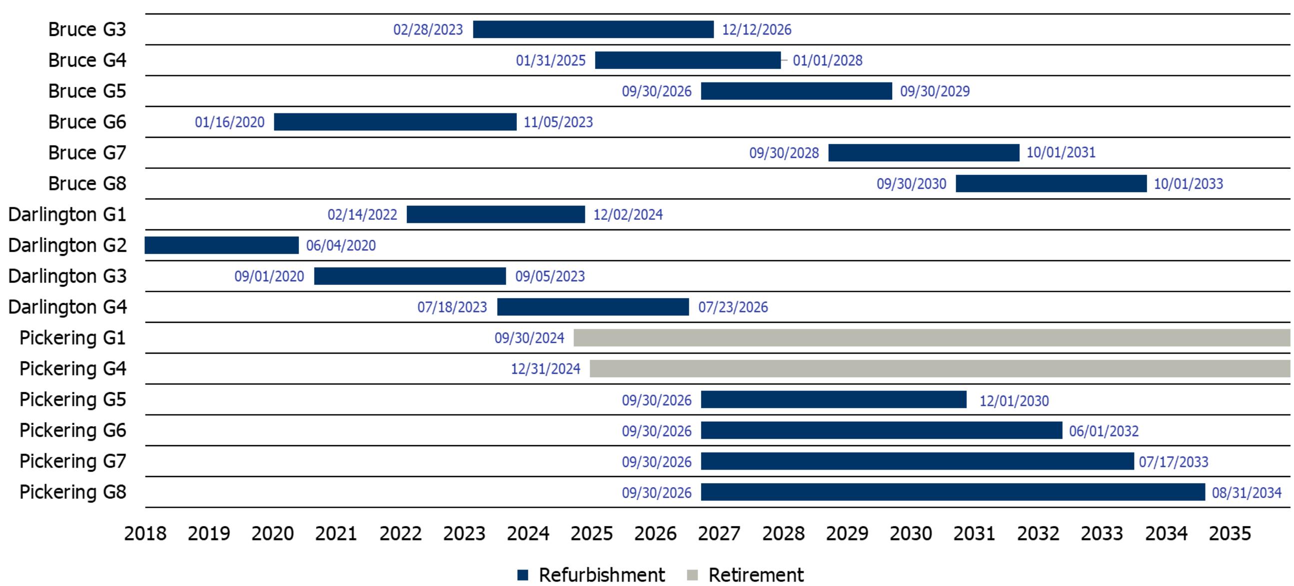
Throughout the 2020s, Ontario's electricity system will see a significant change in the available capacity of its nuclear fleet. The retirement of the Pickering A Nuclear Generating Station (NGS) at the end of 2024, as well as various refurbishments requiring long-term outages at Pickering B NGS, Darlington NGS, and Bruce NGS will increase resource needs. Figure 11 illustrates the planned refurbishment start of Pickering B NGS at the end of Q3 2026. Based on Ontario Power Generation's preliminary schedule, the refurbishment of Pickering B NGS is anticipated to be completed by the mid-2030s. Although not shown in Figure 11, the 2025 supply case also includes the following new nuclear resources:

- Preliminary plans for a new 4,800 MW NGS in Bruce County, projected to be completed in the mid-2040s; and
- Four small modular reactors at Darlington NGS, providing 1,200 MW of capacity and expected to be completed between 2029–2036.

The 2025 supply case does not include the potential new nuclear development being explored in Port Hope (see Section 7.2.2.5).

The nuclear refurbishment and retirement schedule assumed for the assessment is shown in Figure 11, and as the schedule continues to evolve, updates will be incorporated in future analyses.

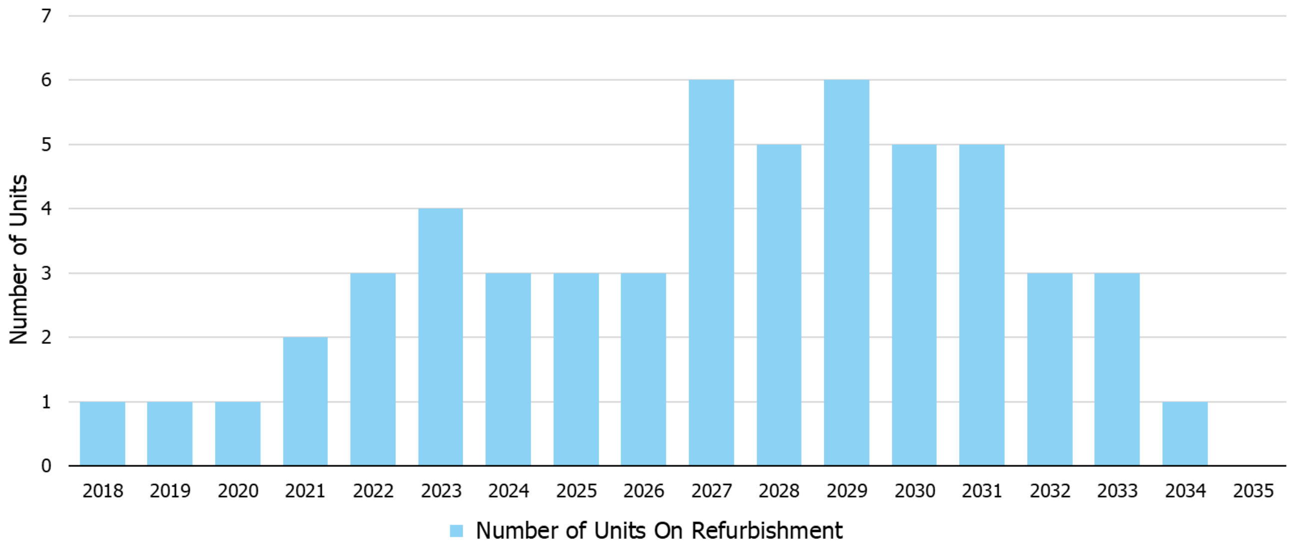
Figure 11 | Nuclear Refurbishment and Retirement Schedule[14]



[14] The forecast schedule was provided by Ontario Power Generation and Bruce Power. Historical dates have been updated to reflect actual refurbishment start/end dates based on unit output measurement from IESO data.

Figure 12 shows that refurbishment activity has increased in recent years, with between two and six units undergoing refurbishment concurrently over the forecast summer periods. The Darlington NGS, Bruce NGS and Pickering NGS refurbishments are expected to be complete in 2026, 2033, and 2034, respectively. By the end of 2034, a total of 10.6 GW of nuclear capacity will have undergone refurbishment. Bruce A Units 1 and 2 are expected to reach the end of their expected operating lives in December 2043.

Figure 12 | Summer Refurbishment Outages



3.1.3. Contracts and Commitments Ending

Over the course of the outlook, many generation contracts/commitments held by the IESO or the Ontario Electricity Financial Corporation will expire. As shown in Figure 13, expirations increase significantly before the end of this decade (e.g., Lennox Generating Station) and the middle of the next decade (i.e., other gas resources in 2034–2035). In addition to the procurement of new resources, growing demand is expected to be met by reacquisition of existing resources in a competitive manner utilizing medium-term procurements and the annual Capacity Auction (described further in Section 9).

Figure 13 | Existing Resources Post-Contract Expiry by Fuel Type

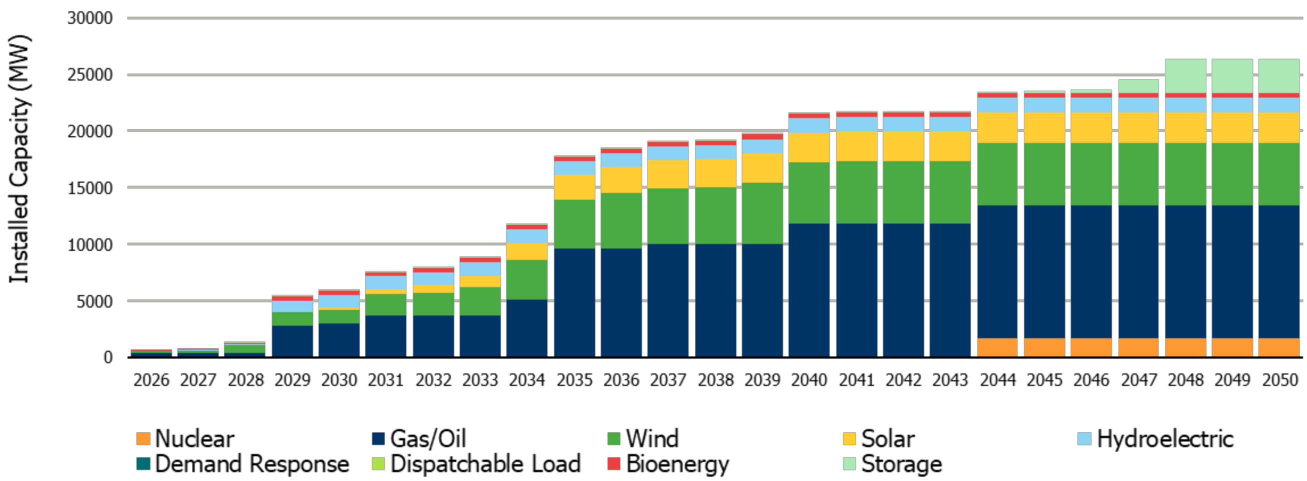


Figure 14 shows the summer effective capacity, by fuel type, that will reach end of term over the course of the outlook.

Figure 14 | Summer Effective Post-Contract Expiry by Fuel Type

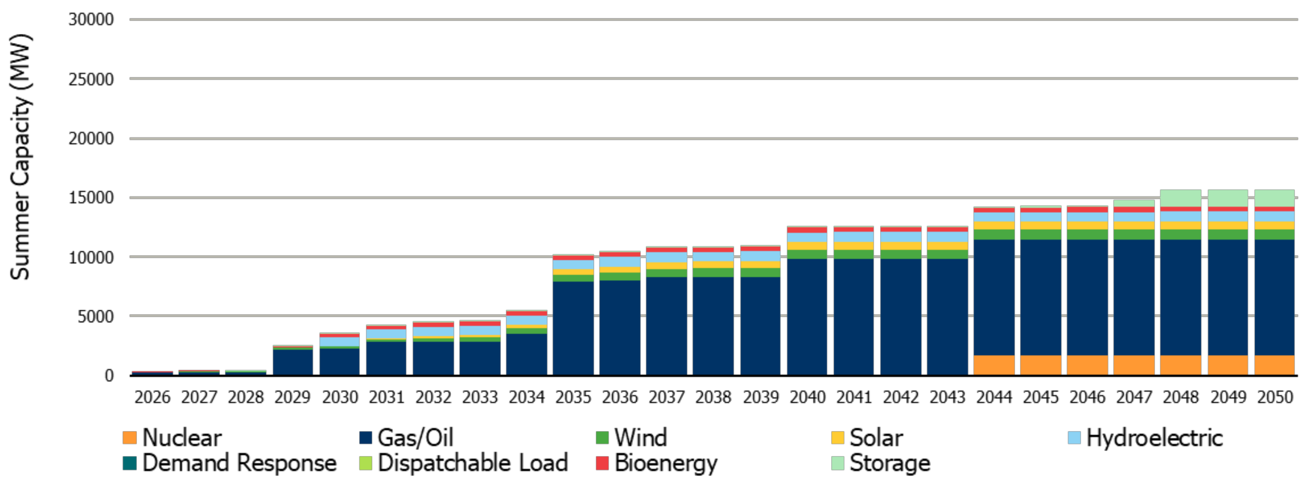
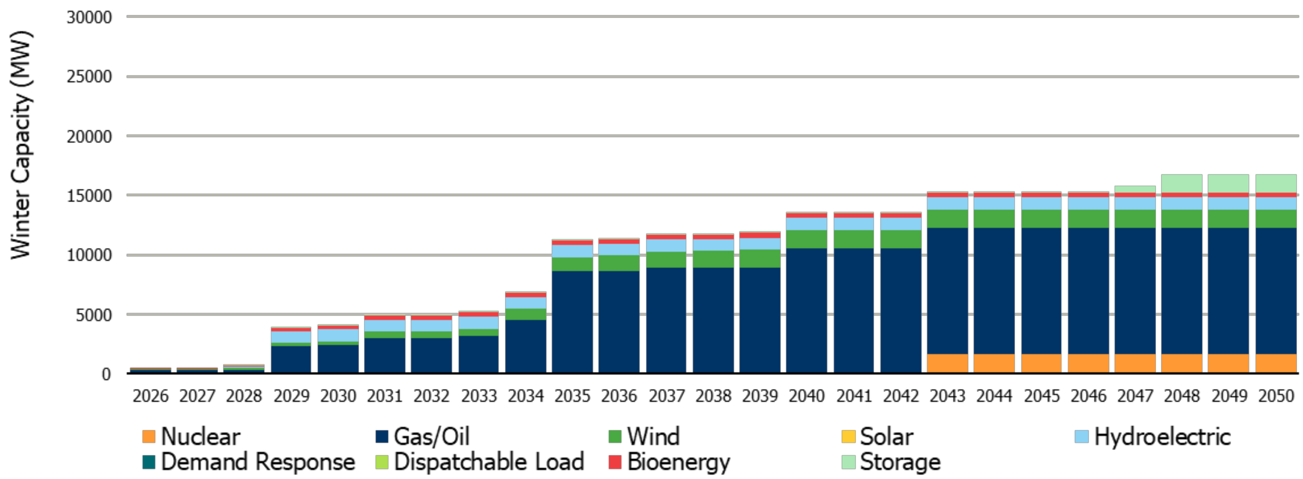


Figure 15 shows the winter effective capacity, by fuel type, that will reach end of term over the course of the outlook.

Figure 15 | Winter Effective Post-Contract Expiry by Fuel Type



3.2. Transmission System Outlook

This section provides a basis for understanding the role of the transmission system in transporting electricity and delivering power from producers to consumers across the province. There are constraints inherent in the existing transmission system that can limit the amount of power that can be transported at different times and under different circumstances. This includes the ability for power to be imported and exported into and out of the province over interties with Quebec, Manitoba, New York, Michigan and Minnesota. Over time, as transmission assets age or retire, and as new facilities come online, the transmission system capability changes. New transmission facilities that will be incorporated into transmission assessments are also summarized in this section.

3.2.1. Existing Bulk Transmission System

The bulk transmission system refers to the network of high-voltage transmission lines and a transmission station (TS) that transports power in high volumes over long distances. This network is critical for ensuring power generated by supply resources can always be transferred to consumers under normal operating conditions, and during and after disturbances. Within Ontario, transmission interfaces that form the boundaries between the 10 IESO electrical zones are used to describe the capabilities of the bulk transmission system. The ability of power to flow across these transmission system interfaces is a key input to resource adequacy assessments because it can limit the delivery of power from one part of the province to another and can contribute to demand-supply imbalances at a zonal level. Over time, as the transmission system changes through reinforcements and/or retirements, the nature of power flows can change and create the need to define new interfaces.

Power is transferred between Ontario and neighbouring jurisdictions via bulk transmission interties, which are facilities at Ontario's borders where transmission lines and elements interconnect with neighbouring jurisdictions. These interties provide several system benefits that include economic trading opportunities and the potential for contractually secured imports and exports to manage resource needs. Other benefits of participating in an interconnected system include system stability, frequency regulation, and voltage support.

Ontario's internal transmission interfaces and interties with neighbouring jurisdictions are shown in Figure 16. More information about the transfer capabilities of Ontario's transmission interfaces and interties is provided in the Transmission Interfaces and Interties Module.

Figure 16 | Ontario's Major Transmission Interfaces, Electrical Zones and Interties

Since the 2024 APO, a few transmission facilities that were in development have been completed and are now in service, providing benefits for all Ontario ratepayers. These projects include the Wataynikaneyap (Watay) Power Transmission Project in the northwest, and the new Chatham to Lakeshore transmission line in the West zone. These projects and their rationale are described in Table 1.

Table 1 | Description and Status of Recently Completed Bulk Transmission Projects

Project	**Rationale**
Wataynikaneyap Power Transmission Project	Connecting several off-grid remote First Nations to the IESO-controlled grid.
Chatham to Lakeshore Project	Supporting sustained growth in the agricultural and automotive sectors.
Sudbury Area Reinforcement – X25S Unbundling	Supporting growth due to electrification and the mining sector.

3.2.2. Planned Transmission System Expansion Projects

Planned transmission projects that are sufficiently far along in their planning and development to be considered committed projects for the purpose of long-term system planning are described in this section. The locations of these planned transmission projects are shown in Figure 17 and a summary of each, including expected in-service date, is provided in Table 2.

The system needs and drivers for the included planned transmission projects have been described in detail in bulk system plans, stakeholder engagements, regional plans, and regulatory approval submissions to the OEB[15].

