2025 Annual Planning Outlook

Demand Forecast Module

April 2025

ieso
Connecting Today.
Powering Tomorrow.

Table of Contents

1. Introduction **2**

2. Demand Forecast Summary **3**

3. Demand Forecast Drivers **6**

3.1 Residential Sector 6

3.2 Commercial Sector 9

3.3 Industrial Sector 13

3.4 Agricultural Sector 15

3.5 Transportation Sector 17

3.5.1 Electric Vehicles 17

3.5.2 New Rail Transit Projects 18

3.6 Other Electricity Demand 19

3.7 Electricity Demand-Side Management (eDSM) 19

3.7.1 eDSM Programs 21

3.7.1.1 Historical Programs 21

3.7.1.2 Current Frameworks 22

3.7.1.3 Long-Term Framework 23

3.7.2 Codes and Standards Regulations 24

3.8 Industrial Conservation Initiative 25

3.9 Residential Demand Response 27

3.10 Embedded Generation 28

4. Demand Forecast Uncertainties **30**

1. Introduction

The Independent Electricity System Operator (IESO) conducts long-term power system planning for the province on an annual basis. The demand for electricity establishes the context for integrated planning, resource adequacy and transmission security assessments, and resource acquisition, as it determines the amount of electricity that must be served. Electricity is used every day by Ontarians to provide a wide range of services. Electricity demand forecasting attempts to anticipate future requirements for the services that electricity provides and is required due to the long multi-year process required to plan, site, build or refurbish energy resources to meet system needs. Updates to the electricity demand forecast provide context for updated integrated plans, energy-efficiency program planning and supply procurement decisions.

Electricity requirements are affected by many factors, including consumer's choice of energy form, technology, equipment purchasing decisions, behaviour, demographics, population, the economy, energy prices, transportation policy and electricity demand side management, and more recently, large step loads including data centres, etc. The IESO monitors and interprets these and other factors on an ongoing basis to develop outlooks against which system planning can take place.

This *Demand Forecast Module* provides greater context of the changes in the demand forecast in the IESO's 2025 Annual Planning Outlook (APO). It includes the IESO's latest interpretation of societal trends and preferences that are shifting towards climate change mitigation through fuel switching and electrification resulting in potentially much higher electricity demand in the future, but is based upon committed and confirmed public sector policies, private sector projects, current underlying fuel rate forecasts and economics, and the rapidly growing large step loads coming to Ontario. The 2025 APO long-term demand forecast module provides a detailed assessment of electricity demand assumptions on a sector level basis.

2. Demand Forecast Summary

The IESO 2025 APO long-term demand forecast was developed in 2024, covers the period of 2026-2050, using year 2025 as a reference year and is produced at the weather normal, zonal hour, net, generator demand level.

Building off of the 2024 APO long-term demand forecast, which in itself was an evolution of the 2022 APO, where electricity demand was still influenced by the conclusion of the impacts of the COVID-19 pandemic, public health measures, and emerging societal transforming climate change mitigation measures, the 2025 APO long-term demand forecast focuses on the continuing trend of growing industrial support for the decarbonization, fuel switching and electrification of the provincial economy. The 2025 APO demand forecast accounts for all known economic conditions, confirmed projects, including those directly attributable to electrification, and other changes in electricity demand and policy at the time of finalization:

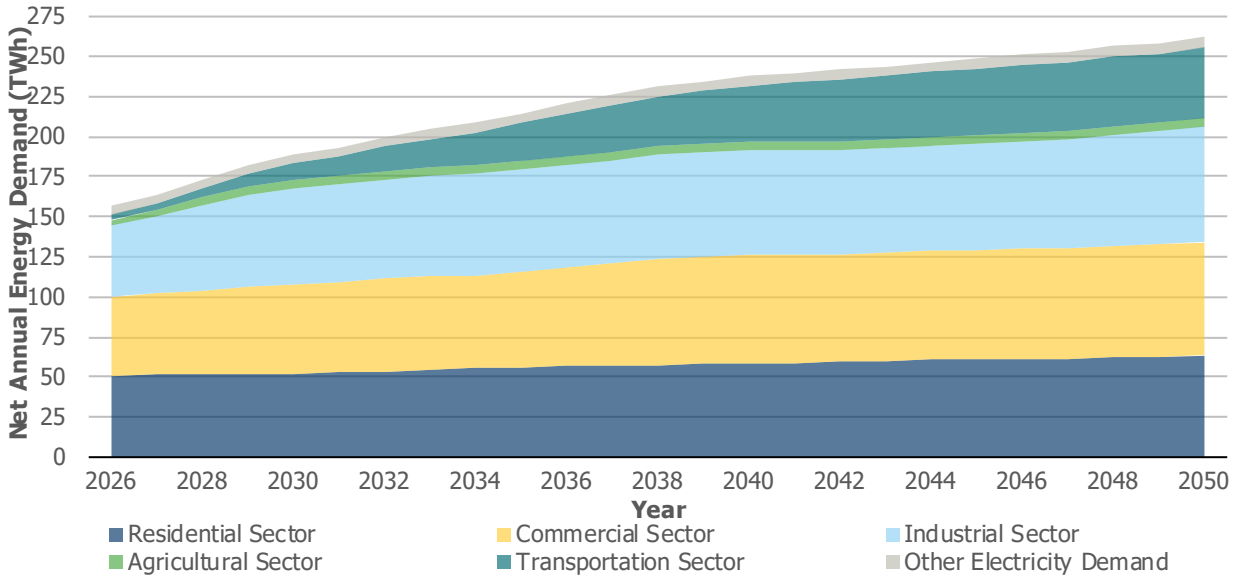
1. Updated and enahanced residential sector building space heating and space cooling hourly demand profiles with greater specificity for end-use efficiency levels and zonal climatic regions.
2. Updated industrial sector demand that reflects:
    a) the latest commitments and expected development of new factories for electric vehicle (EV) production and corresponding supply chain;
    b) expected electrification over the outlook period, and a new cycle of growth in the long-term (2040-2050) period in the mineral extraction and processing sub-sector; and
    c) several industrial large loads in chemical, primary metal and non-metallic minerals sectors.
3. The revision of agricultural sector demand profiles.
4. Updated transportation sector demand attributed to revised assumptions for medium and heavy duty vehicles.
5. Updated electricity demand-side mangement program historical actual results, and enhanced current IESO-funded electricity demand-side mangement program framework design and targets, and federal government funded programs.
6. Improved Industrial Conservation Initiative modelling to integrate expected changes to annual system peak demand day demand profiles from current observations to flattened demand.

The net impact of all updates since and confirmation of other assumptions and projections from the 2024 APO demand forecast are an increase relative to the 2025 APO demand forecast in annual energy, summer peak and winter peak demand through the outlook period. Demand

growth is primarily attributed to the transportation, industrial, and agricultural sectors, as referenced above.

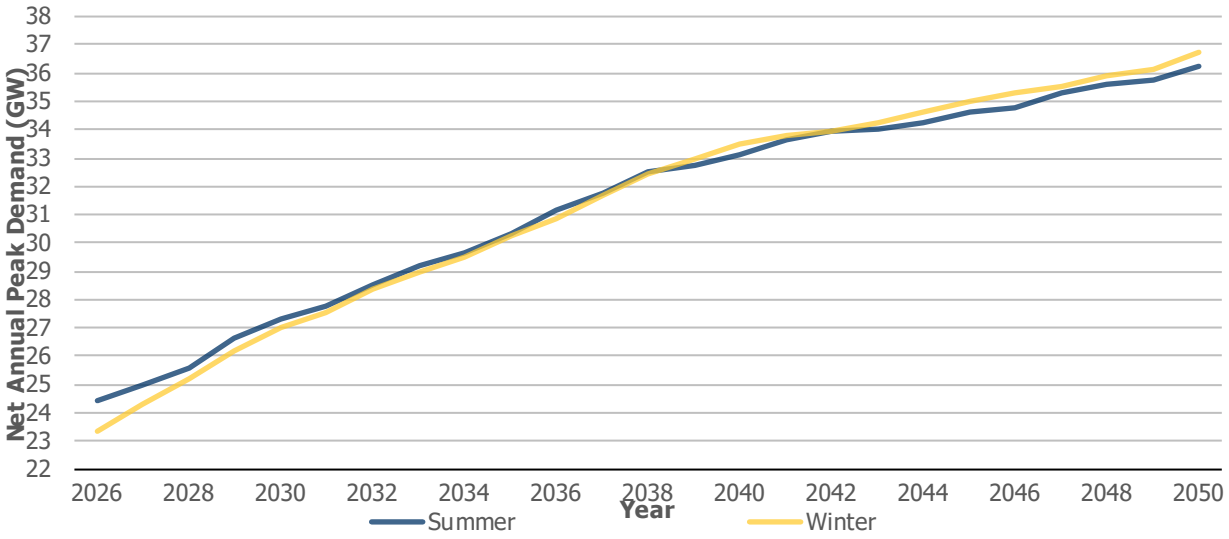
The 2025 APO demand forecast is summarized as having robust, consistent growth over the outlook period, strongest in the mid-2020s to mid-2030s, trending in the 3.6%/year range and steadily flattening to about 1.3%/year by the end of the outlook period. Winter peak demand increases at a pace higher than summer peak demand, attributable to a combination of: 1) expected EV charging demand coincident with daily winter system peak periods, 2) increased building heating electrification, specifically in the city of Toronto; and 3) increased large step loads connecting to the system. The Ontario system is expected to become dual-peaking by the early 2030s.