Figure 17 | Planned Transmission Projects[16]

[15] Individual planning studies are published on the IESO's Regional Planning page.
[16] The voltage control devices described in Table 2 are not shown in the map.

Table 2 | Description and Status of Planned Bulk Transmission Projects

Project	Bulk Plan or Study (If Applicable)	Description/Status	Expected In-Service Date	Transmitter
Waasigan Transmission Line (two phases)		The Waasigan Transmission Line project, comprising a new double-circuit 230 kilovolt (kV) transmission line between Lakehead TS in the municipality of Shuniah and Mackenzie TS in the town of Atikokan, and a new single-circuit 230 kV transmission line between Mackenzie TS and Dryden TS in the city of Dryden, will increase supply to the region west of Thunder Bay.	Q4 2025 (phase 1) Q4 2027 (phase 2)	Hydro One, First Nation Partnership [17]
West of Chatham Area Reinforcements	Windsor-Essex Bulk Plan	Growth in the agricultural sector is one of the main drivers of increasing demand in Ontario, as well as growth in the automotive sector, which has resulted in a need for additional capacity in the Windsor-Essex region. This multi-phase reinforcement project consists of a new Lakeshore TS and two sub-stations[18], and a new double-circuit 230 kV transmission line from Chatham SS to Lakeshore TS. This line was completed December 2024.	2025 for the second South Middle Road sub-station	Hydro One
Etobicoke Greenway Project (formerly the Richview TS to	Toronto Integrated Regional	This reinforcement will improve the bulk transmission supply into the city of Toronto to supply the urban centre's growing demand; the	Q2 2026	Hydro One

[17] Nine First Nation partners including: Eagle Lake First Nation, Fort William First Nation, Gakijiwanong Anishinaabe Nation, Lac Seul First Nation, Nigigoonsiminikaaning First Nation, Ojibway Nation of Saugeen, Seine River First Nation, Waabigoon Lake Ojibway Nation, Lac des Mille Lacs First Nation.

[18] Previous iterations of this table included a new Lakeshore TS comprising two new Dual Element Spot Network (DESN)-type sub-stations (South Middle Road DESN 1 and DESN 2). The TS and first sub-station were completed in 2022, while the second sub-station is planned to be in service in 2025.

Manby TS Transmission Line Reinforcement)	Resource Plan (IRRP)	project has received approval to proceed from the OEB.		
Flow East Towards Toronto (FETT) Capacity Upgrade (formerly the Richview-Trafalgar Reinforcement)		The Richview-Trafalgar reinforcement will increase the FETT transfer capability by approximately 2,000 MW through upgrades to sections of the existing 230 kV lines between Trafalgar TS and Richview TS, and it will enable some of the capacity required east of the FETT interface to be replaced with capacity sited elsewhere in the province.	Q4 2026	Hydro One
East of London Area Reinforcements	Central West Bulk Plan	A short section of the existing M31W 230 kV path between Middleport TS and Buchanan TS will be rebuilt to increase supply capability in the London area region and to continue to support local economic development.	2027	Hydro One
J5D Phase Angle Regulator (PAR) Replacement	Ontario-Michigan J5D Study	The existing PAR on J5D, a critical part of the interconnection between the high-voltage grids in Ontario and Michigan (in the Windsor area), is due to be replaced at its end of life. The PAR will be upgraded to increase its capability and improve control of scheduled intertie flows between the two jurisdictions.	Q4 2028	Hydro One
Bulk System Reactive Requirements in Northern Ontario	Northern Ontario Voltage Study	Voltage support devices across northern Ontario are required to address operational challenges in managing high voltages on the system, and to support the integration of several transmission line projects planned in northern Ontario, including the Watay and Waasigan transmission line projects.	2027-2029	Hydro One

		The reactive support devices consist of: • Two new shunt reactors at Porcupine TS, and two new shunt reactors at Lakehead TS by 2027 (for voltage control) • One new line reactor at Mississagi TS, and two new Static Synchronous Compensators at Mississagi TS and at Algoma TS by 2029 (for voltage stability) While not directly recommended as part of the Bulk System Reactive Requirements in Northern Ontario plan, the study referenced additional devices previously recommended through other studies that are still needed to help manage voltages in northern Ontario: a Static Synchronous Compensator and shunt reactor at Lakehead TS, and two shunt reactors at Mackenzie TS.		
West of London Area Reinforcements	West of London Bulk Plan	In addition to the West of Chatham reinforcements, this project is required to supply the agricultural sector growth in the Windsor-Essex region. The reinforcement project consists of a new double-circuit 230 kV transmission line from Lambton TS to Chatham SS, and a new single-circuit 500 kV transmission line from Longwood TS to Lakeshore TS.	2028 for Lambton to Chatham line 2030 for Longwood to Lakeshore line	Hydro One
Welland-Thorold Power Line	Niagara IRRP	The Welland-Thorold Power line consists of a new double-circuit 230 kV transmission line from the existing 230 kV corridor in Thorold	Q3 2029	Hydro One

		to the Crowland TS in Welland. This reinforcement will support demand and improve the resiliency of the Niagara Region.		
Durham-Kawartha Power Line Project	Gatineau Bulk Plan	New double-circuit 230 kV transmission line from Clarington TS to Dobbin TS. The transmission reinforcements ensure reliability in the Peterborough to Quinte West area is sufficient for the next 20 years.	2029	Hydro One
Northeastern Ontario Bulk Transmission System Reinforcements	Northeast Bulk Plan	Electricity demand in northeastern Ontario is growing, particularly in the areas of Sault Ste. Marie and Timmins. This growth is primarily driven by strong economic development in mining and other industry, electrification and decarbonization initiatives, and government policies, requiring transmission reinforcements, including: • New single-circuit 500 kV transmission line between Mississagi TS and Hanmer TS, and two new autotransformers at Mississagi TS • New double-circuit transmission line between Mississagi TS and Third Line TS • New single-circuit 230 kV transmission line (built to 500 kV standard) between Wawa TS and Porcupine TS.	2029 for Mississagi to Hanmer 2029 for Mississagi to Third Line 2030 for Wawa to Porcupine	Hydro One, First Nation Partnership Hydro One, First Nation Partnership Hydro One
Lakeshore-Lauzon Power Line	Windsor-Essex IRRP	New double-circuit 230 kV transmission line from Lakeshore TS to Lauzon TS, to ensure reliability	2032	

	and support economic development in West Essex and Windsor.

4. Resource Adequacy

The IESO closely monitors Ontario's electricity needs — generation, capacity, transmission, and operational characteristics — and works with sector stakeholders and communities to address potential shortfalls or constraints in a timely and cost-effective manner. Under the demand forecast and supply and transmission outlooks identified from previous sections, electricity needs in the near term up to 2028 are expected to be met by resources secured through the first Expedited Long-Term (E-LT1) and LT1 RFPs. In the medium and long term, needs have increased compared to the 2024 APO due to increasing nuclear refurbishment reserves and growth in the demand forecast.

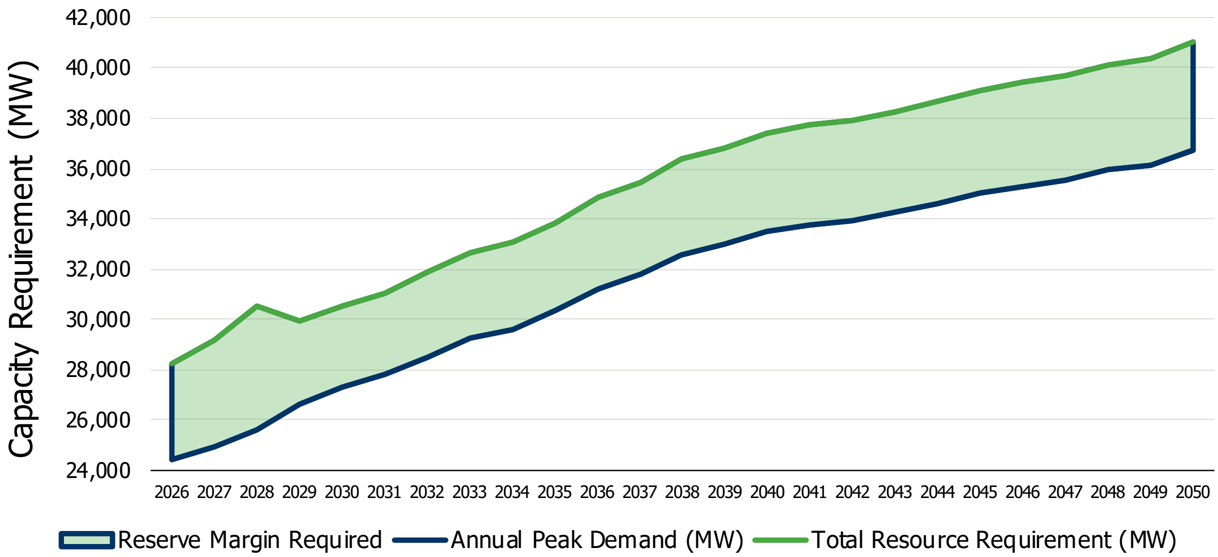
4.1. Reserve Margin

The IESO annually publishes a forecast of reserve margin requirements at the time of projected annual peak. Data tables, which include the reserve margin, for the past five APOs (from the 2019 APO quantifying the 2020–2024 reserve margin onwards to this APO) can be found online. This is done in accordance with Section 8.2 of the Ontario Resource and Transmission Assessment Criteria. The reserve margin requirement is the amount of resources Ontario needs to have available over and above peak demand under normal weather conditions (represented as a percentage of peak demand).

There are various reasons for year-to-year variations in the reserve margin requirement. In addition to the allowances for uncertainties identified by the Northeast Power Co-ordinating Council, the IESO includes additional reserve to account for risks associated with nuclear refurbishments and new build nuclear, with the amount depending on the refurbishment schedule. A year with higher-than-average planned outages will also have a higher reserve margin requirement.

The reserve margin requirements are shown in Figure 18. The APO Resource Adequacy and Energy Assessments Methodology describes how the reserve margin is calculated.

Figure 18 | Reserve Margin Requirement, 2026–2050



4.2. Provincial Capacity Adequacy Outlook

Capacity adequacy can be represented in terms of surplus or deficit, relative to a set of demand and resource assumptions. A capacity adequacy deficit is a type of electricity need that reflects a shortfall in electricity supply that requires resolution. Resource adequacy is assessed for the summer and winter seasons using the demand forecast outlined in Section 2, and the supply and transmission outlook in Section 3. This also accounts for the nuclear refurbishment reserve, as mentioned earlier.

In this section, the capacity deficit represents the total amount of capacity, on an effective capacity basis, that the IESO must acquire to satisfy Loss of Load Expectation (LOLE) requirements of 0.1 days per year of firm loads being disconnected due to supply resource deficiencies[19]. The capacity deficits for summer and winter periods, representing needs based on committed and/or planned resources, are shown in Figure 19 and Figure 20. Available actions to fill this capacity deficit are discussed in Sections 8 and 9.

In Ontario, summer capacity needs are generally higher than winter capacity needs, which is driven by demand and resource performance. Summer peak demands, driven by air-conditioning loads, tend to be higher and more variable than winter peaks. In the future, increased winter load is expected to push the load to be dual-peaking, primarily due to growing greenhouse lighting and EV charging load, which is higher in the winter due to lower efficiency and cabin conditioning requirements in cold temperatures. The other driver is resource performance: existing resources — particularly gas, hydroelectric and wind — provide less effective capacity in the summer than in the winter. While the province is expected to switch from summer-peaking to dual summer-and-winter peaking in the 2030s, Ontario continues to show greater summer capacity deficits for the most part during this

[19] As per Northeast Power Co-ordinating Council Directory 1.

period. The methodology used to calculate effective capacity for each resource type also affects the reserve margin.

Summer capacity needs in 2026 and the near term are expected to be met with previous planned actions, as further discussed in Section 8. Near-term needs have decreased compared with the 2024 APO forecast owing to the inclusion of resources secured through the LT1 RFP, as well as updates to the maximum active power capabilities of generating units. In the long term, out to 2050, system requirements are driven by resources reaching contract expiry, increasing nuclear refurbishment reserves, and an increased growth in demand.

Figure 19 | Summer Capacity Surplus/Deficit

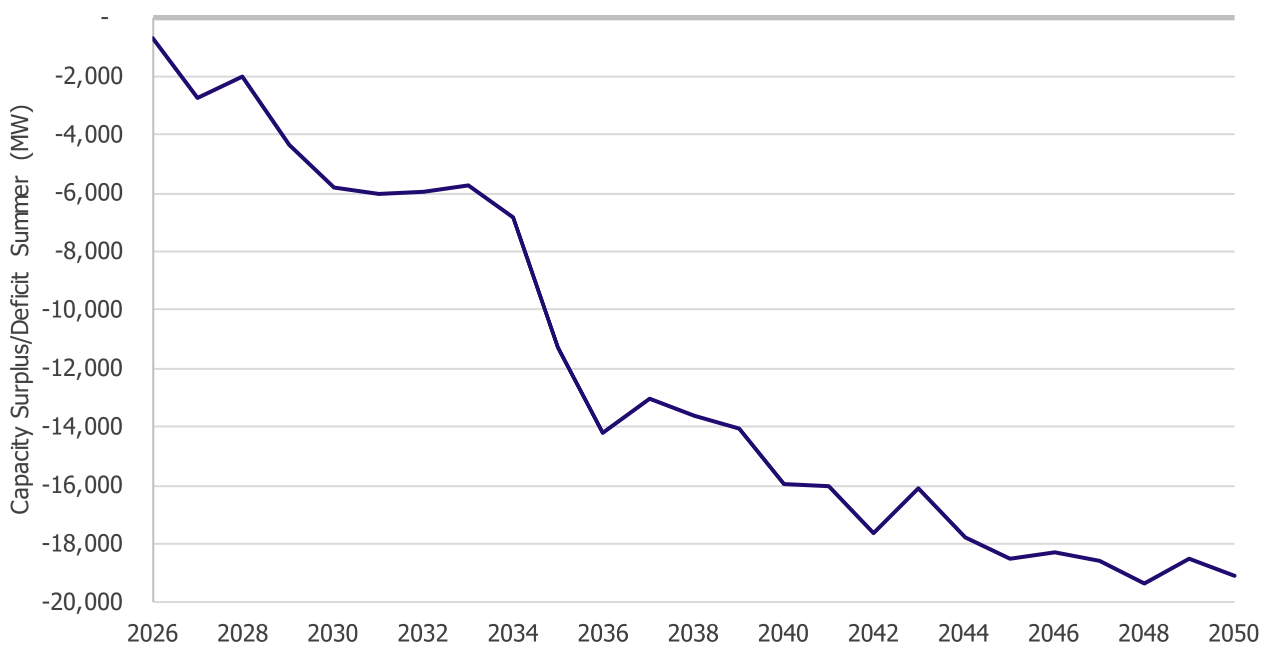
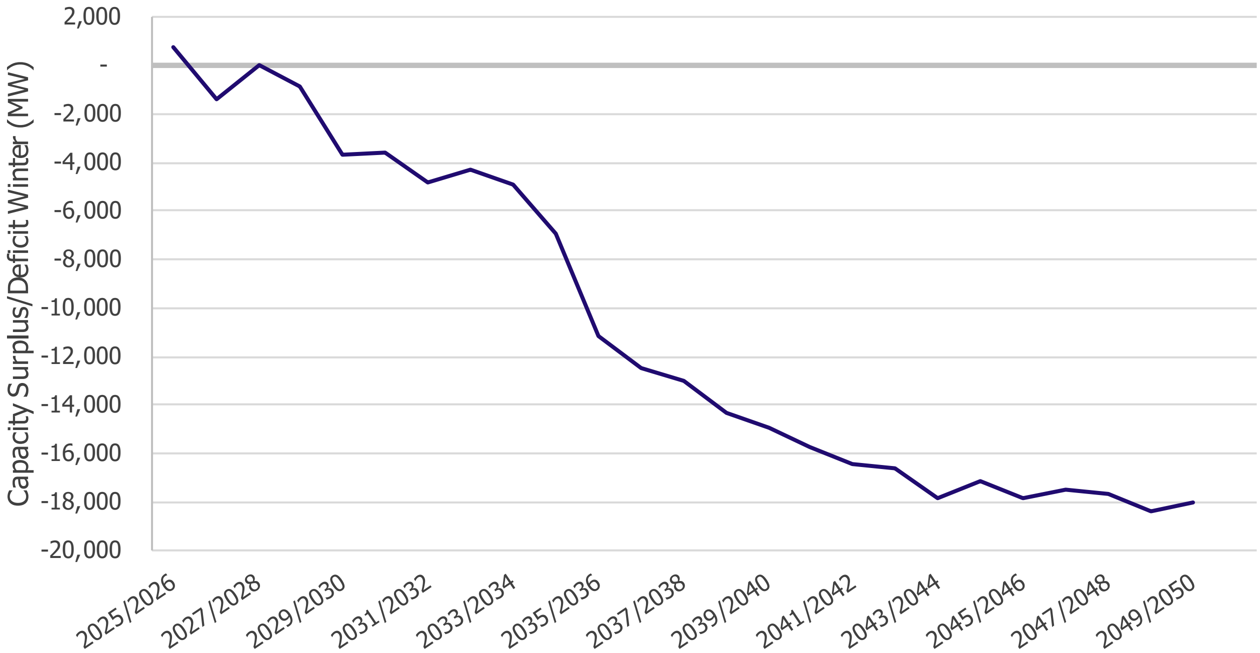