Figure 1: Net Annual Energy Demand, By Sector



In the 2025 APO demand forecast, net annual energy demand grows from 156.7 TWh in 2026 to 262.5 TWh in 2050, an increase of 105.8 TWh, 67.5% or an average annual growth rate of 2.2%; net summer peak demand grows from 24.4 GW in 2026 to 36.2 GW in 2050, an increase of 11.8 GW, 48.3% or an average annual growth rate of 1.7%; and net winter peak demand grows from 23.4 GW in 2026 to 36.7 GW in 2050, an increase of 13.4 GW, 57.3% or an average annual growth rate of 1.9%.

Figure 2: Net Annual Peak Demand, By Season



While demand forecasts are, by definition, inexact, as climate change mitigation, decarbonization and electrification projects, strategy and policy evolve, it will become ever more challenging to assess the scale, location and timing of resulting future changes in demand. These uncertainties are addressed in Section 4.

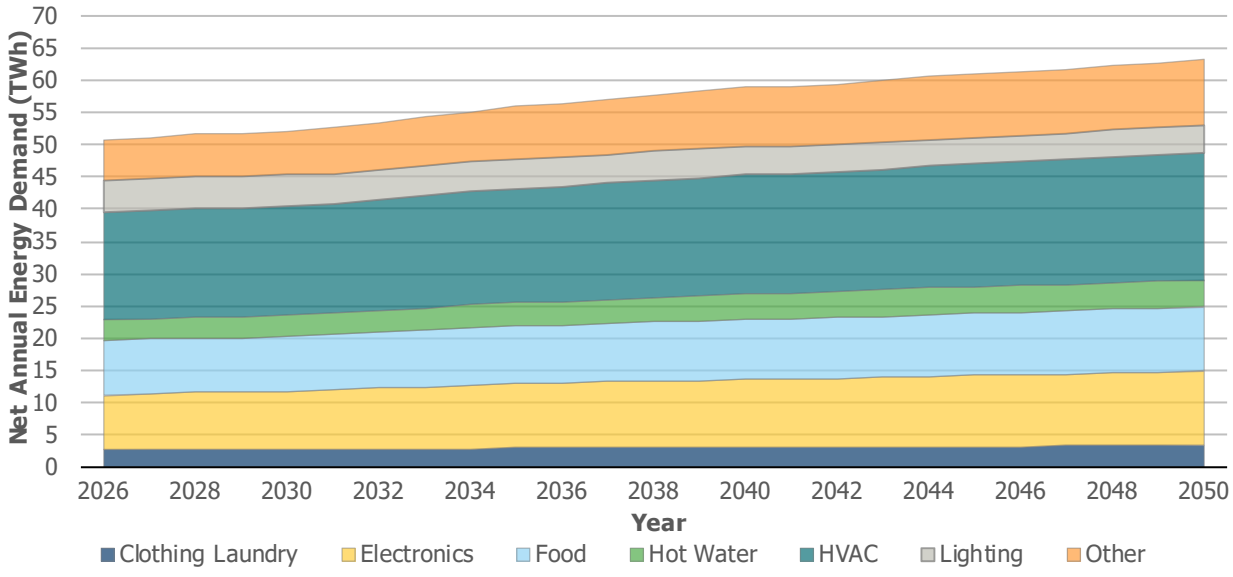
3. Demand Forecast Drivers

3.1 Residential Sector

The main updates to the residential sector are an updated housing stock forecast that reflects Ontario's *Cutting Red Tape to Build More Homes Act*, *More Homes Built Faster Act* and the inclusion of the Toronto Green Standard (TGS) planned increase in minimum building energy and emission intensity requirements in year 2030, while confirming previous years forecast assumptions of work-from-home trends and resulting increased weekday home occupancy, long-term overall housing stock increases as a result of progressive national immigration policies, and a broad long-term increase in electronics electricity demand within homes.

Net annual energy demand grows from 50.6 TWh in 2026 to 63.3 TWh in 2050, an increase of 12.6 TWh, 25% or an average annual growth rate of 0.9%.

Figure 3: Residential Sector - Net Annual Energy Demand, By End-Use Type



While overall average annual increases in energy demand are at 0.9%, consumer electronics, small appliances and other miscellaneous plug-load account for higher than average end-use level demand growth at nearly 2% respectively. While new construction and majorly renovated buildings in the city of Toronto are expected to be wholly electrified with heat pump technologies, with respect to space heating, water heating, cooking and clothes drying, after 2030, since existing buildings and the remainder of the province are not subject to such building requirements, overall demand in these end uses are relatively flat.

While post-2030 new city of Toronto buildings comprise a small proportion of overall residential sector demand, a clear increase in demand from currently emitting end uses in Toronto can be seen. While the TGS planned increase in minimum requirement is set for 2030, it is expected that a growing proportion of new buildings will voluntarily meet the standard prior to 2030. In Figures 4 and 5, it is demonstrated the demand of relevant end uses in the city of Toronto compared to the rest of the province is growing faster over the course of the outlook period.

Figure 4: Residential Sector - Building Electrification, Energy Demand, By End-Use & IESO Zone

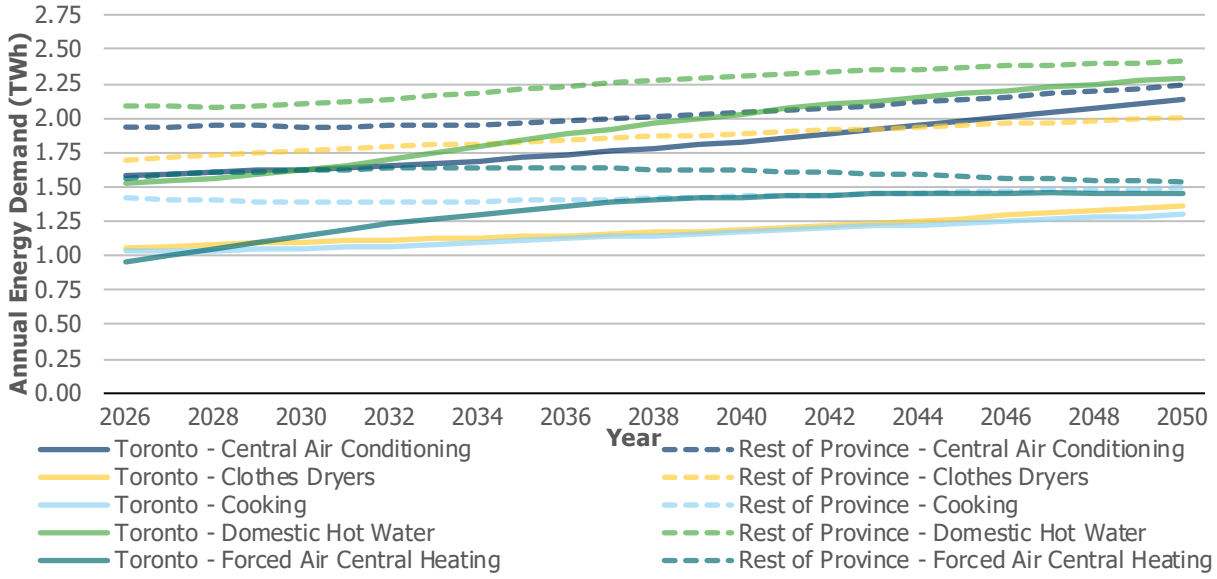
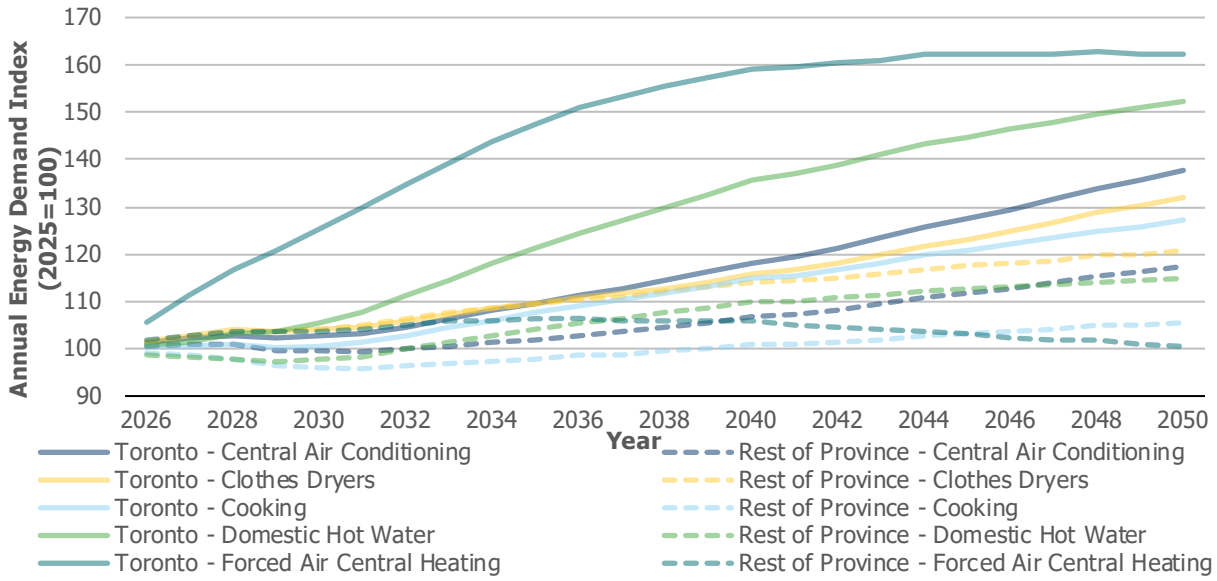


Figure 5: Residential Sector - Building Electrification, Energy Demand Change Since 2025, By End-Use & IESO Zone



The residential sector's major driver is household count. Total household count projections are notably higher than previous forecasts in the 2024 APO due to surging immigration. When the demand forecast was produced, the household projection included the Immigration Levels Plan, which was released in November 2023 that specified 485,000 immigrants in 2024 and a plateauing at 500,000 in 2025 and 2026. Furthermore, the arrival of non-permanent residents has risen dramatically reaching 698,000 in 2023. These factors lead to higher household counts in this APO. Overall, the number of households is expected to increase by nearly an additional 2 million over the outlook period as highlighted in Figures 6 and 7.

Figure 6: Residential Sector - Household Count, By IESO Zone

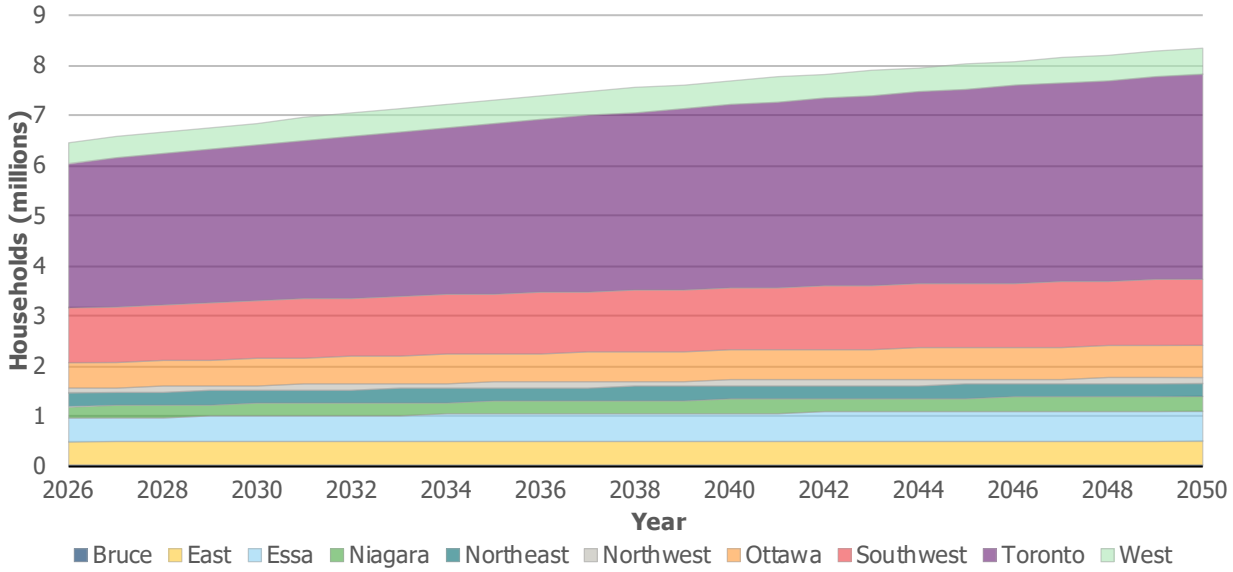
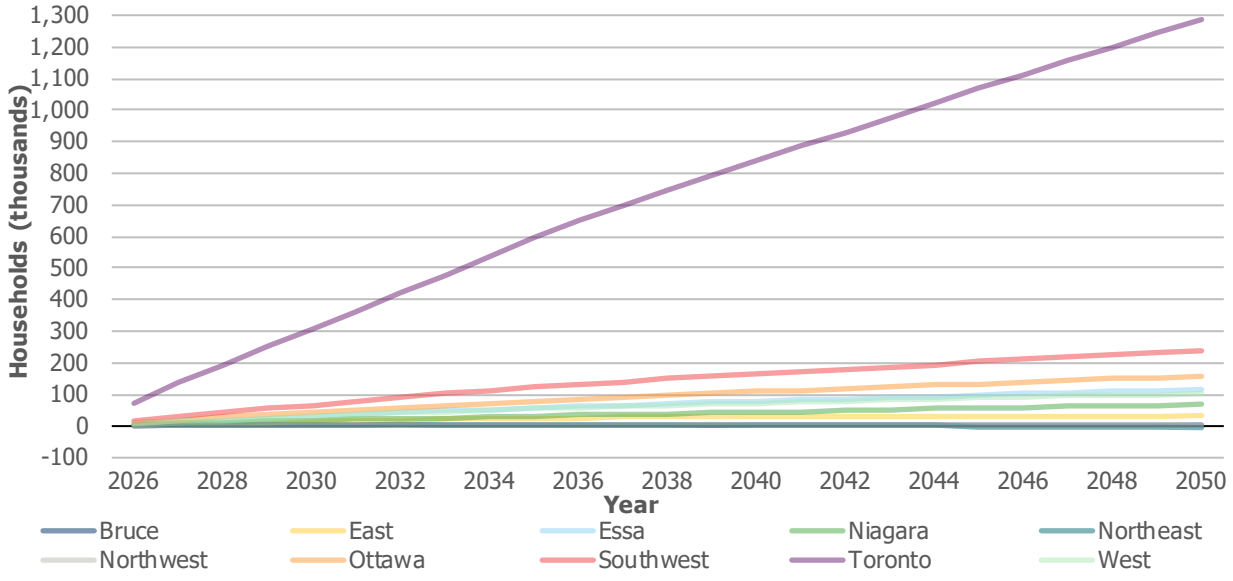


Figure 7: Residential Sector - Household Count Growth Since 2025, By IESO Zone



Despite growth in housing stock in all zones, Toronto, Southwest and Ottawa zones continue to comprise the primary residential sector demand growth, while all other Ontario zones see largely flat demand over the outlook period, as highlighted in Figures 8 and 9.

Figure 8: Residential Sector - Net Annual Energy Demand, By IESO Zone

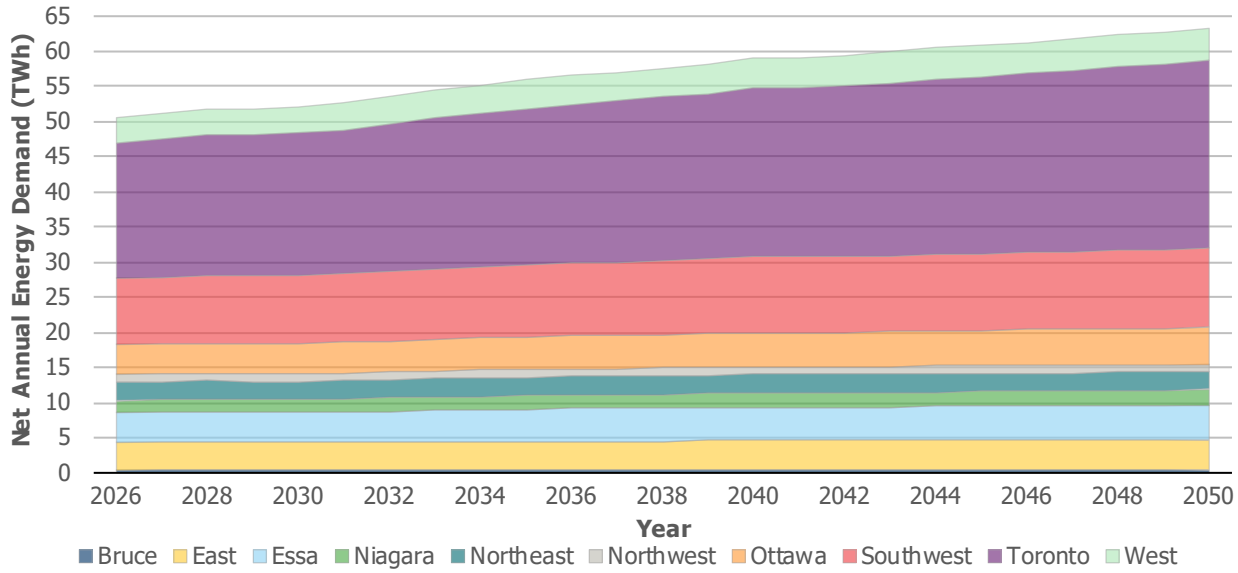
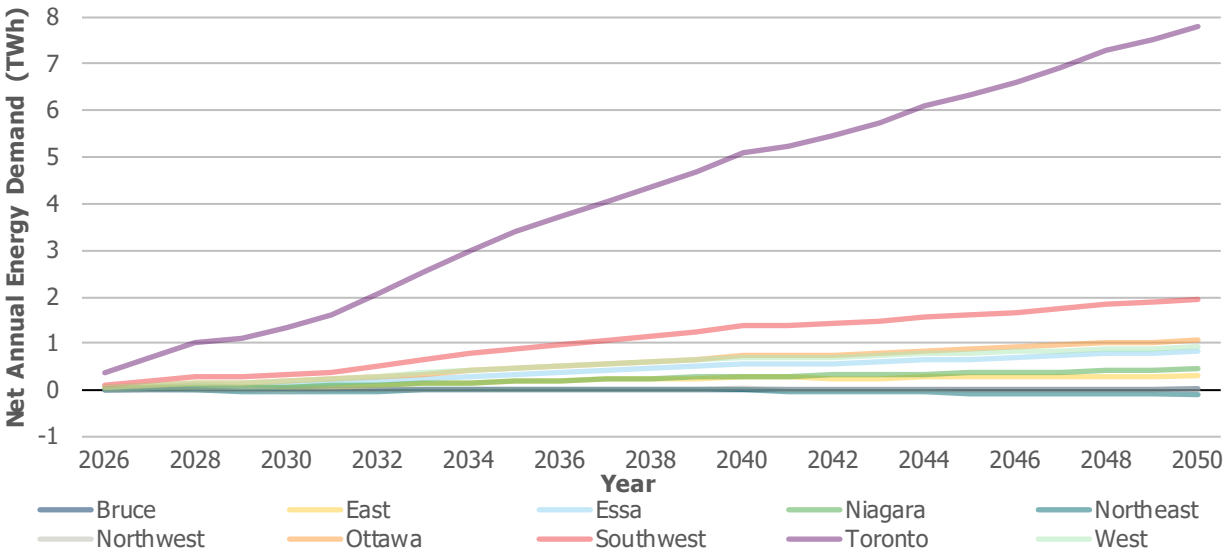


Figure 9: Residential Sector - Net Annual Energy Demand Growth Since Start of 2026, By IESO Zone



3.2 Commercial Sector

Commercial sector demand forecast (other than data centres) increases at a slightly slower pace compared to the previous APO. This is mainly due to increased electricity price over natural gas price for the forecasting period. When the electricity price increases at a faster rate than the natural gas prices, without firm policy intervention, business or building owners naturally tend to switch their end uses from electricity to natural gas or maintain as natural gas. For example, end uses like space heating and water heating follow such trend.