Figure 20 | Winter Capacity Surplus/Deficit

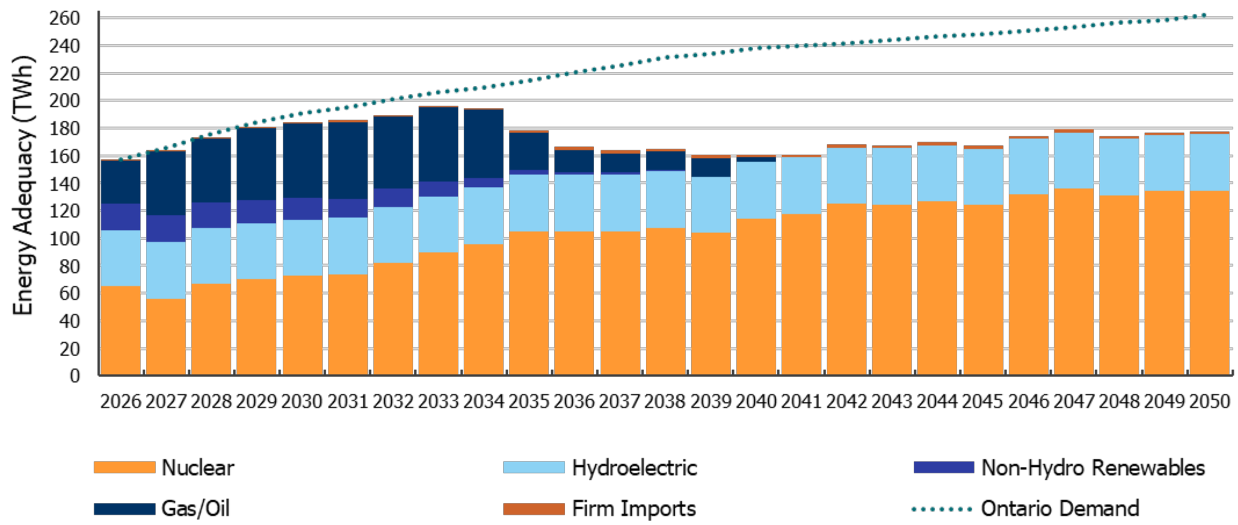


4.3. Provincial Energy Adequacy Outlook

In addition to capacity adequacy, the provincial energy adequacy outlook helps determine Ontario's ability to serve electricity demand and to characterize the nature of system needs. The energy adequacy assessment does not include any economic imports or exports across Ontario's interconnections, as self-sufficiency is assumed in evaluating the system. Consistent with previous outlooks, an energy gap begins to grow in 2029.

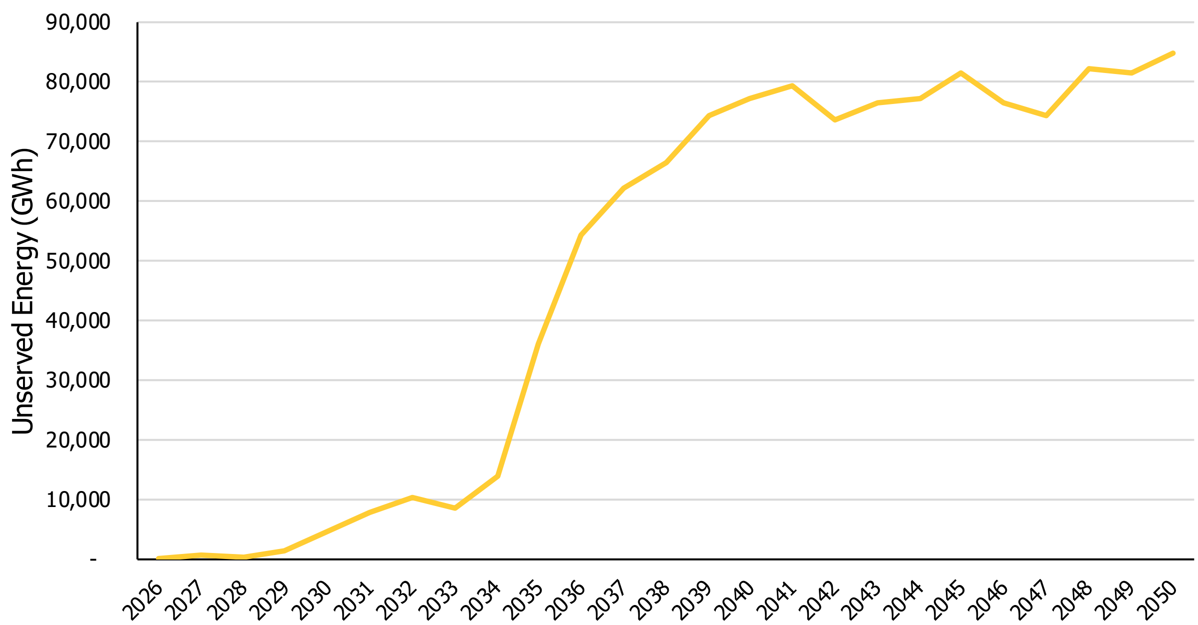
In the long term, the energy needs continue to be driven by increases in demand requirements. The extent of the energy adequacy need will also depend on the availability of existing resources post-contract expiry and potential future policy direction.

Figure 21 | Energy Adequacy Outlook



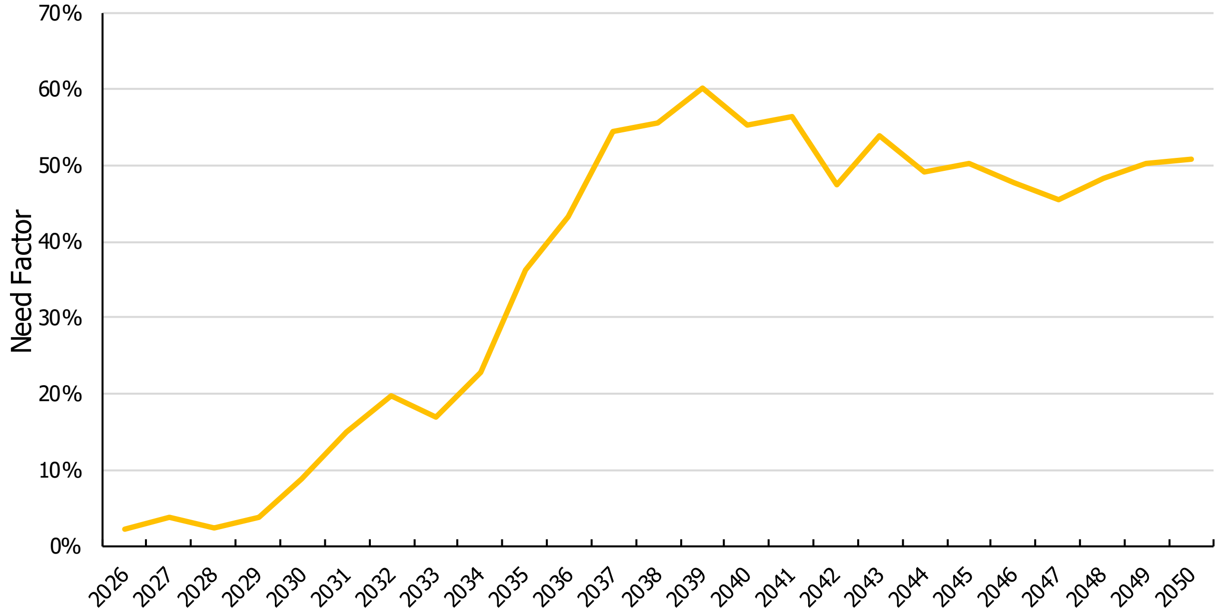
The results of the energy adequacy outlook are the amount of unserved energy, which is defined as the amount of energy that the system is unable to meet. As existing resources exit the market post-contract expiry and the capacity shortfall grows, the potential for unserved energy would increase sharply in 2029 even with the planned additional nuclear units considered in the supply case, surpassing 80 TWh by the end of planning horizon in 2050. The notable increase in energy needs starting in 2035 is driven primarily by expiring resource contracts, as described in Section 3.1.3.

Figure 22 | Potential Unserved Energy



The unserved energy can also be represented by a "need capacity factor," which is calculated by dividing the annual energy need by the annual capacity need. The need capacity factor is used as a method of illustrating the utilization of the portfolio of resources that will be required to meet system requirements. The unserved energy represented as a need capacity factor, becomes more prominent starting in 2029. By the end of the planning horizon, the need capacity factor increases to about 50 per cent.

Figure 23 | Capacity Factor of Need Requirements



5. Transmission System Needs

With capacity and energy needs forecast to increase in the planning horizon, a robust transmission system will play an increasingly critical role in ensuring deliverability of resources to supply forecasted customer demand provincially and locally. This APO summarizes the known transmission system issues that must be addressed to ensure the system can reliably supply growth over the next 25 years, while facilitating changes in the provincial supply mix and the connection of new resources. Public policies that will further drive the energy transition and transmission expansion are also considered, and will shape the scope of the transmission plans to come; this includes looking for strategic transmission expansion opportunities to align with the long-term outlook to 2050 and beyond, carrying out corridor studies to preserve land for future transmission needs, as well driving affordability through utilizing the IESO's proposed Transmitter Selection Framework to competitively acquire eligible new transmission infrastructure.

The transmission system needs described in this section are informed by the IESO's studies performed for resource procurement deliverability and economic development, as well as in-flight or recently published bulk and regional plans. Also reflected in this section are considerations from *Powering Ontario's Growth* and *Ontario's Affordable Energy Future: The Pressing Case for More Power*. An updated Schedule of Planning Activities in Section 9.5 outlines the studies that are ongoing and anticipated to respond to specific transmission system needs summarized in the following sub-sections.

5.1. Drivers of Transmission System Needs

This section describes the transmission system needs anticipated over the planning horizon, driven by the forecasted demand growth and the evolving supply mix that will be needed to support this growth. These changes will impact the nature of bulk power flows on the transmission system. Further, aging transmission equipment will require careful consideration of what to do with facilities as they approach the end of their expected service life. All these factors will contribute to a significant amount of transmission expansion, reinforcement and renewal in the coming decades.

Specifically, transmission plans over the next few years will consider the transmission system investments needed to maintain a reliable supply to support community growth and electrification, and to connect new large industrial customers. These plans will also explore transmission's role in unlocking additional resource development potential, including options to enable the development of new small modular reactors and the proposed Bruce C complex, long-duration energy storage, hydroelectric resources, and new resources as part of long-term procurements. The IESO will stay mindful of the opportunities to proceed with early planning and development work for transmission projects to capitalize on strategic opportunities to support future growth and development. This includes continuing to co-ordinate with government to identify opportunities for protecting land corridors for future transmission development.

These drivers result in transmission system needs that are further described in the sub-sections that follow and will be considered in the scope of the IESO transmission studies and plans. Some of these activities are already underway, and others will be carried out over the coming years. The Schedule of Planning Activities in Section 9.5 provides a transparent view into how and when this work will be carried out. The IESO will continue to engage regularly to share the status and results.

The system needs and planning studies described below are organized broadly by region: southern Ontario, which includes southwestern Ontario and the Greater Toronto Area (GTA); eastern Ontario, which extends from the GTA to the Ottawa region; and northern Ontario, which extends from north of Barrie to include the northeast and northwest parts of the province.

5.2. Transmission Needs in Southern Ontario

5.2.1. Central-West Ontario (Hamilton–Windsor)

In April 2024, the IESO completed the Central-West Bulk Plan, which focused on ensuring continued, reliable bulk supply to the London area region, considering confirmed economic development projects such as the Volkswagen EV plant in St. Thomas. As one of the world's largest facilities of its kind, this EV plant is anticipated to attract additional suppliers associated with the EV industry to the area. This plan also proactively investigated a range of potential growth scenarios across southwestern Ontario, to inform future plans and possible system reinforcements if/when large new loads materialize.

The plan recommended upgrades to a 3–5 kilometre section of the existing transmission 230 kV corridor in the London area region (the M31W circuit between Buchanan TS and Middleport TS). It also identified triggers for additional dynamic voltage support at Ingersoll TS, as well as across the Central-West area depending on where load materializes. These system improvements would help address reliability impacts on the transfer capability of the bulk transmission interface and continue to support major economic development.

The IESO is aware of other potential new large industrial customers that are interested in connecting to the grid in southwestern Ontario and is closely following the status of these new connections. Consideration of these new connections, future changes to the supply mix and potential decarbonization of the electricity supply are being integrated into the South and Central Bulk Plan that is already underway.

5.2.2. South and Central Ontario Bulk Transmission Needs

Several changes anticipated to impact the bulk transmission system across southern and central Ontario have prompted the IESO to initiate a comprehensive bulk plan for the area. This builds upon the investigations first undertaken through the IESO's *Pathways to Decarbonization* report, and later refined through the province's *Powering Ontario's Growth* plan, by reviewing the bulk system's capability to support future generation connections and demand growth in key areas throughout southern and central Ontario. The scope of this plan includes the GTA northward to Essa TS near Barrie, parts of eastern Ontario, the Windsor–Hamilton corridor, and the Bruce area. The approach is designed to allow for interdependencies across a large part of Ontario to be considered in creating a strategic transmission expansion plan that addresses significant changes in demand patterns and the generation supply mix. These changes include the expansion of the Bruce NGS, incorporating new small modular reactors, and the potential for reducing Ontario's reliance on natural gas-fired generation. Each of these changes will impact bulk electricity flows over a wide area.

Work has also been initiated to identify and assess new or expanded land corridor options for future transmission development. If required and to the extent possible, the IESO will work with the Ministry of Energy and Mines to preserve space for future transmission, especially in or around growth areas where there are long-term needs, or for unlocking future generation resource development potential. The initial areas of focus are described in Section 5.2.2.1.

Study work for the bulk plan has started and will aim to conclude by Q3 2025. Drivers for the GTA and Essa area components of this study are summarized in sub-sections below. As demand grows and the supply mix evolves, the IESO will continue to assess the bulk transmission system and may trigger subsequent phases of this bulk plan, as required. One such study for the Niagara area is also discussed below.

5.2.2.1. Greater Toronto Area Bulk Supply

Within the next decade, electricity demand in the GTA load centre[20] is forecasted to reach the capability of the bulk transmission system to deliver sufficient capacity to the area. This is because electricity demand is expected to continue to grow in an area where there are few local generation resources. Customers in the GTA rely heavily on the bulk transmission system for reliable electricity supply. In central Toronto, the only transmission-connected generation resource is the 550 MW Portlands Energy Centre.

There are five major autotransformer stations that supply the GTA from the 500 kV transmission network, including the recently constructed Clarington TS in the east of the GTA. These bulk delivery points supply the 230 kV network, which in turn supplies the 115 kV network in central Toronto and the local distribution networks serving all the businesses and households throughout the region.

Since most of the internal GTA supply capacity comes from natural gas power plants[21], plans for the area will need to consider expanding the links between the bulk transmission network and the GTA. The needs and analysis of options in the GTA are being considered in the scope of the South and Central Bulk Plan as there are other changes that will impact flows across a much wider region, including the connection of major loads, including data centres, and future expansion at Bruce NGS.

Through resource procurement activities, many areas in proximity to the GTA have been identified as limited by short-circuit levels exceeding station equipment capacities. The IESO is working closely with the station owners to resolve as many of these restrictions as possible prior to procured resource delivery dates and to assess opportunities for distributed energy resources through the regional planning process.

[20] East GTA is considered in Section 5.2.2.2.

[21] Including the aforementioned Portlands Energy Centre in downtown Toronto, York Energy Centre in the northern GTA, Halton Hills and Sithe Goreway generating stations in western GTA, and the comparatively smaller Greater Toronto Airports Authority at Pearson Airport.

As a result of the anticipated increase in customer demand over the coming decades, it is expected that new transmission infrastructure will be required to meet regional and bulk system needs. Due to the challenges of acquiring suitable land for new transmission, particularly in built up or urban areas, the IESO has initiated corridor studies that will seek to identify suitable land for future transmission infrastructure ahead of those needs being triggered. The areas of focus presently being explored include the Parkway Belt West Plan lands; the Northwest GTA Transmission Corridor, and the currently idle sections of a 115 kV transmission line from Barrie to Toronto.

5.2.2.2. East GTA Bulk Transmission

Some of the 230 kV transmission lines in the eastern part of the GTA are forecasted to reach their thermal capacity limits in the mid- to late 2030s. These lines, linking two major GTA autotransformer stations, Clarington TS and Cherrywood TS, will carry more power from the east to supply the growing local electricity demand with Pickering A NGS out of service. The most limiting section of these circuits is between Clarington TS and Wilson Junction, which supplies the electrical demand in Oshawa and other fast-growing areas in east GTA.

Through the IESO's ongoing procurement activities, it has also been demonstrated that the 500 kV transmission path between Bowmanville and Cherrywood is a limitation on the potential for new large generation projects to locate in the East Ontario electrical zone (east of Bowmanville). The IESO is reviewing these needs by assessing the long-term bulk supply options in a co-ordinated manner as part of the larger South and Central Ontario Bulk Plan. The addition of small modular reactors at Darlington NGS and development of other provincial supply options east of the GTA have prompted the IESO to identify the need for an additional double-circuit 500 kV transmission line from Bowmanville–Toronto, to be in-service before the second small modular reactor at Darlington NGS can be connected (currently planned for the early 2030s). The plan will determine specific attributes of this line, including determining a suitable termination point in the GTA.

5.2.2.3. Essa Area Transmission

Essa TS, west of Barrie, is a major bulk transmission hub linking northern and southern Ontario as most power flowing to and from northern Ontario flows through Essa TS. The station also serves an important role as a major supply point for the entire region.

Power typically flows north into the Essa zone except under periods of high hydroelectric production. With the expected demand growth within the Essa zone and in northern Ontario, coupled with a changing supply mix, increasing flows are expected on the transmission system connecting Essa TS to stations to the south.

Issues affecting the 500/230 kV autotransformers at Essa TS were also found in the Barrie-Innisfil Integrated Regional Resource Plan published in May 2022. This plan identified a risk that the loss of one autotransformer at Essa TS will overload its companion transformer and recommended that this be addressed through bulk system planning. Therefore, the need for additional autotransformer capacity in the region, along with bulk transmission system needs, will be assessed as part of a broader IESO bulk planning that will consider possible transmission options for an expanded Bruce NGS and supply into the GTA (i.e., the South and Central Bulk Plan).

In addition to these bulk network constraints, two 230 kV transmission lines from Essa TS supply loads in Orillia and Minden. The lines near Minden TS are expected to reach their thermal capacity in about 2032 or shortly after. This issue is expected to progressively worsen as the demand in the area grows. Further, the 230 kV transmission lines from Orangeville TS to Essa TS are at capacity when southwest generation is heavily flowing east to supply GTA loads, preventing additional resources in the southwest and towards Essa TS from being deliverable. These 230 kV circuits between Orangeville and Essa are also approaching end-of-life and will be reconductored in the near term with advanced conductors to support load connections in the Alliston area and address bulk system limitations.

Further plans to reinforce the transmission system in this area are currently being investigated as part of the South and Central Ontario Bulk Plan. While Essa TS is physically situated in southern Ontario, recommendations identified in the Northern Ontario Bulk Plan and the North of Sudbury Bulk Plan (see Section 5.4.1) will impact the scope of needs in the Essa area.

5.2.2.4. Niagara Area Transmission

The IESO is proposing to initiate a comprehensive bulk planning study of the transmission system in the Niagara peninsula to ensure that the bulk transmission system is sufficient to supply continued economic development. The area of focus for this future study covers the Niagara area between Lake Ontario and Lake Erie. Niagara is an important source of hydroelectric power from the Beck Generating Stations and is interconnected with the Unites States through the New York-Niagara interconnection.

The electricity demand in the Niagara region is primarily being driven by economic development of new and existing industries, particularly in Port Colborne, Thorold, Welland, and Niagara-on-the-Lake. The IESO has been monitoring this development, with the area load projections currently on track to exceed the high electricity demand forecast developed in the 2022 Niagara Integrated Regional Resource Plan. As electricity demand grows, transmission reinforcements may be required in the medium-to-long term to ensure the bulk transmission supply capability to the area is sufficient to continue to accommodate demand growth for different scenarios informed by economic development opportunities. The study will also consider opportunities for Ontario’s intertie with New York in the Niagara area when developing options for reinforcing the bulk system in the area.

These needs will be assessed as part of a new Niagara Bulk Plan that will be initiated in the second half of 2025 and will aim to conclude by mid-2026.

5.3. Transmission Needs in Eastern Ontario

5.3.1. Eastern Ontario Bulk Transmission Needs

The IESO has initiated a comprehensive bulk plan for eastern Ontario to examine interdependent transmission needs arising across the area because of electrification, decarbonization, and economic development. Studying these various needs together will allow the IESO to develop recommendations to reinforce the transmission network in eastern Ontario in a co-ordinated manner. In the scope of this plan, there is an opportunity to consider if new or expanded land corridors could be preserved for future transmission development, explore opportunities to improve transmission system’s capability to deliver new resources located in eastern Ontario, and examine the potential for new and/or expanded interties with neighbouring jurisdictions. The Eastern Ontario Bulk Transmission Needs Plan aims to conclude by early 2026.

The transmission system surrounding Lennox TS has also been identified as limited by short-circuit grounding as part of the Preliminary Connection Guidance for the second Long-Term Request for Proposal (LT2 RFP) document released in April 2024. Recently Hydro One has committed to fixing the short circuit grounding issue in time for the LT2 RFP resources coming online in 2029–2030.

5.4. Transmission Needs in Northern Ontario

5.4.1. Northeast and Northwest Ontario

In 2022, the IESO completed a bulk plan that recommended major transmission expansions in northeastern Ontario to accommodate future industrial growth in the mining sector and decarbonization in the metal production subsector. A follow-up study recommended voltage control devices to enable better control of system voltages throughout the north. The status of the facilities recommended in these studies is summarized in Table 2.

While the transmission facilities previously recommended in the north will improve the capability of the system to accommodate growth, transmission limitations constrain the ability to site large amounts of new generation resources in northern Ontario. Further, there are limits on the number of inverter-based resources that can be connected to the existing system. The LT2 RFP encourages new supply resources in northern Ontario to serve provincial resource adequacy needs; the IESO will continue to monitor these procurement outcomes, and if development interest exceeds the present capability of the transmission system, future planning will be considered to further enable resource connections.

The cumulative effects of significant industrial demand growth and anticipated changes in the northern Ontario supply mix have prompted the IESO to study options for increasing the ability to transfer power across the bulk transmission interface between northern Ontario and southern Ontario (the Flow North/Flow South interface). The Northern Ontario Bulk Plan that is underway aims to recommend the scope and timing of transmission reinforcements to alleviate the bottleneck between Hanmer TS in Sudbury to Essa TS near Barrie and ensure economic development and decarbonization efforts can continue in northern Ontario. The IESO is recommending that early development work be initiated, including facility design and environmental approvals, for two new single-circuit 500 kV transmission lines from Sudbury to Essa TS. However, only one 500 kV transmission circuit would need to be constructed initially.

In the area north of Sudbury and North Bay, a similar situation occurs with increasing demand growth projections, changes to the supply mix, and an inability to develop new pockets with renewable generation resource potential. Planning activities as part of the Northern Ontario Bulk Plan are underway to ensure the transmission is in place so that economic development can continue, and new generation resource opportunities can be developed in the more remote reaches of northeast Ontario.

In the northwest, transmission alternatives are being studied as part of the Northern Ontario Connection Study to enable connection of off-grid First Nations, prospective mining developments in the Ring of Fire, and new hydroelectric generation opportunities. This study is underway and the IESO is engaging with local First Nations to explore the possible transmission alternatives.

5.5. Interties with Ontario's Neighbouring Jurisdictions

Ontario's interties are critical for enabling import and export activity, as well as enhancing system stability through participation in the eastern interconnection. The IESO participates in co-ordination activities with Ontario's neighbouring electrical jurisdictions to share data and information related to the interties, and to address issues that could have interjurisdictional impacts.

A screening study of Ontario's interties identified interties where a long-duration equipment outage could result in reliability impacts for electricity customers in Ontario. It was identified that an unexpected failure of unique, non-standard transmission equipment, such as a phase angle regulator (PAR, also known as a phase shifter[22]), could have a high impact on flows across the intertie and take a long time to replace. In 2022, a joint intertie study was completed between the IESO and Midcontinent Independent System Operator to study end-of-life options for replacing the existing PAR on J5D, a critical part of the interconnection between the high-voltage grids in Ontario and Michigan (in the Windsor area). The recommended upgrade and replacement of the PAR on circuit J5D is expected to be in-service by Q4 2028, to increase its capability and improve control of scheduled intertie flows between these two jurisdictions.

A second study is underway to assess major equipment at the Ontario–Manitoba intertie, including two PARs and two step-up transformers that are approaching end of life. A joint Phase Shifter Study was initiated between the IESO, Manitoba Hydro and Minnesota Power to create a plan to replace and/or upgrade this critical intertie equipment.

To consider future opportunities for new or expanded interties, the IESO is currently leveraging ongoing bulk planning activities. Studies will consider intertie capability as one consideration when assessing options to address system reliability needs in areas near interties (e.g., Niagara, Eastern Ontario, and North of Sudbury bulk plans). The IESO may also consider opportunities to enhance trading activities, per *Ontario's Affordable Energy Future: The Pressing Case for More Power*. If opportunities are identified, further investigation and a detailed study can then be initiated.

[22] These are highly specialized transformers that are purpose-built pieces of equipment that help control the power flow between two interconnected transmission systems.

5.6. Development of a Transmitter Selection Framework

In response to a July 10, 2023 letter from the Minister of Energy, the IESO engaged stakeholders, municipalities, Indigenous communities, and transmission developers throughout 2024 to design a potential future Transmitter Selection Framework (TSF). The TSF is proposed as a competitive mechanism that can be used to select transmitters to develop and build eligible new transmission lines. The development of a TSF is intended to support the significant transmission build-out anticipated in the years and decades ahead. As with the strategy for resource procurements, a comprehensive approach will be necessary to address the scale of new transmission infrastructure needed.

The TSF will be designed to support this diversified approach by maintaining the option for priority designations for projects not suitable for the TSF (i.e., those needed immediately or unsuitable for competition). At the same time, it will introduce a competitive process for selecting transmitters for eligible projects. Additionally, it leaves room for bilaterial negotiations, such as policy-driven projects like interties. A goal of the TSF is to provide a transparent and predictable process for selecting transmitters to design, build, and own/operate select new transmission projects. Successful implementation of the TSF would attract new investments and establish a competitive framework for eligible transmission projects in Ontario. This can complement the IESO's Resource Adequacy Framework; support broader economic growth; and leverage the benefits of competition to deliver ratepayer value, as outlined in the *Ontario's Affordable Energy Future: The Pressing Case for More Power*. The TSF will also seek to protect ratepayers from undue cost and risks, and to support Indigenous participation within projects procured under the framework.

The IESO is continuing to develop aspects of the TSF in collaboration with the Ministry of Energy and Mines. The TSF design will be refined in preparation for its potential implementation for initial transmission procurements that could proceed under the new framework.

6. Operability

A reliable system is one that is both resource-adequate and operable. In addition to requiring that energy and capacity needs are met, Ontario's supply mix must contain the reliability services needed to support reliable grid operations, and respond to the inherent variability and uncertainty of electricity supply and demand. More information on the services needed for the reliable operation of the electricity system is provided in the Operability Module.

As the supply mix evolves, assessments of operability needs will become more critical to ensuring reliable operations in the future. These assessments also inform design considerations for future procurements on the value of resources that can provide needed reliability services. The IESO anticipates that attributes such as dispatchability, capability to provide frequency support, voltage support and flexibility (i.e., the ability to respond quickly to changing system needs)[23] will be increasingly valued. Historically, the IESO has acquired services such as regulation and voltage support through ancillary service contracts; going forward, other avenues of acquiring and incentivizing the efficient provision of these essential reliability services may be explored.

6.1. Ancillary Services Needs Assessments

6.1.1. Regulation Service

Regulation service (regulation) is an ancillary service that the IESO contracts to help ensure the reliable operation of the power system. Regulation provides frequency support through minute-to-minute balancing to ensure electricity supply matches demand and is currently provided by generation facilities with automatic generation control capability, which permits them to vary their output in response to signals sent by the IESO.

The IESO schedules a minimum of ±100 MW of regulation, as required by the market rules; this helps to maintain the balance between Ontario's supply and demand and the IESO's compliance with the relevant reliability standard, as established by the North American Electric Reliability Corporation.

6.1.2. Regulation Needs Assessment

Each year, the IESO conducts an assessment to determine if there are incremental regulation needs within the province over the next 10 years. Forecasted load growth associated with loads with highly fluctuating operating profiles is considered — this includes anticipated electrification of industrial loads, and public transit electrification and expansion. The assessment analyzes the impact of these

[23] Flexibility services include, but are not limited to, regulation, operating reserve and ramping capability.

changes on the amount of regulation needed to maintain a sufficient balance between electricity supply and demand[24].

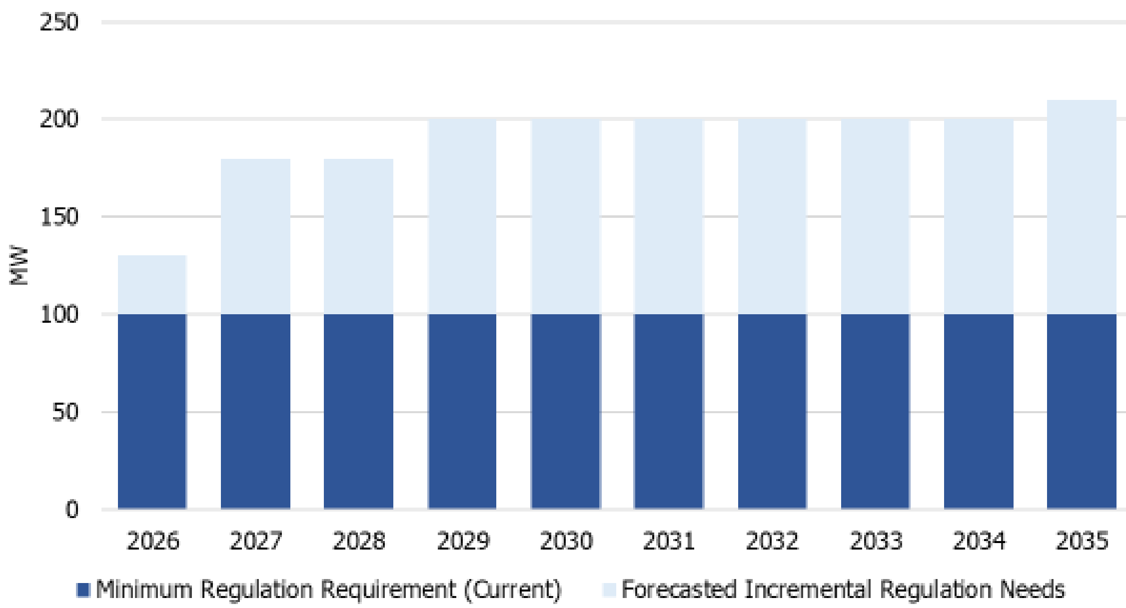
To maintain sufficient balance between supply and demand over the next decade, incremental regulation of approximately 30 MW is required beginning as early as 2026 and is anticipated to grow to 110 MW in 2035. The IESO continues to pursue opportunities to acquire additional regulation needs in the near term and in the future, through either bilateral negotiations or via a specific regulation service procurement process.

Approximate needs are shown in Figure 24. Future regulation needs may change based on factors that include:

- Updates to the demand forecast;
- Changes to the in-service dates or size of expected highly fluctuating industrial loads;
- Transit electrification and expansion and the associated load profiles;
- Actual operating experience from highly fluctuating industrial loads; or
- Increased energy production from variable generation resources.

The IESO will continue to incorporate these dynamic factors into subsequent regulation needs assessments and adjust future regulation needs accordingly.

Figure 24 | Forecasted Incremental Regulation Needs



[24] Further information on the assessment methodology is provided in the Operability Module.

6.1.3. Voltage Control Service

Pickering NGS has begun its staged shutdown, with decommissioning of Pickering A units in 2024 and refurbishment of Pickering B units scheduled to start in late 2026 (the continued operation of Pickering B was authorized by the Canadian Nuclear Safety Commission). In total, more than 1,000 Megavolt-Amperes reactive (MVAr) of voltage control capability will be removed from the system in the GTA load centre. While previous planning actions, operating studies and operational experiences gained during the Pickering Vacuum Building Outages (VBOs) will position the IESO to operate the grid reliably post-shutdown, the IESO acknowledges that the overall complexity of power system operations will increase.