Persisting forecast assumptions from previous years forecasts include lingering effect of hybrid work arrangements, the resulting decreased weekday office occupancy and associated electricity demand, and continued long-term digitalization of the economy with decreased office space requirements, and increased e-commerce affecting retail and warehouse sub-sector space.

With the rise of cloud computing and artificial intelligence, the need for data centres is growing across North America. There are significant number of data centres looking to connect in Ontario. These data centres are considerably larger than current data centres in the order of 100-1000 MW and need to be transmission-connected. There is a high amount of uncertainty as to if data centres will materialize and how quickly they will materialize.

Data centre projects were categorized into multiple tiers based on information from proponents and sector partners, including but not limited to: current project development stage, transmission constraints, and project timelines. The tiered system was then used to determine a 'likelihood factor' for the loads.

Tier	Considerations	IESO Forecast Certainty Factor
1	100% Confirmed loads with System Impact Assessment (SIA)	100%
2	Pre-SIA consultation with high likelihood	Rounded to 50% of total volume used to inform data centre Growth Margin, starting in 2035
3	Medium and low likelihood	0%

Tier 1 includes 100% of certain projects totaling ~800 MW. Tier 2 includes a general data centre growth margin rounded to 50% of total volume, starting in 2035 totalling 950 MW. In this APO, data center loads in Tier 1 and Tier 2 are included.

Commercial sector net annual energy demand grows from 49.6 TWh in 2026 to 70.5 TWh in 2050, an increase of 21 TWh, 42.1% or an average annual growth rate of 1.5%. Data centre itself grows from 2.5 TWh in 2026 to 14 TWh in 2050.

Figure 10: Commercial Sector - Net Annual Energy Demand, By Sub-Sector Type

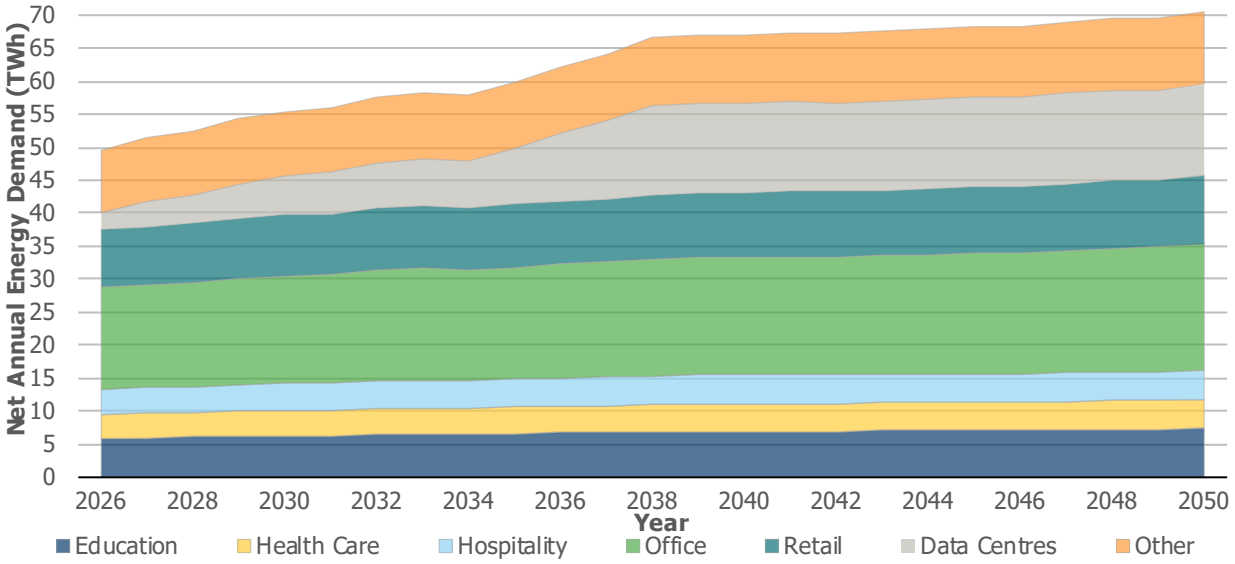
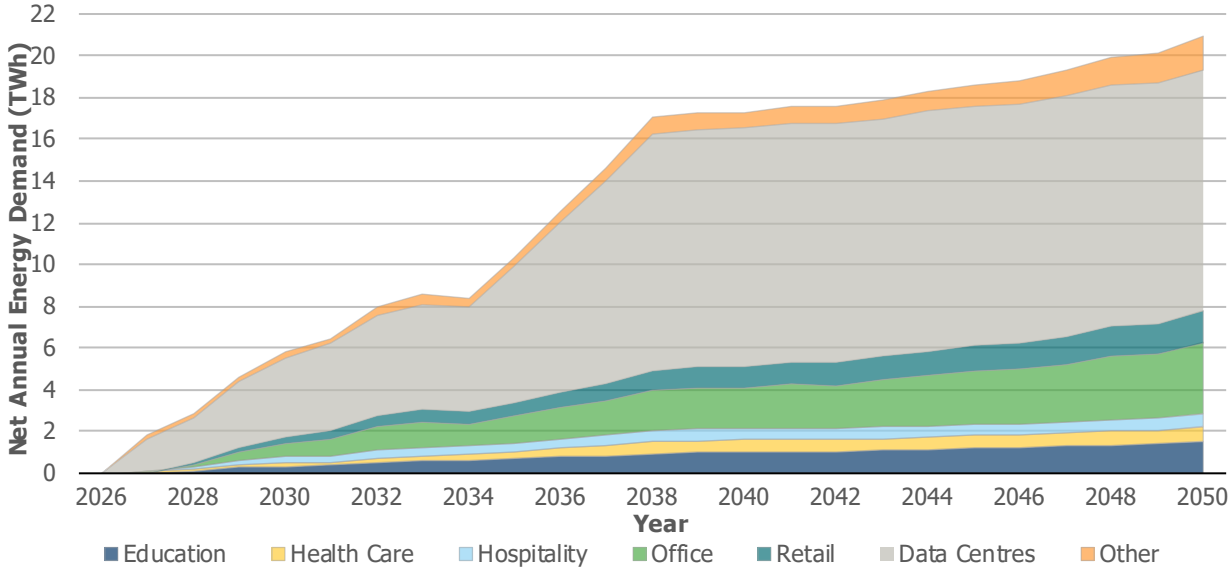


Figure 11: Commercial Sector - Net Annual Energy Demand Growth Since 2026, By Sub-Sector Type



Commercial sector building floor space continues to be the major driver of commercial sector energy demand, and the commercial sector building floor space forecast has been updated with the latest available projections by sub-sector for the Ontario economy. Major themes in the commercial sector energy forecast continue to be:

1. A return to the long-term trend of an increasing residential base in urban Toronto neighbourhoods, due to continuing new building construction, increasing demand for institutional services (education and health care), and adding pressure on existing facilities to expand in their current locations.
2. A continuing trend toward decreasing square footage per worker achieved through alternative workplace strategies, hybrid or permanent work from home practices and more efficient building design, particularly evident in major urban markets.
3. An establishment in the shift in consumer shopping behaviour, from in-person shopping and toward online retail and e-commerce having a lasting impact.
4. Continuing growth in the commercial warehouse real estate market, with increasing demand for large warehousing, logistics and distribution hubs and data centres in particular, in the wake of changes to the retail real estate landscape, e-commerce and other technological advances.

Figure 12: Commercial Sector - Floor Space, By Sub-Sector Type, Excluding Data Centres