All generators connected to the IESO-controlled grid are required to provide a certain amount of voltage control proportional to their size as per current Market Rules. With the loss of Pickering's substantial voltage control capability, along with its strategic location in the GTA — Ontario's key load centre — additional power flows will be required from other parts of the province and neighbouring jurisdictions. This shift will lead to higher transmission losses and necessitate increased voltage regulation. Additionally, meeting demand during shoulder seasons and accommodating critical generator and transmission facility outages will further stress the need for robust voltage support. To ensure stable and cost-effective system operations, the IESO will require additional voltage regulation beyond the current Market Rules obligation near the GTA as early as 2027. The IESO continues to pursue opportunities to acquire additional voltage regulation needs in the near term and in the future, through either bilateral negotiations or via a specific ancillary service procurement process.

7. Uncertainties

This section describes uncertainties related to demand and supply. The potential impact of these uncertainties is then considered, to the extent possible, in the Integrated Reliability Needs assessment in Section 8, subsequently informing Planned Actions in Section 9. Incorporating potential uncertainties in the needs assessments ensures that reliability needs are addressed in a timely manner while balancing factors that could drive oversupply or inefficient outcomes.

7.1. Demand Uncertainties

Electricity demand is driven by many factors, including customer preferences, economic conditions, changes in climate, and population and housing growth. The Forecast in Section 2 is based on the IESO’s best efforts to identify, assess, and determine the current and most probable future levels of all Forecast drivers. Should these drivers change, the IESO will incorporate more current information during the next APO.

To complement the publication of the 2025 APO, the IESO authored a series of technical papers, each exploring a specific area of considerable long-term demand uncertainty in greater detail: EVs, heating electrification, and large step loads such as data centres and new EV production and supply chain manufacturing facilities. The technical papers are intended to enhance sector understanding of critical areas of uncertainty inherent in the demand forecast, and identify potential implications and opportunities for system planning.

7.1.1. Space and Domestic Hot Water Heating

With space and domestic hot water heating representing more than 60 per cent of the total energy use for residential and commercial sectors, the electrification of these end uses represents a large source of uncertainty for future electricity demand. Heat pumps are identified as the main space and domestic water heating technology used in electrification, and are expected to consume less energy than traditional electric resistive heating systems. However, the following factors have been identified to contribute to forecast uncertainties in the long-term demand forecast:

- Heat pump adoption;
- Variability in heat pump operation; and
- Government policy.

7.1.2. Electric Vehicles

High uncertainties are associated with forecasting demand related to EVs. Several factors may impact EV adoption including government policies and targets, technological advances, consumer preferences, supply chain constraints, and global economic and geopolitical conditions. Therefore, the number of EVs on the road and the electricity required to charge them are forecasted with high uncertainty. Moreover, system peaks are affected by when EVs are charged, with EV charging management considered necessary to avoid adding significant capacity needs to the system.

7.1.3. Large Step Loads

Large step loads are projects that are equal to or greater than 20 MW in size and connect to the grid in large blocks over a short time, as opposed to ramping up their load gradually. Sectors that are currently forecasted to have large amounts of these loads include commercial (driven by an influx of data centres) and industrial (driven by EV production supply chain). There is significant uncertainty related to the timing, size, and location of new load growth from large step loads in the province due to various factors, such as shifting market forces and limited available information on such projects. The IESO will continue to monitor large step loads, and work with sector partners to inform future demand growth.

7.1.4. Economy

Electricity demand is impacted by the state of the economy and economic cycles (including income, employment, and output), commercial and industrial sector expansion levels (including project-specific changes and timelines), and emerging industries (such as battery materials production, hydrogen production, or cryptocurrency mining).

Policies and regulations related to the economy also impact electricity demand. Examples include foreign national tariffs on Ontario exports, government revenue, interest rates, economic development, job creation and trade, mines, and northern development[25].

7.1.5. Demographics

Population changes, geographic migration, and residential sector household count growth and type shares are some demographic uncertainties influencing electricity demand.

7.1.6. Fuel Costs

Global or provincial fuel commodity prices and costs of provincial electricity generation resources can affect marginal commodity costs of electricity, and discretionary, elastic demand for electricity. Fuel costs also impact fuel source decisions for capital expenditure such as building space heating (e.g., electricity or natural gas).

Policies and regulations that influence fuel costs (e.g., Ontario Electricity Rebate or global adjustment), electricity rate structures (e.g., time-of-use electricity pricing, ICI, Ultra-Low Overnight electricity rates, Interruptible Rate Pilot, dynamic pricing pilot), and energy efficiency can also change and subsequently impact electricity demand.

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[25] Such as the Bank of Canada monetary policy and interest rates, Ontario Critical Minerals Strategy, Ontario Low-Carbon Hydrogen Strategy, Ontario Driving Prosperity automobile production plan, Northern Ontario Heritage Fund, and project-specific funding support.

7.1.7. Technological Capabilities

Technological changes to specific electricity end uses can impact overall electricity demand. For instance, end-use fuels may become substitutable (e.g., building heating, transportation, industrial heating) or more efficient (i.e., building space and water heating from heat pumps with cold-climate performance and ambient temperature-dependent coefficients of performance).

7.1.8. Climate Change and Electrification

Actions taken to support climate change mitigation and/or adaptation can impact electricity demand. Climate uncertainties affecting demand can be categorized as transitional (i.e., relating to the transition to a low-carbon future that addresses climate change, such as electrification), or physical (i.e., arising due to changes in climate and natural environment).

7.1.8.1. Transitional Climate Uncertainties Affecting Demand

Some policies and regulations that are in support of climate change mitigation efforts can drive direct and indirect electrification of sectors. Examples include the federal government target for 100 per cent of sales of new light-duty vehicles to be non-emitting by 2035; industrial decarbonization strategies; GHG emission cost structures; the federal 2030 Emissions Reduction Plan; natural gas demand-side management programs incenting heat pump adoption; and local requirements such as the Toronto Green Standard municipal building permit requirement. With the Dec. 4, 2024 changes to the *Electricity Act* the IESO has been enabled to promote electrification and facilitate energy efficiency measures aimed at using electricity to reduce overall emissions in Ontario. The impacts of new beneficial electrification programs will be captured in the next APO.

Transitional climate risks impacting demand relate to uncertainty regarding the pace of electrification, which includes electric vehicles and new weather-sensitive loads on the electricity system. For example, there is a large amount of uncertainty related to the uptake of electric space heating technologies driven by policy, regulations, customer preferences and other factors. As these technologies are adopted, overall load on the system will increase, particularly in winter, and the system will be more reactive to physical climate risks. If there are more heat pumps on the system and climate stays static, winter load will increase. If there are more heat pumps on the system and winters become warmer, winter load will increase compared to today's provincial levels, but would be lower than the previous scenario. If customers who previously did not have air conditioning adopt heat pumps, summer load will increase and be more reactive to higher summer temperatures.

7.1.8.2. Physical Climate Uncertainties Affecting Demand

The changing climate has caused actual weather variables to diverge from historical trends, leading to increased uncertainty in weather-sensitive loads and embedded generation demand profiles, both in aggregate as well as seasonally. Over time, as electrical loads become more responsive to weather (e.g., electrified space heating) and weather continues to diverge from historical trends (e.g., higher temperatures and heat waves leading to increased cooling load), the uncertainty in demand is expected to increase. The main risk is if the demand forecast underestimates the needs.

These risks can be further divided into two categories: acute (e.g., more and frequent heat waves and cold snaps); and chronic (e.g., rising average temperatures). While acute risks do impact energy, they primarily impact peak demand. An example of an acute risk is an increase in the length and duration of heat waves, which can drive up the summer peak. Chronic risks also have an impact on peak, but primarily impact total annual energy consumption. For example, if overnight temperatures rise in the summer, consumers will run their air conditioners overnight more, which will lead to an increase in the amount of energy consumed by this end use.

The IESO continues to work to understand climate change-specific uncertainties and how they can be incorporated in the APO. These anticipated efforts include understanding guidance on the use of climate-informed weather projections, the development of climate-informed weather variables, and the development of tools needed to incorporate this information into long-term forecasts. As this work progresses, the IESO will engage with relevant stakeholders.

7.2. Supply Uncertainties

7.2.1. Existing Resources

Uncertainties related to the future participation of existing resources could impact Ontario’s supply and influence the outlook on resource adequacy (capacity and energy) and transmission adequacy. The IESO will continue to monitor these risks, discussed below, and the resulting impact on resource adequacy.

7.2.1.1. Aging Assets and Decreased Performance

Ontario’s existing resources consist of facilities of varying ages, with a large portion of the fleet that is reaching end of life. Aging supply infrastructure applies upward pressure on future resource adequacy requirements, as performance typically decreases over time — observed through increased frequency and duration of planned outages and higher forced outage rates. This can be further exacerbated by climate-driven events and extreme weather conditions. Investments in existing facilities may be required to maintain the same level of reliability and performance that existed before, and to adhere to regulations.

Co-ordinating outages is expected to become more challenging during the years where new replacement facilities and supporting infrastructure are under construction and commissioning. Outage co-ordination will also be challenged as physical climate changes affect the duration of shoulder seasons, which tend to be more optimal periods for scheduling of outages; outage scheduling will also be challenged by the load shift from summer-peaking to dual-peaking. In combination with the increased risk of forced outages resulting from an aging fleet, this increases uncertainty in the availability of supply and transmission to meet adequacy needs.

7.2.1.2. Nuclear Refurbishments

The nuclear refurbishment program, currently underway, has multiple nuclear units scheduled to be out of service for years at a time. Given the size of each unit, there is a significant risk to resource adequacy if the return of units is delayed. Conversely, an advancement in the refurbishment schedule could shift the timing of resource adequacy needs. The resource adequacy assessment in Section 4 includes additional planning reserve to manage risks related to nuclear refurbishments, and is further described in the 2025 APO Supply, Adequacy and Energy Outlook Module.

7.2.1.3. Resources Reaching Contract End

A significant number of resources reach contract end at the end of this decade, increasing through the next decade. Factors such as aging assets, revenue uncertainty, and policy uncertainty may drive a portion of existing resources to exit the market after contract expiry and put downward pressure on supply. This risk is also cited in the 2024 North American Electric Reliability Corporation Long-Term Reliability Assessment, which raises concerns that new resources could fail to keep pace with demand growth and expected generator retirements.

Understanding these uncertainties, the IESO's Resource Adequacy Framework offers regular re-contracting opportunities, including the medium-term procurements and annual Capacity Auction. A portion of resources that participate in an acquisition mechanism may not be successful in securing a contract or commitment, which could put upward pressure on Ontario's resource adequacy needs[26].

7.2.1.4. Climate Change Impacts on Resource Performance

The changing climate has caused actual weather variables to diverge from historical trends, which impacts historical performance of supply resources. If the performance and contribution of resources is overestimated, there could be resource adequacy concerns at certain periods in the future.

7.2.2. New Resources

As Ontario enters a period of significant and increasing resource acquisition through the energy transition, new resources of both existing and emerging technology types will be integrated into Ontario's electricity system to help meet resource adequacy needs. New technologies will play an important role in future procurements and a diverse portfolio of resources will be critical to meeting future reliability needs.

With any new resource type or new-build facility, there are various risks that may materialize at any point as resources reach milestones to fulfill requirements for commercial operation. These risks can include challenges to obtain the necessary permits and approvals (including municipal approval and social acceptance), delays due to supply chain disruptions, or once a resource has reached commercial operation, an initial period of less reliable operation.

7.2.2.1. Acquisition Targets Not Met

Various factors could result in a target for a given acquisition not being met. One risk is that projects will be proposed in areas of the province with transmission limitations. To mitigate this risk, the IESO's deliverability assessment process ensures that procured resources are located such that they avoid areas with limited connection availability due to transmission and/or distribution system limitations. Moreover, this process helps ensure that projects awarded contracts can operate with minimized risk of curtailment and congestion on the system. As the period of high acquisition activity continues, deliverability limitations may increase until sufficient transmission and distribution

[26] The IESO is also authorized to enter reliability must-run contracts with generation assets that request to de-register.

infrastructure is in place — infrastructure that could have longer lead times than the proposed projects.

The preliminary deliverability guidance provided as part of the LT2 RFP indicated areas of the province where accommodating additional resources is challenged by transmission constraints present during the expected in-service dates of the proposed projects. This includes zonal limitations, congestion limits on areas and circuits, inverter-based resource specific limitations, and more.

Deliverability assessments that are part of future acquisition periods may have different results, as:

- Transmission upgrades identified in regional and bulk plans come into service;
- Transmission system upgrades that were recommended to Hydro One based on the results of final stage deliverability testing for the LT1 RFP and preliminary guidance for the LT2 RFP come into service. The upgrades are expected to improve deliverability and allow more projects to contribute to meeting system needs;
- Existing generation assets retire or exit the market;
- The nature of the reliability needs changes (i.e., energy versus capacity); and
- The demand forecast changes.

In addition to deliverability challenges, the risk of acquisition targets not being met could result from lower participation in procurements, driven by external factors such as:

- Potential opportunities in other markets leading to competition for capital;
- Policy and regulatory uncertainty pertaining to resource eligibility, such as the Clean Electricity Regulations;
- Corporate environmental, social and governance mandates; and
- Inability to secure municipal support and land use restrictions.

7.2.2.2. Commercial Operation Not Achieved

Reaching commercial operation is not guaranteed after capacity or energy from a resource is contracted through a procurement process; this uncertainty has materialized in past procurements primarily due to an inability to secure the necessary permits for a project. Other reasons for not reaching commercial operation can include challenges with community support or securing financing. Resources that are acquired through the IESO’s procurements but are unable to reach commercial operation would increase resource adequacy needs.

7.2.2.3. Project In-Service Delays

All projects face development risks that can lead to in-service delays, driven by multiple factors. As the IESO experienced in the transition from coal generation to replacement supply, only 30 per cent of projects were in operation on schedule, with 60 per cent falling behind by an average of 10 months and the remainder failing to reach commercial operation.

Supply chain disruptions, increases in costs, shortage of skilled labour, permitting complexities, community acceptance, and geopolitical events increase the risk of delays in project development.

These factors have already impacted certain projects that were recently procured and are anticipated to continue to pose risks, particularly as the development of new supply resources accelerates, which could increase resource adequacy needs.

7.2.2.4. Reliable Operation of Resources

Experience has indicated that after a new resource comes into service, there is a period where the risk of equipment failure and forced outages is higher. While this risk decreases over time, the initial period of uncertainty can result in an increase in resource adequacy needs. In addition, new market participants may be unfamiliar with operating in the IESO's real-time market, which can result in a resource not being available when expected. With newer technologies expected to participate in upcoming procurements, the integration and reliable operation of new resource types is anticipated to take time and may put upward pressure on resource adequacy needs.

In the meantime, as Ontario's supply mix evolves, the IESO's upcoming technical papers exploring a specific area of supply uncertainty in greater detail. These include:

- Effective Load Carrying Capacity of Energy Storage, which studies the value of energy storage in Ontario based on factors such as penetration, duration, supply mix, and the demand forecast; and
- Hybrid Resource Portfolio Equivalency Assessment, which compares the reliability and economics of non-emitting hybrid resources to gas and nuclear generators to meet system needs.

7.2.2.5. New-Build Nuclear

New nuclear resources can help to meet increasing demand, providing a reliable source of baseload supply. As indicated in *Powering Ontario's Growth*, new nuclear facilities are committed or under development to meet Ontario's growing electricity demand in the 2030s. In addition, the Ontario government asked Ontario Power Generation to begin community engagement to determine support for new energy generation, including nuclear, at existing sites in Haldimand County and St. Clair Township, as well the Wesleyville site in Port Hope that could potentially host up to 10,000 MW of new generation.

There are many factors that could result in project delays to new nuclear facilities, including the inability to secure community support and federal regulatory approvals, supply chain shortages, lack of skilled workers and new technology development risks. The resource adequacy assessment in Section 4 includes additional planning reserve to manage risks related to new-build nuclear resources.

7.2.3. Policy and Regulatory Supply Uncertainties

Ontario's supply mix continues to be informed by, and adapt to, government policy. Some of the initiatives below, if pursued, will result in an overall increase in supply. The contribution of these resources is subject to policy and regulatory decisions — subsequent planning outlooks are anticipated to reflect any decisions that are made. In addition, there are other factors that can affect Ontario's resource adequacy needs such as policies implemented by both federal and provincial governments.

- **Nuclear Licensing:** The supply case considered in this APO assumes the refurbishment of Pickering B units and the Bruce C expansion, as both developments were indicated in *Powering Ontario's Growth*. The Pickering B refurbishment would allow the facility to operate for an additional 30 years, while the Bruce expansion would increase the province's generating capacity by up to 4,800 MW. Both developments are subject to regulatory approval and the licensing process by the Canadian Nuclear Safety Commission. At the time of this APO's assessment, Ontario Power Generation had proceeded with the Project Initiation phase of the Pickering B refurbishment, while the Bruce expansion was in early stages of pre-development work. The potential sites being explored by the Ontario government for new energy generation (in Port Hope, Haldimand County, and St. Clair Township) would also require nuclear licensing, should development of new nuclear proceed at one or more of the sites.
- **Pumped Storage Projects:** On Jan. 9, 2024, the Minister of Energy asked TC Energy to provide the IESO with a breakdown of the estimated costs and project schedule of pre-development work on the Meaford Pumped Storage. Further, on Jan. 25, 2025, the Ministry of Energy and Electrification announced it would be investing to advance the pre-development work, including completion of the cost estimate and environmental assessments. If the project proceeds, subsequent planning outlooks could reflect its resource adequacy contribution.
- **Clean Electricity Regulations:** On Aug. 10, 2023, the federal government released a draft of the Clean Electricity Regulations as part of its *Powering Canada Forward* plan to achieve net-zero emissions in the electricity system across Canada, with emissions restrictions starting in 2035. The IESO provided a submission highlighting that the emissions restrictions in the draft regulations are unachievable in Ontario by 2035 without risking the reliability of the electricity system and electrification of the broader economy and economic growth. The IESO also highlighted the insufficient amount of time to plan, acquire and build suitable alternatives to natural gas generation and build transmission infrastructure at the scale required. On Feb. 16, 2024, an update on the Clean Electricity Regulations was released, summarizing key concerns raised by stakeholders and potential changes under consideration to address them. The IESO's modelling indicated more cost-effective pathways to reach a near net-zero grid by 2050 without the Clean Electricity Regulations. Subsequently, the final regulations were released on Dec. 18, 2024; however, their implementation is pending.

8. Integrated Reliability Needs

Further to the demand and supply uncertainties described earlier, the IESO considers in-flight actions that were previously planned, and will help meet capacity and energy adequacy requirements. The remaining capacity and energy needs resulting from this integrated needs analysis will require future procurement actions; this informs the planned actions described in Section 9.

Section 4 described the resource adequacy needs of the system considering existing resources until the end of their contract/commitment period, and resources committed through actions undertaken by the IESO and/or informed by government policy.

This section describes the in-flight actions that are underway and their impact on the needs described in Section 4; as well as remaining needs after accounting for some uncertainties discussed in Section 7. Planned actions to address remaining needs are described in Section 9.

8.1. In-Flight Actions to Meet Reliability Needs

Recognizing that resources from in-flight actions can provide different services (e.g., capacity only, or both capacity and energy), contributions from the following activities were only considered in the integrated capacity needs assessment:

- The firm guidance target for the 2025 Capacity Auction was assumed for the summer 2026 obligation period, and the minimum target threshold of 1,000 MW was assumed to be acquired in the remaining years of the outlook period;
- Capacity from the 2015 Hydro-Québec Capacity Sharing Agreement, with 500 MW of firm imports anticipated to be utilized in summer 2027; and
- Capacity from the 2024 Capacity Sharing Agreement with Hydro-Québec Energy Marketing, providing 600 MW of firm imports starting in summer 2025 through to October 2031[27].

The following resources from in-flight actions can provide both capacity and energy:

- Uprates to hydroelectric generating units under Ontario Power Generation's Hydro Refurbishment Program;
- Anticipated resources re-acquired through the MT2 RFP[28]; and

[27] The IESO was directed by the Minister of Energy and Electrification on Nov. 28, 2024 to enter into a new electricity trade agreement with Hydro-Québec Energy Marketing for a term of up to ten years.
[28] Consideration for future medium-term procurements is discussed further in Section 9.2.

- Uprates to Bruce Power's nuclear generating units following refurbishments through its Project 2030 initiative.

8.2. Integrated Capacity Needs

Considering the in-flight actions in Section 8.1 and some of the supply-side uncertainties discussed in Section 7.2 (i.e., a portion of existing resources exiting the market after contract expiry, acquisition targets not being met, project in-service delays, unreliable operation of new resources), capacity needs remain. These are illustrated in Figure 25 for the summer period[29], and summarized below in three time periods: 2026–2029, 2030–2034, and 2035–2040.

Summer Capacity Needs: 2026–2029

The in-flight actions described in Section 8.1 help address capacity needs this decade, with the remaining capacity needs in 2027–2029 expected to be fully addressed by resources acquired through the Capacity Auction.

Summer Capacity Needs: 2030–2034

Incremental capacity needs emerge in 2030 and continue to grow through 2034, requiring future sustained procurement actions to meet needs. With needs of more than 2,000 MW in 2030 and increasing to more than 5,500 MW in 2034, a set of actions will be required that includes reacquisition of existing facilities, acquisition of capacity from new resources and/or incremental capacity from existing resources, continued Capacity Auction growth, eDSM, and other programs.

Summer Capacity Needs: 2035–2040

Post-2035, several uncertainties will influence the extent of capacity needs. Present analysis indicates that capacity needs could range from more than 10,000 MW in 2035 to more than 14,000 MW in 2040. Demand growth is anticipated over this period and may be higher than forecasted depending on the timing and impact of economy-wide electrification. Supply contributions may be lower than anticipated, driven by reduced participation of existing resources from retirements, market exit or the outcomes of procurements being lower than expected.

Uncertainty in future decarbonization policies brings uncertainty to the contribution of emitting resources beyond 2035. With capacity from emitting resources making up a large portion of existing resources with contracts expiring after April 2035, there is significant uncertainty in the magnitude of capacity needs in 2035 and beyond. Moreover, increasing energy needs will require acquisition of resources that can provide energy for longer durations.

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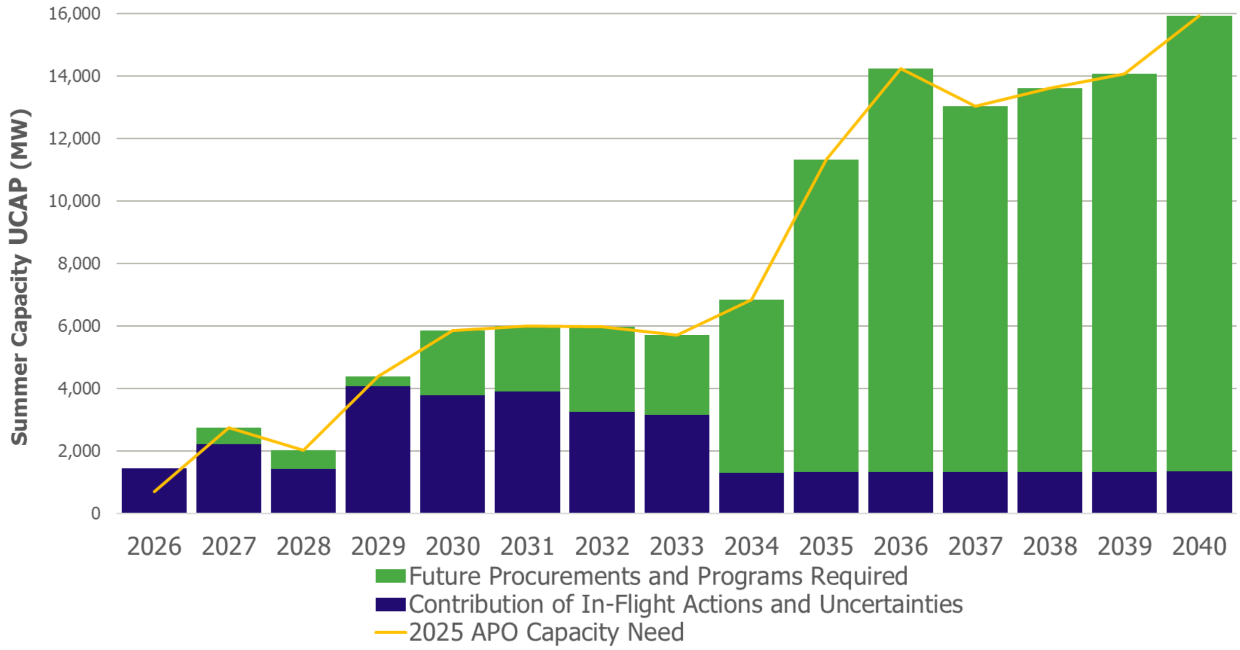
[29] Although the province is expected to switch from summer-peaking to dual summer-and-winter peaking in the 2030s, Ontario continues to show higher summer needs for the most part due to lower summer resource performance.

Figure 25 | Integrated Capacity Needs



8.3. Integrated Energy Needs

The assessment for remaining energy needs also considered in-flight actions (Section 8.1) and uncertainties (Section 7) similar to those in the integrated capacity needs assessment. Total annual needs are summarized below in three time periods: 2026–2029, 2030–2034, and 2035–2040.

Annual Energy Needs: 2026–2029

Energy needs prior to 2029 are driven by several risks, including project delays and unreliable operation of new resources. These risks can be mitigated with increased dispatch of existing and committed resources, and energy from incremental eDSM; as such, no additional procurements or programs are required to meet needs prior to 2029.

Annual Energy Needs: 2030–2034

Energy needs that emerge in 2029 continue to grow through 2034 and require future sustained procurements and programs. Needs are approximately 3 TWh in 2029, growing to 17 TWh by 2034.

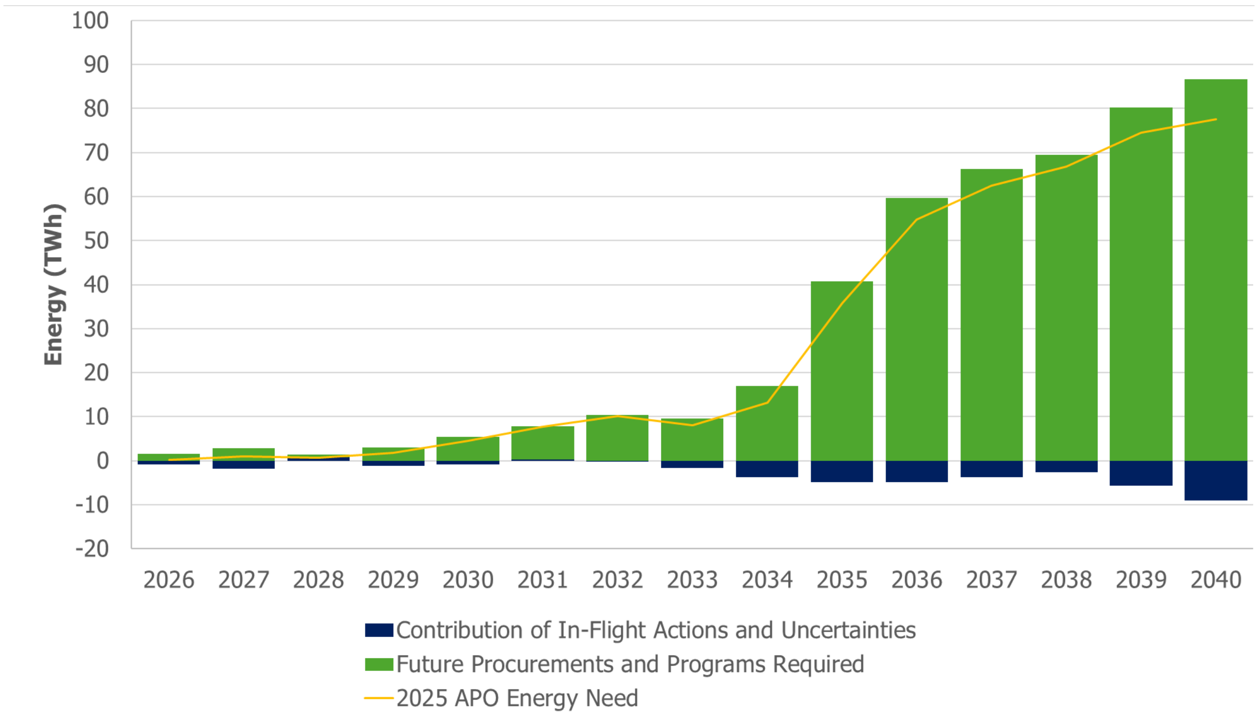
These needs are expected to be met by the reacquisition of existing facilities through medium-term RFPs and acquiring new or repowered, energy-producing resources through future long-term RFPs. They can also be helped by the new eDSM Framework. These actions are discussed further in Section 9.

Annual Energy Needs: 2035–2040

After 2035, additional uncertainties will influence energy needs. Present analysis indicates that unserved energy could range from a total of 41 TWh to 87 TWh from 2035–2040. A demand growth rate that trends higher than is currently forecast, or supply contributions that are less than anticipated due to retirements, market exits, or lower procurement outcomes will drive these remaining energy needs even higher.

Most significantly, federal policy on the participation of existing emitting resources brings uncertainty after 2035. Limited potential for energy from emitting resources, combined with long-term forecast demand growth and nuclear retirements, will increase energy needs. A variety of new energy-producing resources will be required on the system to address a range of energy needs arising in both winter and summer, and over different hours of the day. Potential magnitude and timing of energy needs from the resource adequacy assessment (Section 4) is described in the Supply, Adequacy, and Energy Outlook Module.

Figure 26 | Integrated Energy Needs



9. Planned Actions

As demand for electricity grows and Ontario's supply mix continues to evolve and diversify, sustained resource acquisition actions and system reinforcements are necessary to ensure that reliability needs are met. This section specifies actions to address needs in the near term, as well as actions to acquire new resources and implement new transmission to meet significant capacity and energy needs emerging in the long term. These actions include leveraging near-term and ongoing mechanisms, such as the Capacity Auction and eDSM programs; medium-term mechanisms, such as procurements to reacquire existing resources that are reaching contract end; and long-term mechanisms, such as procurements for new-build resources. Planned actions also include prioritizing specific future transmission studies, as outlined by the Schedule of Planning Activities.

As Ontario competes for capital and investment with other jurisdictions, procurement targets help to provide clarity and foresight to developers. The planned actions and targets in this section signal the need for project development work to continue, while allowing the IESO to adjust targets as system needs change because of evolving electricity demand and new infrastructure coming into service. Changes in Ontario's electricity system needs are captured through the annual planning process and addressed through the mechanisms in the Resource Adequacy Framework, which provides flexibility to adjust to changing needs and enables competition to ensure ratepayer value.

The planned actions and targets in this section aim to mitigate potential risks to reliability from factors that include increasing demand, market exit of resources, project delays, uncertain operational behaviour of new resources, and deliverability issues, while providing investor certainty.

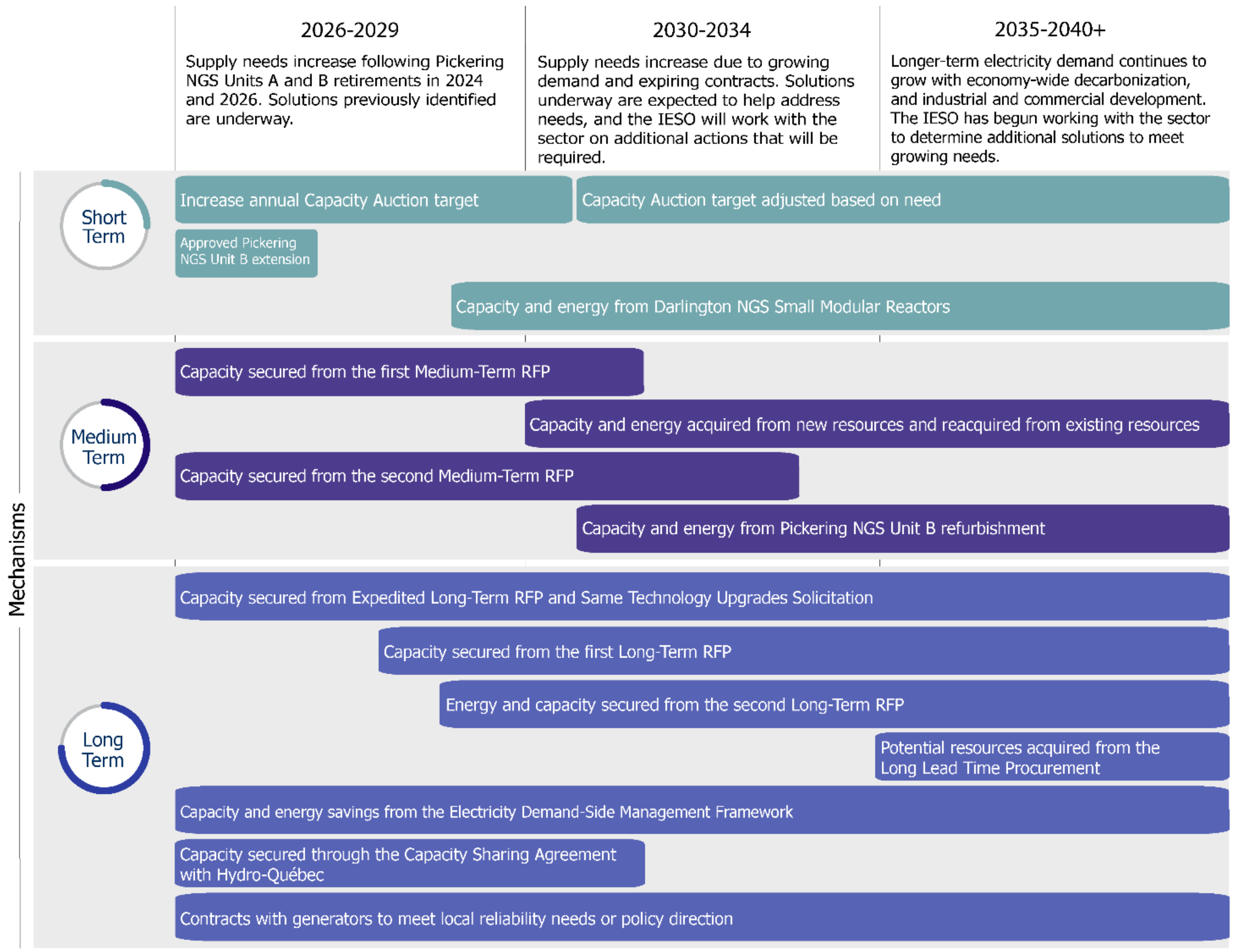
Recognizing the wide range of uncertainties that arise in developing forecasts and outlooks, the planned actions in this section focus on addressing needs in the nearer term, only out to 2040.