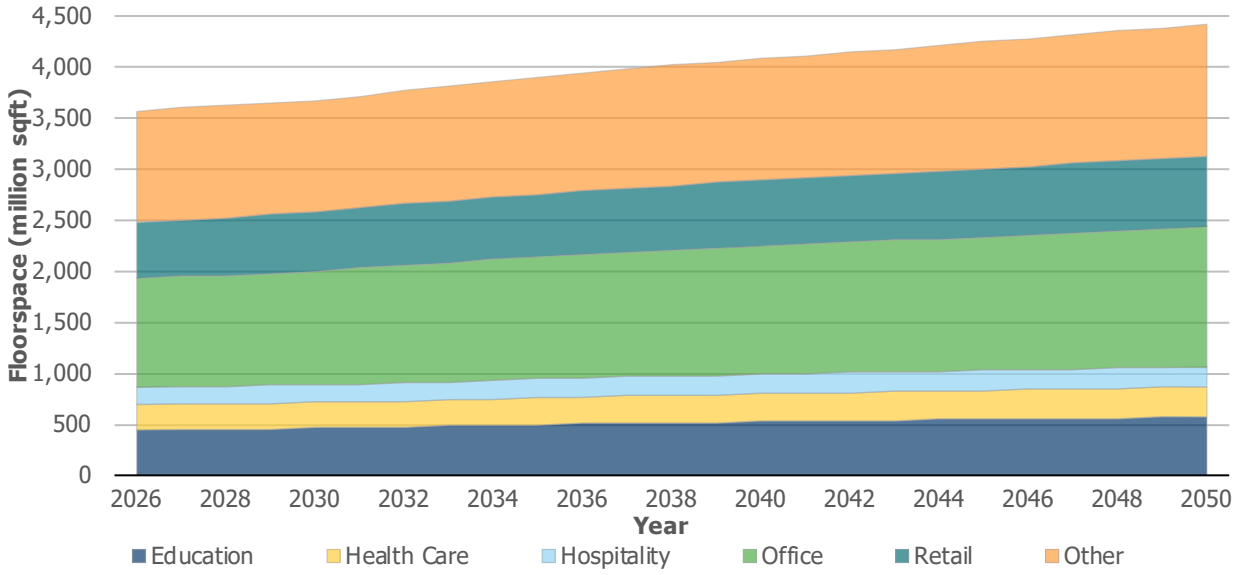
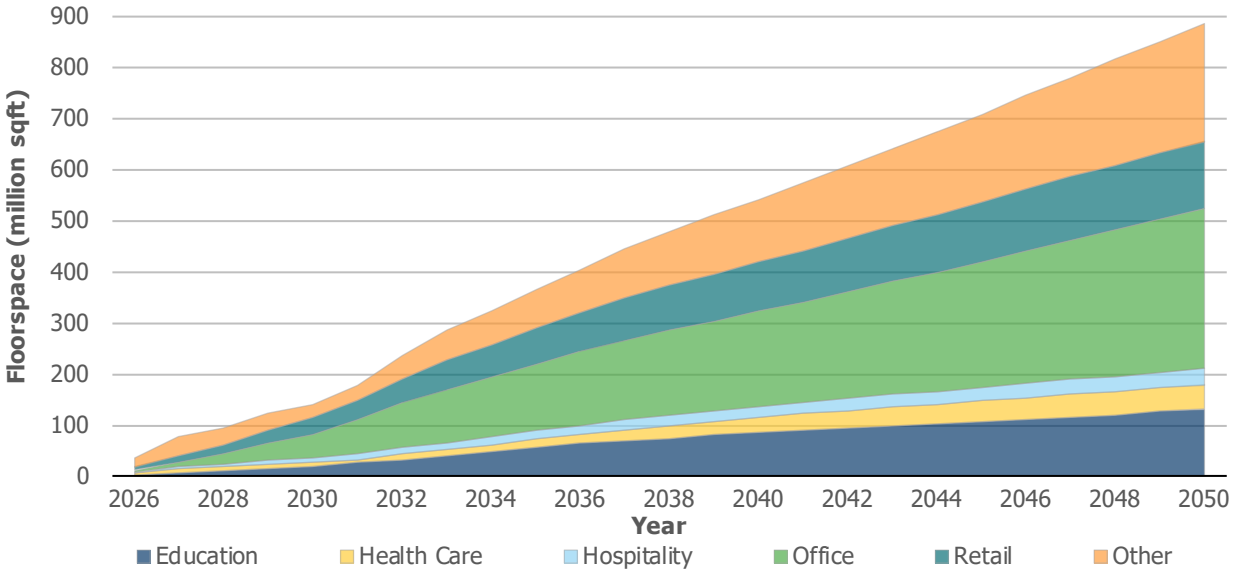


Figure 13: Commercial Sector - Floor Space Since 2026, By Sub-Sector Type, Excluding Data Centres



The 2025 APO demand forecast is largely consistent with the 2024 APO except data centres and assumes that the average annual growth rate of the total commercial floor space is 0.9%and includes updated assumptions:

- Relatively flat commercial sector building floor space growth through the end of the 2020s reflective of current economic conditions, before returning to a persisting period of slow growth through the end of the outlook period.
- This APO includes a drasticinflux of data centre demand, however, due to lack of data centre floorspace information, it is not available in this APO.

As economic conditions evolve over the immediate near term, the IESO continues to evaluate the state of the commercial sector and its electricity demand drivers, and will refresh its long-term electricity demand forecasts on an annual basis.

3.3 Industrial Sector

The Ontario industrial sector continues to undergo a transformation in the near term. After nearly a decade of declining or flat electricity demand, several large projects, particularly attributable to climate change mitigation, fuel switching and electrification, are underway.

Net annual energy demand grows from 44.5 TWh in 2026 to 72.8 TWh in 2050, an increase of 28.3 TWh, 63.6% or an average annual growth rate of 2.1%.

Figure 14: Industrial Sector - Net Annual Energy Demand, By Sub-Sector

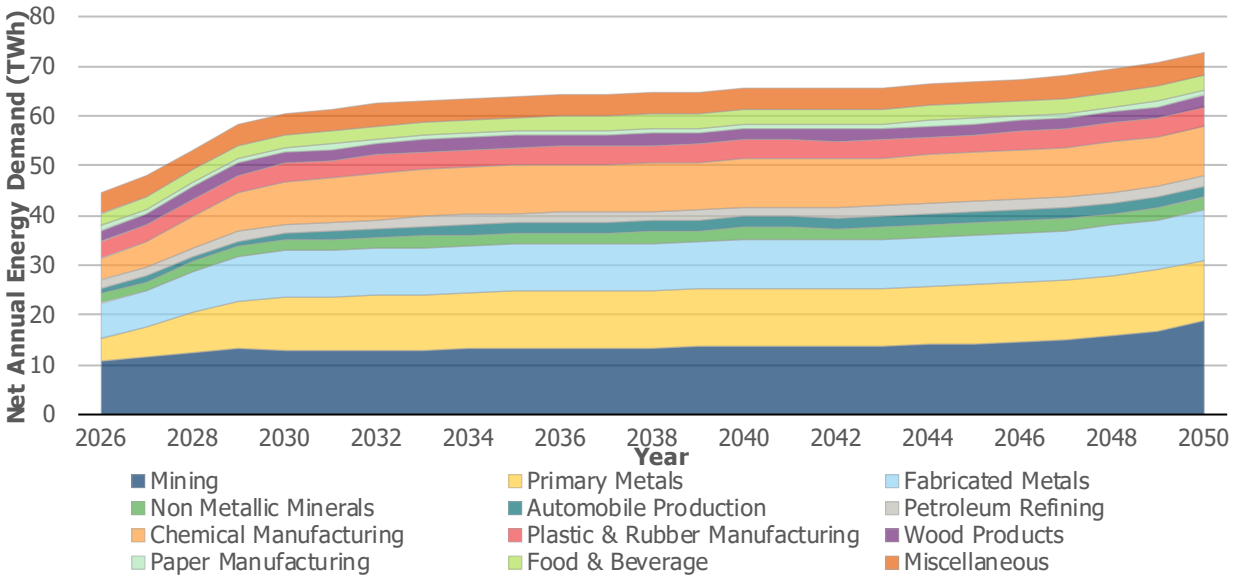
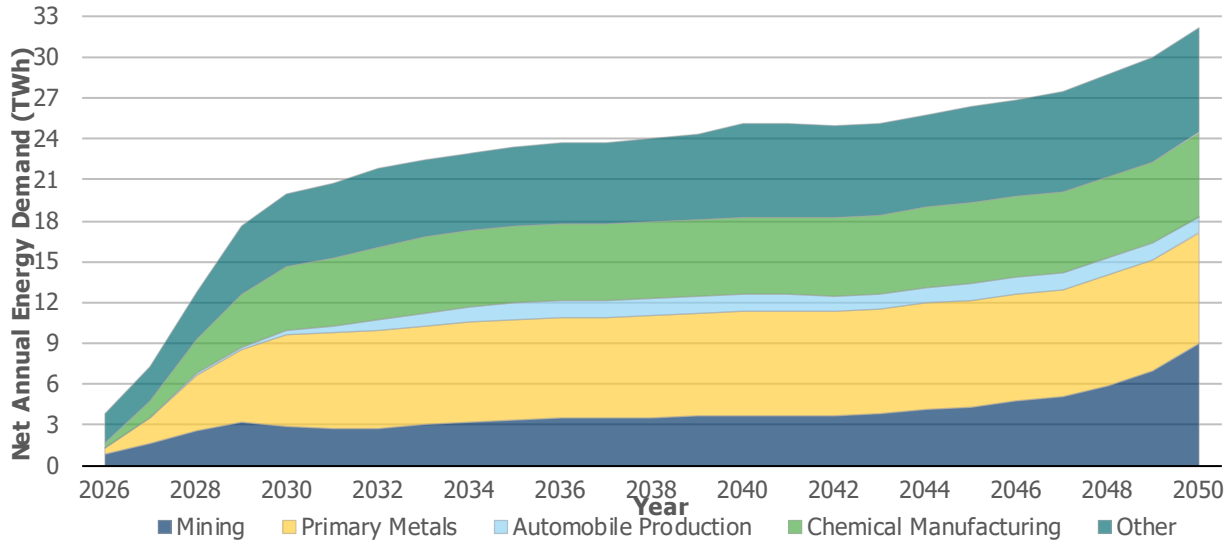


Figure 15: Industrial Sector - Net Annual Energy Demand Growth Since 2026, By Sub-Sector



Consistent with past APO demand forecasts, the 2025 APO forecasts, strong industrial sub-sector growth, concentrated in the automobile production, mining, primary metal and chemical sub-sectors, helping to establish long-term electrification / decarbonization trends and with several projects supported by policy initiatives.

The Ontario automotive sub-sector continues to expand, with Volkswagen Group announcing on March 13, 2023, its plans to construct an EV battery factory, in the St. Thomas area, which is expected to lead to the creation of a local supply chain as well. Stellantis and LG Energy reconfirmed its plans on July 5, 2023 to construct an EV battery factory in the Windsor area. Honda Motor Co., Ltd. announced on April 15, 2024 that it plans to build a comprehensive EV

value chain in Canada with an approximate investment of CAD$15 billion, including investment by joint venture partners, to strengthen its EV supply system and capability to prepare for a future increase in EV demand in North America. Other expected automotive sub-sector production facilities have been accounted for in the industrial sector demand forecast. Together these projects are expected to add nearly 1.4 GW in electricity demand.