The planned actions specified align with the competitive acquisition mechanisms set out in the IESO's Resource Adequacy Framework. The IESO has begun to implement a cadenced approach to the medium-term and long-term procurements to meet needs in the 2020s and into the 2030s providing ongoing investment opportunities in resource development that aligns with different resource types and development timelines. The cadenced approach also allows for a continued reassessment of needs to protect against under- or over-commitment of resources; and takes advantage of continuing technological advances and associated reductions in costs.

In addition to the medium- and long-term procurement approaches, addressing Ontario's growing reliability needs may require execution of other mechanisms in the framework, including programs and bilateral agreements. This includes the Small Hydro Program and Northern Hydro Program that would offer re-contracting opportunities to existing hydroelectric facilities; and the Local Generation Program (see Section 9.4.1), to meet electricity policy objectives in a more targeted manner. Bilateral agreements can secure resources where a need exists that cannot be addressed in a practical and timely manner through competitive processes.

Considerations for the suite of future planned actions are shown in Figure 27; this includes targets for the first window of the LT2 RFP, which are largely driven by energy needs that emerge in 2029 and capacity needs that emerge in 2030. Procurement targets to meet needs arising after 2035 are dependent on various factors that include the federal Clean Electricity Regulations and the development of new nuclear at Bruce C.

Figure 27 | Summary of Planned Actions



9.1. Annual Capacity Auction

The annual Capacity Auction will continue as a near-term mechanism to secure capacity with a short forward period. For the remainder of the decade, the auction is expected to continue to be a key mechanism to secure capacity and provide flexibility to balance changes in reliability needs.

The IESO continues to provide three stages of guidance for the Capacity Auction, each informed by the level of certainty about capacity needs going forward. The aim of this guidance is to signal the upcoming period of growth and future revenue opportunity for potential Capacity Auction participants. The first stage of guidance establishes the firm guidance target for the auction taking place in Q4 2025. The second stage establishes a minimum target threshold for future Capacity Auctions. The third stage provides a forward guidance on the range of potential target capacities for future auctions beyond the next few years.

To enhance the auction's ability to meet growing capacity targets, the IESO will continue to investigate opportunities to increase competition and available supply, while maintaining reliability as a top priority in terms of performance in accordance with dispatch instructions and fulfillment of obligations. Working with stakeholders to investigate future enhancements provides assurance that the Capacity Auction can adapt to evolving market conditions and continue to be a competitive, transparent and accessible marketplace for a diverse range of capacity resources.

9.1.1. Target Capacity for the 2025 Capacity Auction

The following sets out the targets for the next Capacity Auction to take place in Q4 2025 for the May 2026–April 2027 commitment period. The targets described in this section are expressed in terms of unforced capacity (UCAP).

Summer 2026 Obligation Period (May 1–Oct. 31, 2026): 1,800 MW Target

Consistent with the forward guidance target outlined in the 2024 APO, the 2025 Capacity Auction will target 1,800 MW for the summer 2026 obligation period, representing an increase from the 1,600 MW target for the summer 2025 obligation period. Setting the target at 1,800 MW signals to the market the auction's potential growth trajectory and emerging capacity needs the auction could be expected to secure. The higher target also helps mitigate risks to resource adequacy if one or more of the demand- or supply-side uncertainties discussed earlier in this outlook materialize.

Winter 2026-2027 Obligation Period (Nov. 1, 2026–April 30, 2027): 1,200 MW Target

The 2025 Capacity Auction will target 1,200 MW for the winter 2026–2027 obligation period, representing an increase from the 1,000 MW target for the winter 2025–2026 obligation period. With needs in winter 2026–2027 largely driven by potential delays to new resources acquired through the E-LT1 and LT1 RFPs, setting the target at 1,200 MW helps mitigate the risks of project in-service delays and unreliable operation of contracted resources as described in Section 7.2 should they materialize.

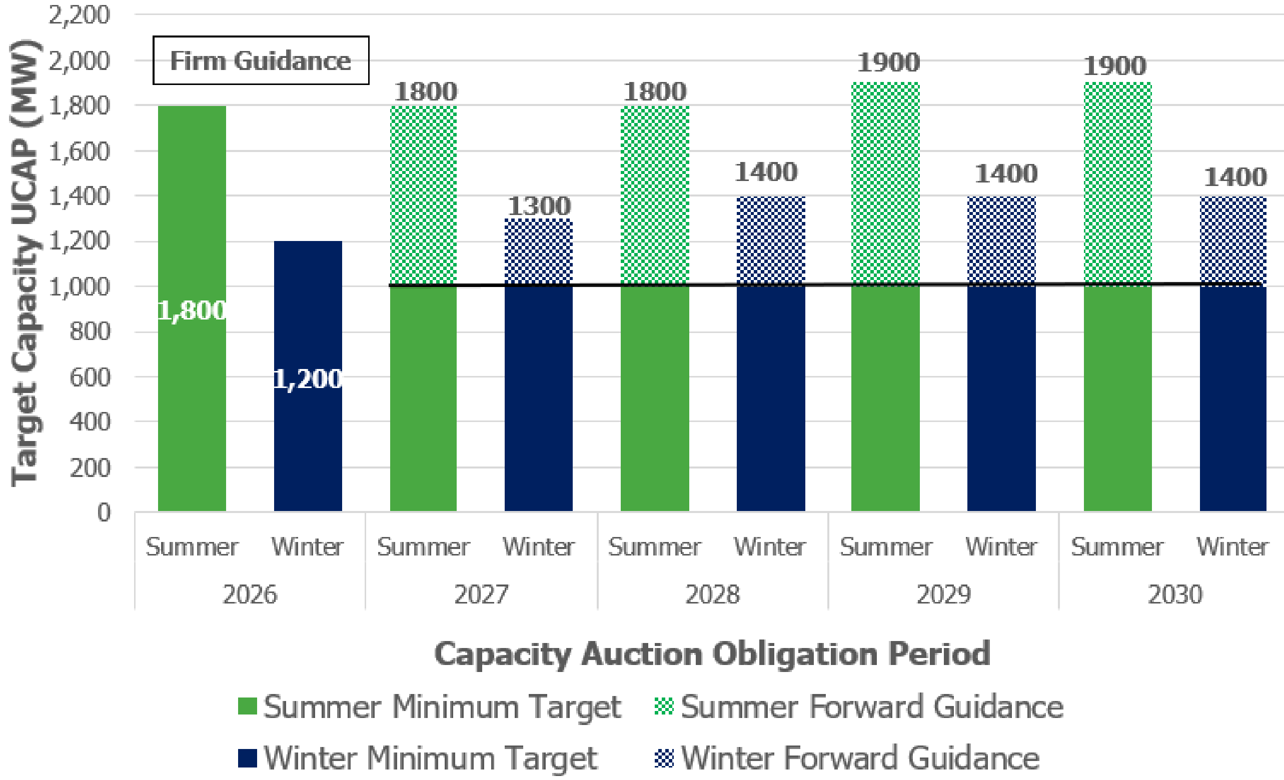
9.1.2. Minimum Target Threshold and Forward Guidance for Future Capacity Auctions

To meet increasing needs, the IESO will maintain the minimum target capacity for each obligation period at 1,000 MW to signal a predictable and stable marketplace for capacity suppliers to invest in operations in Ontario. This minimum target capacity also provides assurance to the IESO that resources will be available to meet reliability needs.

Forward guidance is provided up to the summer 2030 and winter 2030–2031 obligation periods. Figure 28 illustrates the forward guidance for both summer and winter target capacities, showing gradual growth to 1,900 MW starting in the summer 2029 obligation period and 1,400 MW in the winter 2028–2029 obligation period. This reflects the integrated capacity needs determined for these periods and the use of the Capacity Auction as a mechanism to help address them.

As in past years the IESO will reassess forward guidance for future auctions and, if required, adjust guidance to help meet system needs. At the same time, the IESO will review the auction's potential contributions to needs each year when adjusting targets.

Figure 28 | Capacity Auction Forward Guidance



9.1.3. Enhancements to the Annual Capacity Auction

In 2024, the IESO established a Capacity Auction enhancements objective statement: Potential enhancements should help ensure that the Capacity Auction can adapt to evolving market conditions and continue to be a competitive, transparent and accessible marketplace for a diverse range of capacity resources.

The November 2024 auction introduced several enhancements as a result of review and engagement with stakeholders, including:

- Reviewing and updating the capacity auction demand curve's reference technology and pricing basis from a simple cycle gas turbine resource to a four-hour battery storage resource. This update ensures that the curve is reflective of the current market environment and remains competitive with other jurisdictions;
- Reviewing the Hourly Demand Response standby price trigger ($) amount based on current market conditions, with the outcome of maintaining the price at $200;

- Reviewing and updating the amount of virtual capacity that can be accepted in the Niagara zone; and
- Implementing administrative updates including annual amendments to capacity auction market rule and manual language based on lessons learned, changes in processes, error corrections, etc.

The IESO continues to collaborate with stakeholders to identify and prioritize future enhancements to the auction, with the aim of enabling increased competition and greater resource reliability to continue to drive value for ratepayers. Plans for future enhancements are detailed on the Capacity Auction Enhancements stakeholder engagement page.

9.2. Medium-Term Procurements

Medium-term procurements help meet needs by competitively reacquiring existing resources coming off contract for five-year terms. Contracts provide proponents with flexible start dates and an avenue for participation until the next long-term procurement or a subsequent medium-term procurement. The cadenced process of medium-term procurements provides the IESO with flexibility to adjust to changes in system needs and adapt processes to lessons learned.

9.2.1. Medium-Term 2 RFP

As indicated in Section 3.1, several facilities reach contract end by the end of this decade. The MT2 RFP is expected to recommit a portion of facilities with contracts that expire between 2026–2029. To ensure competitive reacquisition of all resource types, the MT2 RFP (and future MT RFPs) will include capacity and energy streams with separate targets for each. Target capacities for each stream are indicated in the final MT2 RFPs posted on Nov. 15, 2024. Contract award is anticipated in Q2 2025, with commitment periods beginning on May 1 of either 2026, 2027, 2028, or 2029.

9.2.2. Subsequent Medium-Term Procurements

The number of resources that are expected to reach end of contract increases significantly in the early to mid-2030s. By the end of 2035, there is almost 10,000 MW of capacity (on a summer UCAP basis) from resources reaching contract end. Subsequent medium-term procurements will be executed using a cadenced approach to procure resources with contracts expiring in the next decade.

9.3. Long-Term Procurements

Energy and capacity needs emerge in 2029 and 2030, respectively, as indicated by the top bars in Figure 29 and Figure 30. The needs shown in these figures account for:

- In-flight actions described in Section 8.1;
- Forward guidance targets for the Capacity Auction provided in Section 9.1; and

- The contribution from existing non-emitting[30] and emitting resources with expiring contracts that are assumed to be reacquired through medium-term commitments.

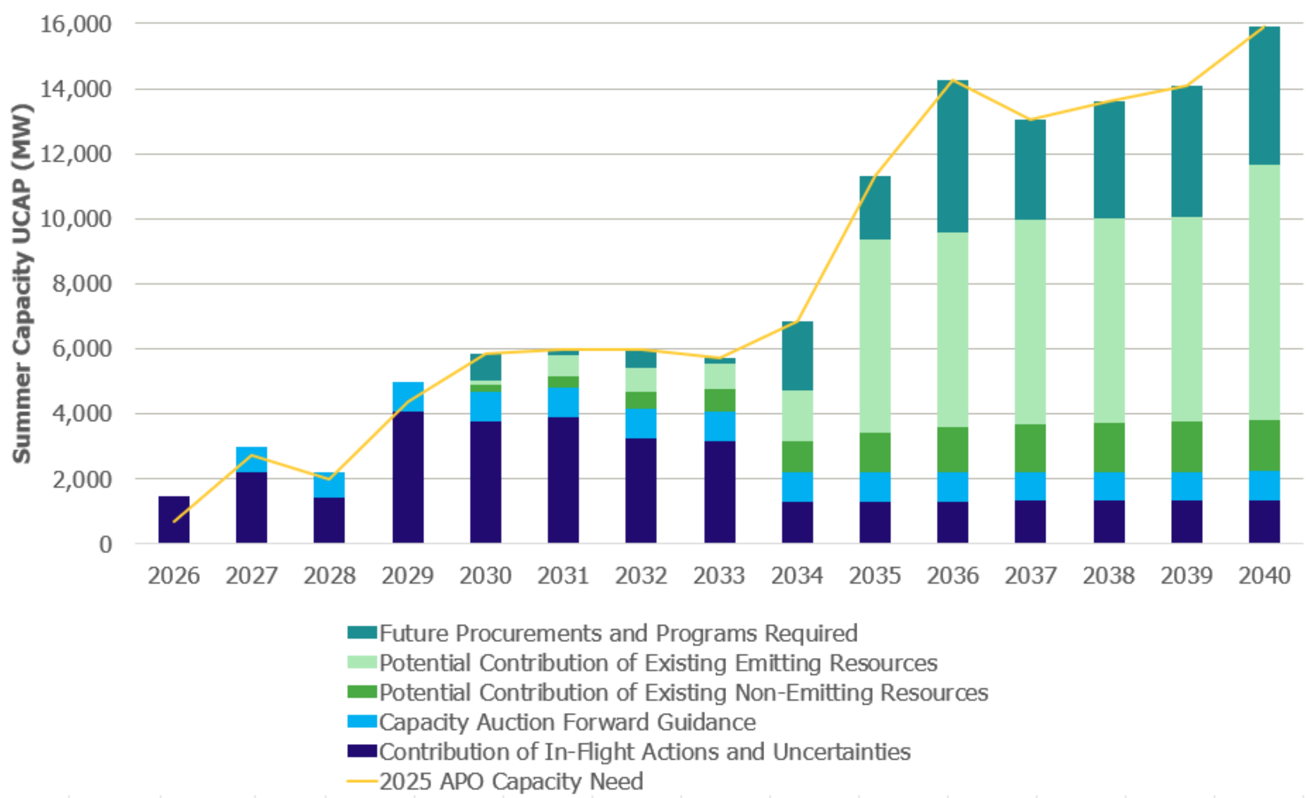
By 2034, the IESO forecasts a remaining annual energy need of approximately 7 TWh and a remaining capacity need of about 2,100 MW on a summer UCAP basis. The magnitude of needs may change depending on materialization of demand- or supply-side risks; the outcome of the MT2 RFP; and the capacity and energy from resources acquired in the LT2 RFP. Capacity and energy needs, which are also subject to federal and provincial policies, are expected to grow significantly throughout the 2030s amidst ongoing nuclear refurbishments and uncertainty around resources reaching end of life.

9.3.1. Remaining Capacity Needs

The capacity needs identified in Section 8.2 are reduced after considering the potential contribution of existing non-emitting and emitting resources. Figure 29 illustrates a capacity need of more than 800 MW emerging in 2030 and growing to more than 2,100 MW in 2034 (on a summer UCAP basis).

In 2035 and beyond, the federal Clean Electricity Regulations would limit production from most of Ontario's gas fleet, reducing capacity that could be relied on from emitting resources when a large portion of their contracts expire.

Figure 29 | Remaining Capacity Needs and Future Procurements and Programs Required



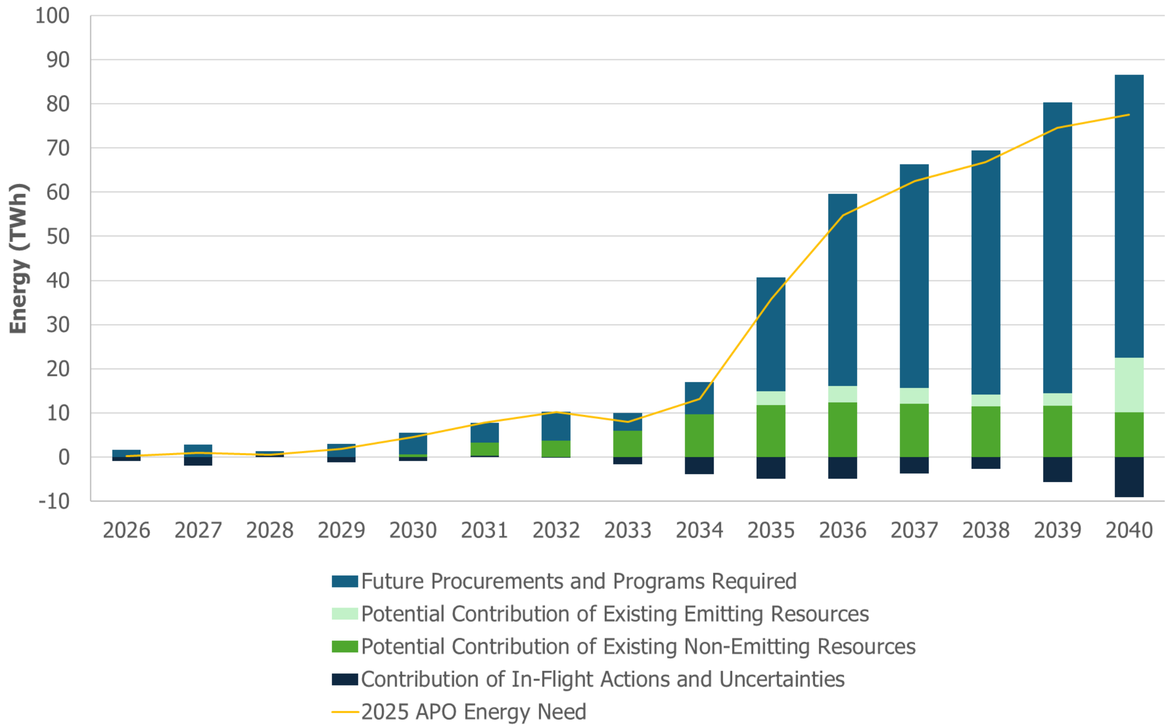
[30] Non-emitting electricity resources can include wind, solar, bioenergy, hydroelectric, nuclear and other technology types.

9.3.2. Remaining Energy Needs

Energy needs identified in Section 8.3 are reduced after considering the potential contribution of existing non-emitting and emitting resources. Figure 30 and Figure 31 illustrate these remaining annual needs, which begin in 2029 at 3 TWh and grow to approximately 7 TWh by 2034. These nearer-term needs reflect supply uncertainties discussed in Section 7.2, including potential delays to new-build nuclear facilities and planned refurbishments. Should these developments be on time, energy needs may arise after 2029.

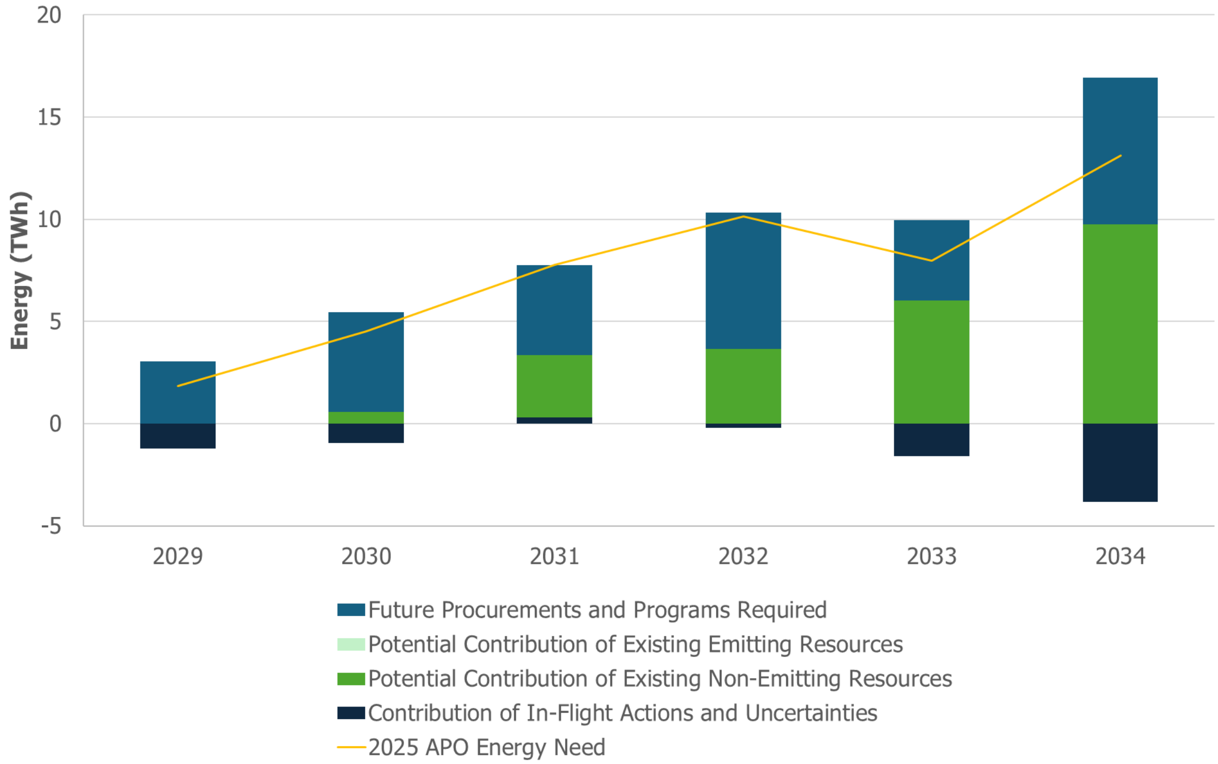
Energy needs also increase significantly starting in 2035 as resources reach their assumed end of life, and at which point energy needs depend on the federal Clean Electricity Regulations that would limit production from most of Ontario's gas fleet.

Figure 30 | Remaining Energy Needs and Future Procurements and Programs Required[31]



[31] Note that the energy impact of some risks considered in this analysis exceeds the expected contribution of in-flight actions, resulting in negative terawatt-hours (displayed in dark blue) and showing the need to procure more energy than is indicated by the APO resource adequacy assessment. Moreover, no energy is accounted for from resources acquired through the Capacity Auction, which specifically targets capacity services.

Figure 31 | Remaining Energy Needs and Future Procurements and Programs Required (2029–2034)



9.3.3. Targets for New Resources

Meeting remaining capacity and energy needs emerging in 2029 and growing through the 2030s will require several procurement initiatives and programs. On Nov. 28, 2024, the IESO was directed by the Minister of Energy and Electrification to undertake the LT2 RFP, structured to include multiple submission windows under distinct capacity and energy procurement streams. The expected cadence and timing for all the procurements is intended to ensure that eligible resources gradually enter the electricity system to meet needs.

Under the LT2 RFP, the totality of all energy procurements will target the acquisition of contract capacity sufficient to enable the production of up to 14 TWh of annual generation from eligible energy-producing resources. The capacity submission windows will collectively target the procurement of up to 1,600 MW of eligible capacity resources.

These total targets, set for resources to be in service by 2034 or earlier and last contracts issued on or before March 31, 2029, help meet remaining energy and capacity needs identified in this APO. Moreover, these targets support resource adequacy requirements if additional risks (e.g., project delays or previous targets not being met) materialize. They can also help prepare for significant needs starting in 2035; better position the province to accommodate load growth above what is currently forecast; and support other government energy strategies.

Table 3 illustrates the LT2 RFP capacity and energy targets and commercial operation dates (COD) for each procurement window. Number of windows, targets and dates are subject to change; final targets for Window 1 will be published in the LT2(c-1) RFP and LT2(e-1) RFP, anticipated to be released in February 2025. Provisions may also be included in the LT2 RFP to allow the IESO to exceed targets, and early operation incentives may be used to encourage earlier CODs. Notification to Selected Proponents for both capacity and energy streams of Window 1 is targeted for Q1 2026.

Table 3 | LT2 RFP Capacity and Energy Targets

LT2 RFP Procurement Window	Capacity Target	Energy Target
Window 1 – May 1, 2030 COD	600 MW	3 TWh
Window 2 – May 1, 2031 COD	400 MW	1–3 TWh
Window 3 – May 1, 2032 COD	300 MW	2–4 TWh
Window 4 – May 1, 2033 COD	300 MW	2–4 TWh

Flexibility has been built into the energy targets to allow for iterative target setting based on the results of prior windows, as well as updates to the demand forecast as per the IESO's annual planning process. Flexible targets also provide room to re-evaluate energy targets based on the nature of the resources procured through prior capacity RFPs, recognizing that some capacity resources that are procured may have some nominal energy value.

9.3.3.1. LT2 RFP Resource Eligibility and Contract Term

The LT2 RFP will be open to all resource types that can meet the mandatory criteria outlined for each of the submission windows (e.g., nameplate capacity >1 MW); and proponents must choose to participate in either the energy or the capacity stream. Natural gas resources with a nameplate capacity of greater than 45 MW will only be permitted to participate in the capacity stream.

Contract term length will be 20 years for all resource types, subject to the appropriate contractual provisions and adjustments. For the first window, early operation incentives will be offered to non-electricity storage projects that can be in-service prior to May 1, 2030, which may result in contract terms lengths greater than 20 years.

9.3.4. Long Lead Time Resource Procurement

On July 10, 2023, the Minister of Energy issued a letter asking the IESO to consider a potential procurement for resources with long lead times and long lifespans. In a March 2024 report-back, the IESO recommended a carved-out approach for long lead time resources due to their unique considerations. The IESO is looking to design and develop a separate procurement for acquiring long lead time resources that can be in service by 2034. This could include both long lead time long duration energy storage and new hydroelectric generation. To further this work, the IESO issued a Request for Information (RFI) to solicit information and gain a better understanding of potential projects that can come forward for this procurement. The RFI closed on Nov. 1, 2024; and insights from the responses will be shared in 2025. The IESO will continue engaging with RFI respondents to seek further information that can help inform the development of the Long Lead Time Resource procurement; in addition, RFI responses and any subsequent engagement or discussions will inform a report-back that will be submitted to the Minister of Energy and Mines.

9.4. Programs

9.4.1. Local Generation Program

On Nov. 28, 2024 the IESO was directed to explore a new competitive program — the Local Generation Program — to secure existing and new distribution-connected generation facilities to help meet regional and system-wide supply needs. In addition, opportunities for upgrades and/or expansions at existing distribution-connected facilities will be considered. Securing existing and new distribution-connected generation facilities could potentially help meet both regional and system-wide needs.

The IESO will report back to the Ministry of Energy and Mines by April 30, 2025 on a proposal to establish a local small generation procurement program in Ontario, with an expectation to launch a competitive program by early 2026[32].

9.4.2. Northern Hydro Program

On May 8, 2024, following the successful launch of the Small Hydro Program in December 2023, the Minister of Energy asked the IESO to design a Northern Hydro Program for existing facilities that have: Installed capacities above 10 MW; and Contracts with the IESO or the Ontario Electricity Financial Corporation expiring on or before April 30, 2043.

In June 2024, the IESO began engaging directly with owners of Northern Hydro Program-eligible facilities to get their perspective on key elements of program design. A report-back to the Minister of Energy and Electrification was submitted in December 2024 containing the status of program development.

[32] Separately, the IESO continues its Enabling Resources Program, which includes incorporating dispatchable distributed energy resources into IESO-administered markets, tools, and processes. Distributed energy resources also continue to be considered as non-wires alternatives assessed in transmission plans.

9.4.3. Electricity Demand-Side Management

Electricity demand-side management continues to play a key role in the power system, achieving energy and peak demand savings and, in turn, reducing energy and capacity needs. Using electricity wisely also offers benefits for individuals and businesses, as well as Ontario's electricity system, where energy efficiency typically involves upgrading or replacing existing equipment with higher efficiency alternatives. On Jan. 7, 2025, the Minister of Energy and Electrification announced a new eDSM Framework for the years 2025–2036 to address provincial, regional, and local system needs with a budget of up to $10.9 billion. The new framework includes programs for residential, commercial, institutional (including municipalities), industrial, and agricultural segments, in addition to programs for income-qualified households and on-reserve First Nations. Per the requirements of the directive, on Jan. 22, 2025, the IESO published a program plan for the first three years of the new framework, establishing targets of 4,636 GWh of energy savings and 900 MW of peak demand savings for 2025–2027. Beyond 2027, the IESO plans to continue to grow eDSM targets in future program plans to maximize potential for these programs to cost-effectively meet system needs.

9.5. Transmission Schedule of Planning Activities

The transmission system needs described in Section 5 will require planning to develop, evaluate and recommend solutions in bulk system plans. A Schedule of Planning Activities provides a snapshot of the IESO's workplan for priority bulk system transmission plans over the next three years. If conditions evolve — for example, if the generation or demand outlooks change, or new public policy direction emerges — then the need, scope and/or timing proposed for these planning studies may be revised. These transmission studies, also referred to as bulk system plans, are geared toward addressing those system needs that require a detailed evaluation of possible solutions, including transmission and other integrated alternatives. The IESO carries out stakeholder engagement for these studies according to their individualized engagement plan, and the final plans with detailed recommendations are published as stand-alone reports on the IESO website.

The Schedule of Planning Activities includes an estimate of the duration of each bulk plan, which will be further defined when the plan scope of work is developed and communicated through stakeholder engagement activities.

Table 4 | Schedule of Planning Activities

Area	Study Name	Start - End (Estimate)	Scope / Considerations
South and Central Ontario (including the GTA)	South and Central Ontario Bulk Plan (*Powering Ontario's Growth* plan)	2024–Q3 2025 (ongoing)	This study was initiated to review the capability of the bulk system to support future generation connections and demand growth in key areas throughout southern and central Ontario, including the GTA, to enable a decarbonized power system in the future. This study includes several considerations:

			• Sufficiency of the bulk transmission supply to the GTA given future growth in electrical demand, and reduced reliance on existing local natural gas-fired generation; • Expansion for the 500 kV transmission system between Cherrywood TS and Bowmanville to enable continued expansion of generation, including small modular reactors, in eastern Ontario; • Continuing the assessment of the bulk transmission system between the Hamilton and Windsor areas to understand future transmission needs that could result from further economic development; and • Transmission needed to enable expansion of the Bruce NGS. This work also considers opportunities to preserve new or expanded corridors for future transmission development. Two new corridor studies, in addition to the ongoing northwest GTA corridor work, have recently been recommended as early outcomes of this work.
Southern Ontario (including the GTA)	Niagara Bulk Plan	2025–2026	This study is proposed to review the capability of the bulk transmission system to continue to support economic development in the Niagara region, with consideration of the future role of the area's intertie with New York.
Northern Ontario	Ontario-Manitoba Intertie Joint Study	2022–2025 (ongoing)	This study was initiated to proactively plan for the end of life of critical transmission intertie equipment on the Ontario-Manitoba interconnection. This is a joint study between the IESO, Hydro One Networks, Manitoba Hydro and Minnesota Power.
Northern Ontario	Northern Ontario System Bulk Plan (*Powering Ontario's Growth* plan)	2024–Q3 2025 (ongoing)	This study was initiated to review the capability of the bulk transmission system to facilitate additional power flows from northern Ontario to southern Ontario and vice versa, and to support future generation connection and demand growth to enable a decarbonized system. The bulk plan is ongoing and will continue to assess the medium- and long-term needs. This includes consideration of opportunities to

			preserve new or expanded corridors for future transmission development.
Northern Ontario	North of Sudbury Bulk Plan	2025–2026	This study will examine the capability of the bulk transmission system's ability to supply additional increasing levels of demand in the areas surrounding Timmins, Kirkland Lake, and Pinard. The study will also look at creating opportunities to potentially locate new non-emitting resources and opportunities for new or upgraded interconnections with Quebec.
Northern Ontario	Northern Ontario Connection Study	2024–2025 (ongoing)	This study will evaluate transmission options for enabling connection of remote First Nations and prospective mining developments in remote northwestern Ontario.
Eastern Ontario (including Ottawa)	Eastern Ontario Bulk Plan	2024–2026 (ongoing)	This study will examine if the bulk transmission system is sufficient to reliably supply the demand growth expected in eastern Ontario and explore opportunities to improve the transmission system's capability to deliver new resources located in eastern Ontario and the capacity transfers to and from Quebec.

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