In the mining sub-sector, concentrated in northern Ontario, electricity demand is continued to be expected to grow robustly in the near term supported by favourable resource prices and the implementation of Ontario's Critical Mineral Strategy, which aims to develop sources of minerals that have specific industrial, technological and strategic applications; and support dependent Ontario sectors such as information and communications technology, clean technology, energy, transportation, aerospace and defense, and health and life sciences.

The sub-sector is forecast to gradually adopt electrification measures in mineral extraction facilities over the course of the outlook period and begin a growth cycle in the long-term period (2040-2050) as existing projects, planed expansions or extensions deplete their resource deposits and reach their end-of-lives. Electricity demand is then forecasted to increase relatively fast to early 2030s, then level off through the early 2040s before growing rapidly through the end of the outlook period as a result of various mining project implementations, expansions, extensions, and electrification. The net result of the industrial mining sub-sector over the entire forecast period is an increase of about 1.1 GW from 2025 to 2050.

In the primary metals sub-sector, decarbonization and electrification is underway in the form of the electric arc furnaces in the provincial steel production sub-sector that was announced in mid-2021. Past APO demand forecasts have accounted for the July 5, 2021 annoucement of Algoma Steel project and the July 30, 2021 annoucement of ArcelorMittal Dofasco project, each supported by the Governments of Canada and Ontario. This year Stelco announced its decarbonization of integrated steel making as well, along with Algona Steels' amplification of its current load. These industrial projects are expected to achieve full commercial operation by year 2031 with a significant and distinct increase in demand. These primary metal production facilities are expected to add up to 0.8 GW in electricity demand.

The Ontario chemical production sub-sector is expanding with a few battery materials processing facilities, as well as the construction of various hydrogen production / electrolysis facilities across the province. Total chemical sub-sector projects are expected to add an additional 1 GW in electricity demand, when full operational levels are achieved.

Apart from the aforementioned automobile production, mining, primary metal, and chemical production industrial sub-sectors, all other industrial sub-sectors are expected to see slow growth through the outlook period that is consistent with previous APO forecasts.

3.4 Agricultural Sector

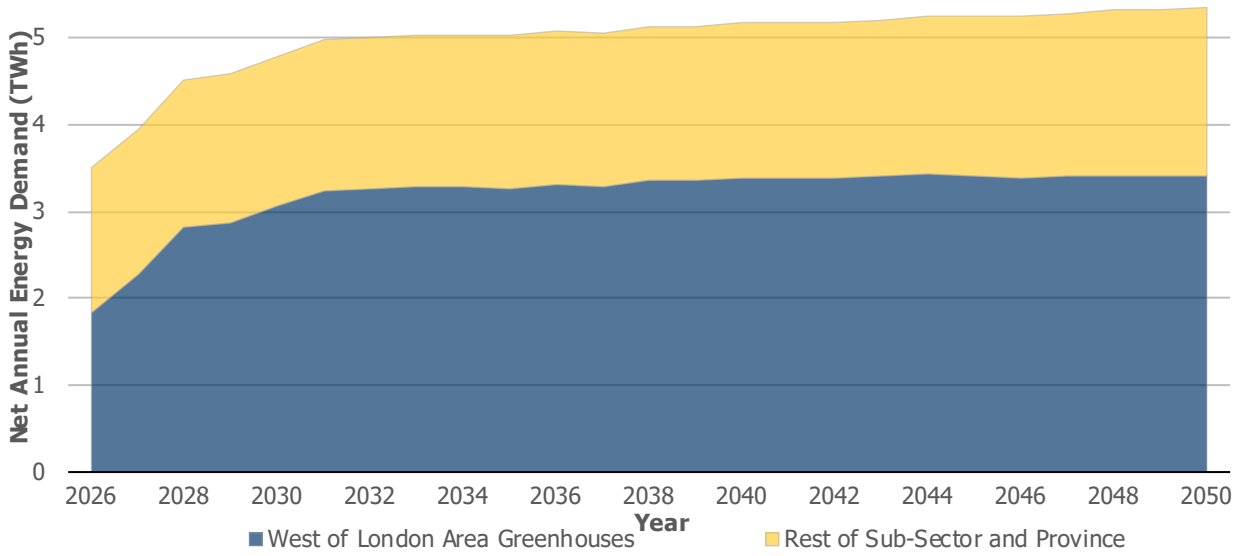
The Kingsville-Leamington area within the Windsor-Essex region is home to North America's largest concentration of greenhouse vegetable production. The demand for electricity from Ontario's agricultural sector continues to grow, but at a slower pace compared to the previous

APO due to reassessment of previous Agripark assumption. Growth has been driven by indoor agricultural growth, mainly vegetable greenhouses, as well as in part, cannabis, specifically through existing greenhouses switching to lit indoor facilities, expansion of greenhouse facilities, and supplemental load to support the agricultural sector.

Additional demand growth is emerging primarily in three pockets of the West of London area: Kingsville-Leamington, Dresden and Lambton-Sarnia as detailed in the IESO's Need for Bulk System Reinforcements West of London bulk power system planning report, published in September 2021.

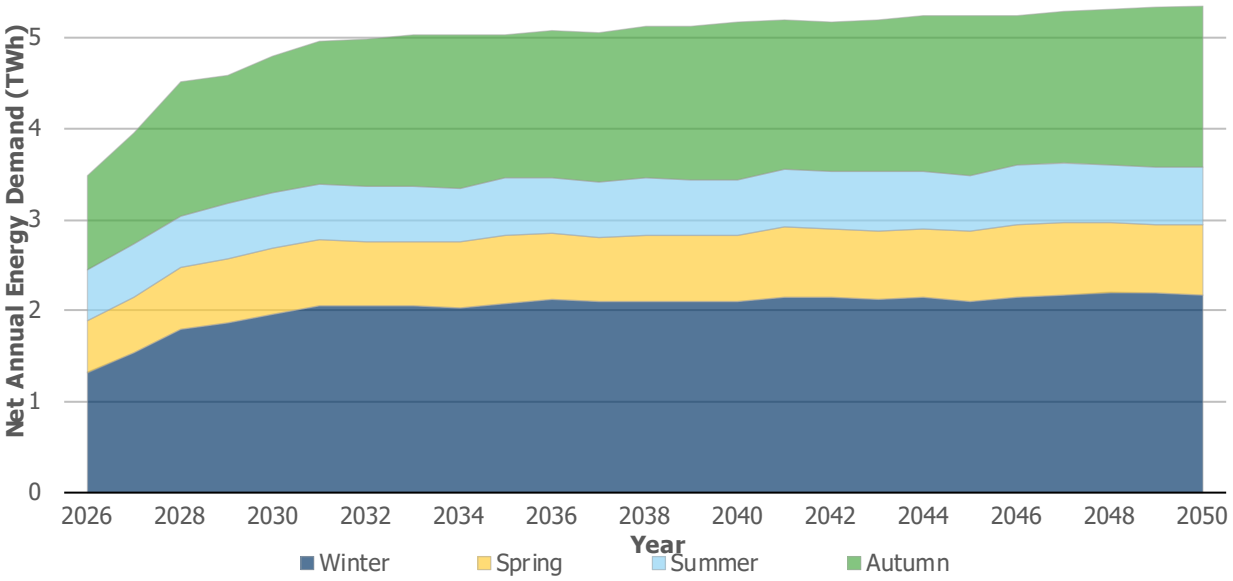
Net annual energy demand grows from 3.5 TWh in 2026 to 5.4 TWh in 2050, an increase of 1.9 TWh, 53% or an average annual growth rate of 1.8%. The forecast of agricultural sector energy being lower than previous APO is due to the revision of assumptions made in the latest Integrated Regional Resource Plan (IRRP). This APO aligns with the IRRP assumptions.

Figure 16: Agricultural Sector - Net Annual Energy Demand, By Sub-Sector & IESO Zone



The share of greenhouse production attributed to cannabis is lower and the share of greenhouse production attributed to vegetables is higher than previous assumed. A net result of this assumption update is a change in the seasonal greenhouse electricity demand profile, with lesser summer seasonal energy and peak demand as a result of the switch from cannabis to vegetables, as demonstrated in Figure 17.

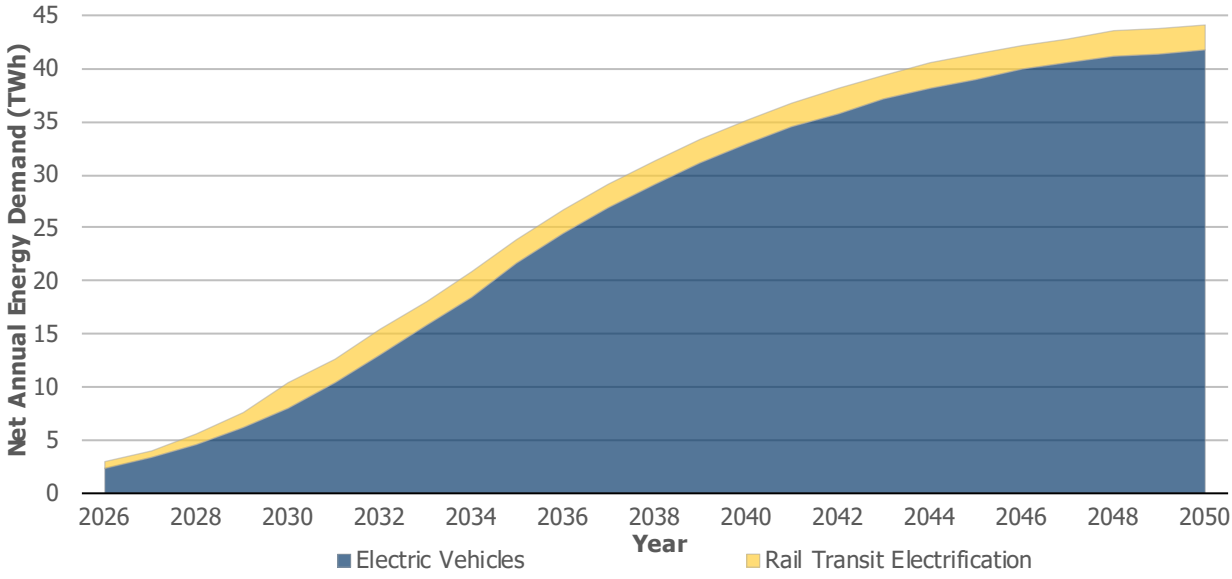
Figure 17: Agricultural Sector - Net Annual Energy Demand, By Season



3.5 Transportation Sector

Net annual energy demand grows from 3 TWh in 2026 to 44.1 TWh in 2050, an increase of 41.1 TWh, or an average annual growth rate of 12%.

Figure 18: Transportation Sector - Net Annual Energy Demand, By Mode



3.5.1 Electric Vehicles

There were about 208,000 EVs registered in Ontario by the end of 2024, representing about 2% of automobiles on the road in Ontario. The electricity demand of powering them was about 700 GWh a year, representing approximately 0.5% of total electricity consumption in the

province. Policy measures, improved technology, matured production, and consumer preference continue contributing to the shift from internal combustion engine vehicles to electric vehicles. It is projected that EV adoption will continue to grow significantly over the next decade. The electricity demand of EV charging is forecast to increase exponentially and EVs are one of the fastest growing end uses of the APO's demand forecast.

The vast majority of registered vehicles in Ontario are light duty vehicles. In December 2023, the Government of Canada introduced regulations that require manufacturers and importers to meet annual zero emission vehicle (ZEV) sales targets. These begin for the 2026 model year, with a requirement that at least 20%of new light-duty vehicles offered for sale be ZEVs, and would increase annually to at least 60%by 2030 and 100 percent for 2035. The IESO's LDEV forecast is in line with the regulations. It is projected that the number of LDEVs on Ontario road will increase from nearly 400 thousand in 2025 to 11.5 million in 2050.

Besides light duty vehicles, medium and heavy duty vehicles combined represent nearly 3% of today's total vehicles in the province. Despite significant technological progress in recent years, there is more work to do to support the commercialization and uptake of ZEV in those vehicle segments. There are debating opinions from various organizations on fuel types to power them. It is generally agreed that the battery powered electrification of medium and heavy duty vehicles will lag behind light duty vehicles. Given a wide range of operation characteristics and small number of these vehicles, it is more challenging to forecast medium/heavy EV than LDEV. The IESO refers to the forecast of other provinces and relies on a consultant study to develop electricity demand forecast of M/HDEV. It is projected that the number of M/HDEV in the province will increase from one thousand in 2025 to more than 90,000 in 2050.

In addition to the number of EVs on road, the average driving distance and fuel efficiency are the other two main factors determining electricity demands of charging. Overall, EV charging demand is forecast to grow from 1.6 TWh in 2025 to 42.1 TWh in 2050.

3.5.2 New Rail Transit Projects

Broad rail transit electrification is underway in Ontario with projects at various stages, including nine light rail transit projects, three subway projects, and the GO rail system electrification. Most projects are at early planning stage, in procurement process, or under construction. Their electricity demands are estimated with limited information. It is projected that electricity demand to power new rail transit projects will be over 2 TWh by 2030. The IESO is pursuing additional information, and the demand forecast will be updated when it becomes available.

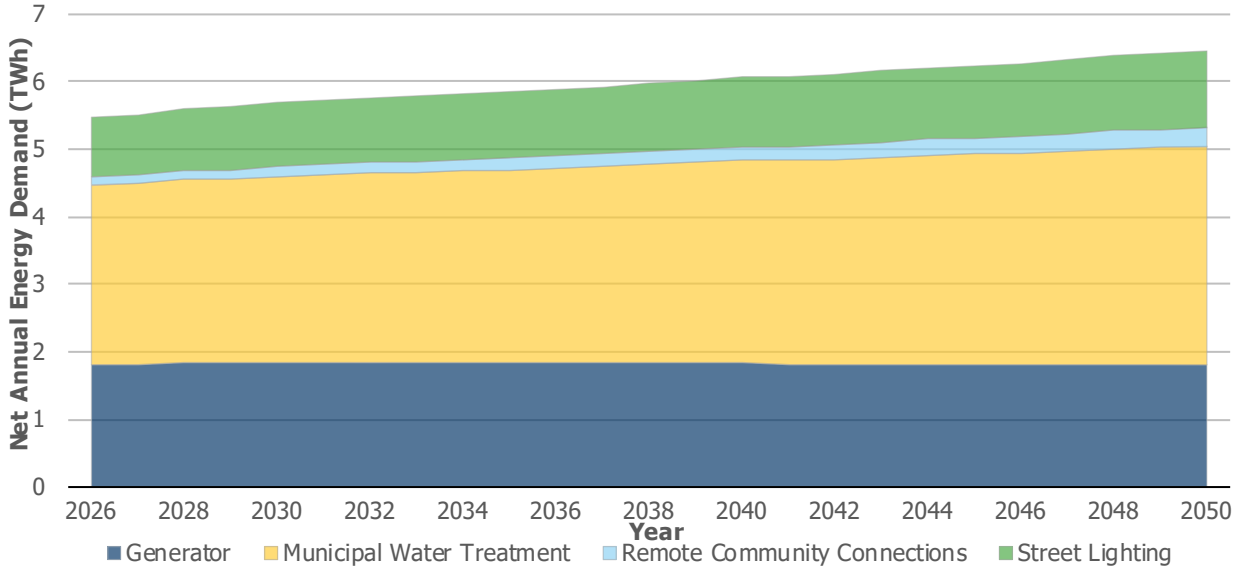
Overall, new rail transit projects demand is forecast to grow from 0.6 TWh in 2025 to 2.4 TWh in 2050.

3.6 Other Electricity Demand

This demand forecast accounts for all electricity energy and peak demand in the province, which is generally categorized and evaluated according to established market sectors. Certain loads do not fall under any one sector and are classified as "other." These include: 1) remote communities connections; 2) electricity generators; 3) street lighting; and 4) municipal water treatment. A number of small remote communities in northern Ontario are not currently connected to the provincial electricity grid, but will be within the next few years. Connecting these communities is expected to add approximately 0.01 TWh of annual energy demand by 2043. Collectively these four "other" load categories are expected to grow minimally, but consistently, over the course of the outlook.

Net annual energy demand grows from 5.5 TWh in 2026 to 6.5 TWh in 2050, an increase of 1.0 TWh, 17.9% or an average annual growth rate of 0.7%.

Figure 19: Other Sector - Net Annual Energy Demand, By Sub-Sector



3.7 Electricity Demand-Side Management (eDSM)

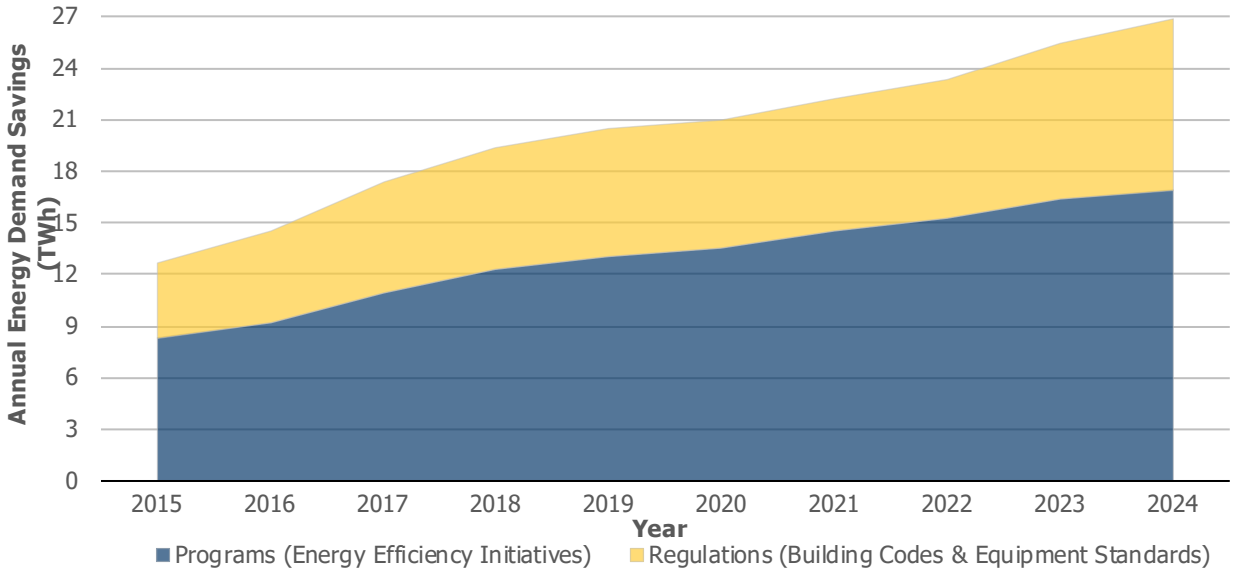
The IESO's Forecast is decreased as a result of demand side management programs, a form of resource acquisition, and regulations, a form of market transformation.

Electricity Demand-Side Management (eDSM) programs help businesses and people lower their energy costs and cut emissions. The resulted savings usually persist a number of years after eDSM measures are implemented. Historical programs continue contributing electricity savings. Electricity savings are analyzed with two categories of initiatives, programs managed by the IESO and programs funded and administrated by other organizations.

It is estimated that the programs implemented between 2006 and 2023 have contributed approximately 16.4 (16.9 in 2024) TWh electricity savings in 2023. Building codes and

equipment standards regulations have delivered approximately 9 (9.9 in 2024) TWh electricity savings in 2023.

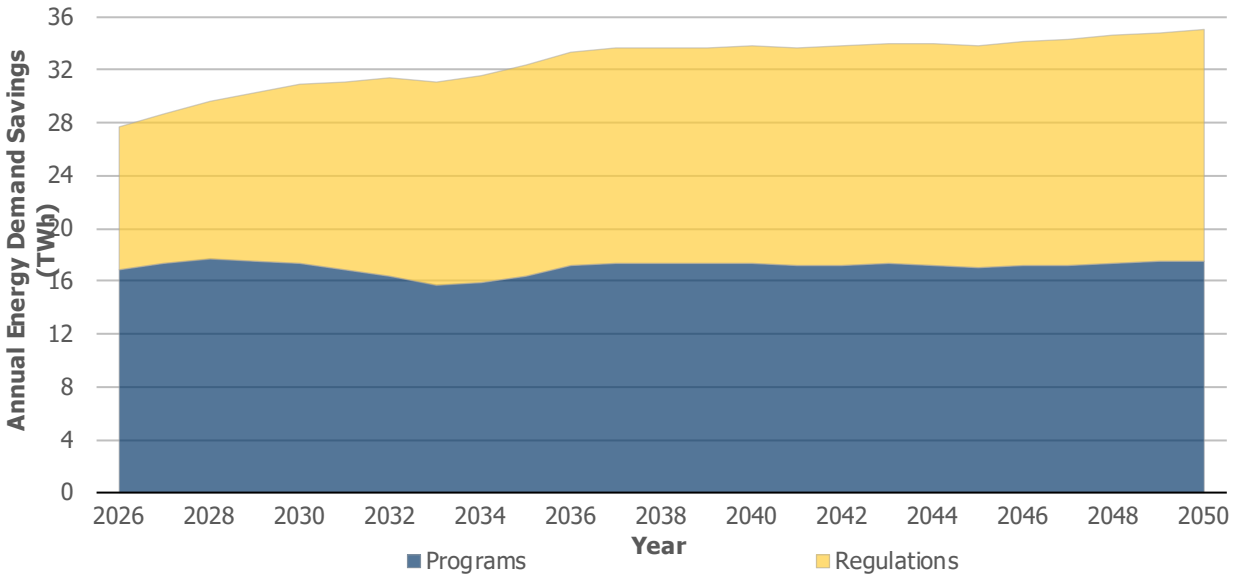
Figure 20: eDSM - Historical - Annual Energy Demand Savings, By Type



Historically delivered programs and regulations result in electricity demand savings that usually persist a number of years after the respective energy efficiency measures, building codes and equipment standards are implemented. Historical programs continue contributing electricity savings and the continued expected delivery of new programs and planned future increases in regulations provide future incremental savings over the outlook period.

It is estimated that the total electricity demand savings through historical eDSM since 2006 and future programs and regulations will contribute between 27.6 and 35.1 TWh in annual electricity demand savings over the outlook period.

Figure 21: eDSM - Forecast - Annual Energy Demand Savings, By Type



3.7.1 eDSM Programs

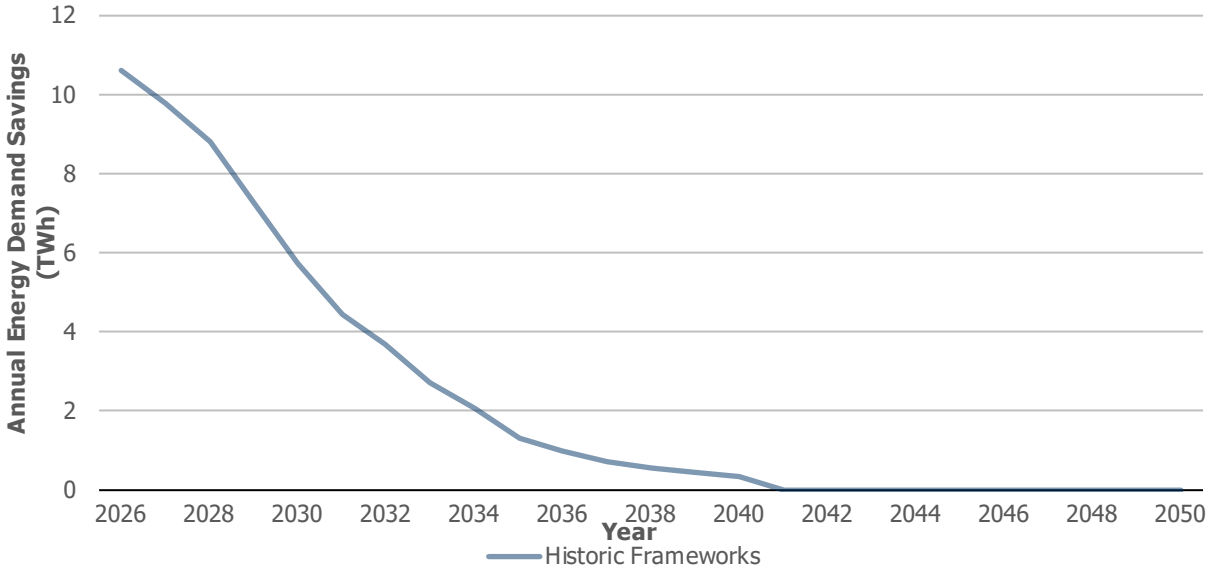
Electricity savings through eDSM programs help businesses and people lower their energy costs and cut emissions.

3.7.1.1 Historical Programs

EDSM savings resulting from programs typically persist a number of years after eDSM measures are implemented. Historical programs from 2006 to 2023 continue to contribute to electricity savings.

From 2025, annual electricity savings achieved from historical eDSM frameworks decay as measures that achieve such electricity savings reach their end-of-life.

Figure 22: EDSM - Historical Program Frameworks - Annual Energy Demand Savings

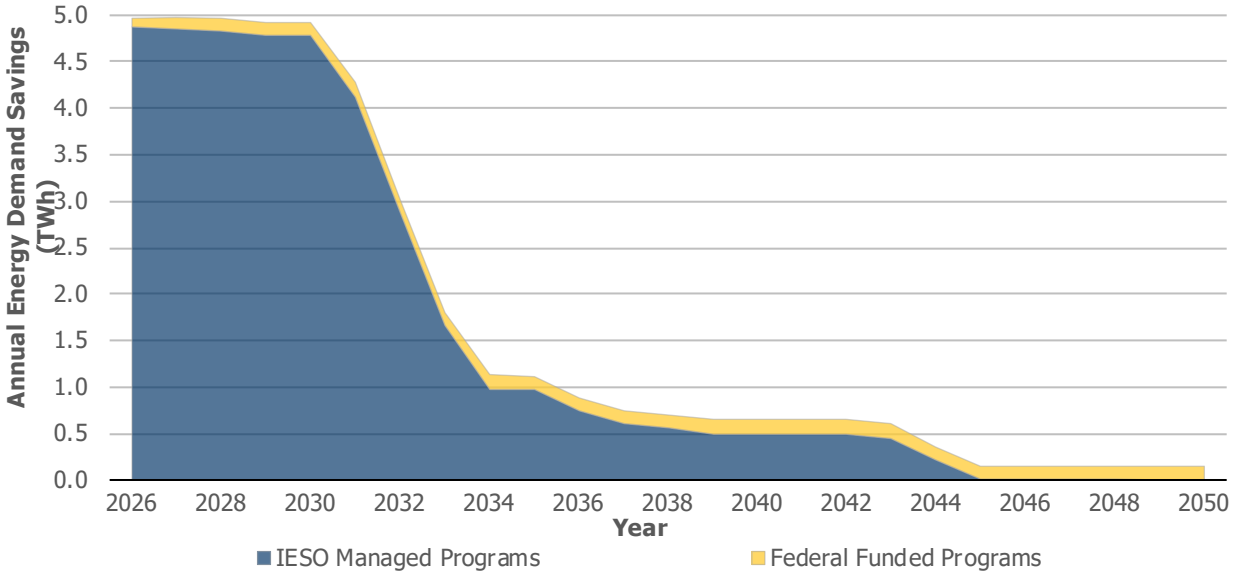


3.7.1.2 Current Frameworks

The central piece is the 2021-2024 Conservation and Demand Management Framework as directed by the Minister of Energy, Northern Development and Mines on September 30, 2020. Programs are centrally delivered by the IESO, since January 2021, and target commercial, industrial, institutional, on-reserve First Nations, and income-eligible electricity consumers. In October 2022, the IESO received a ministerial directive in connection with the Framework to enable additional eDSM programming through a budget increased to a total of $1 billion. The 2024 APO forecast that the enhanced Framework will achieve 4 TWh annual savings when fully implemented in 2026. Since then, further enhancements were made resulting in great success in programs like greenhouse LED lighting adoption and Peak Perks. In addition, some large industrial eDSM projects that were approved under precious frameworks completed in the past year. All together, electricity savings from eDSM initiatives managed by the IESO between 2021 and 2024 are estimated as 4.9 TWh in 2025.

In addition to the IESO managed provincial programs, a couple of initiatives funded by the federal government are underway, which will result in electricity savings in Ontario. The Green Municipal Fund targets on commercial sector to reduce consumption and emission of various fuels. The Canada Greener Homes Grant and the Canada Greener Homes Loan programs help homeowners across the country implement energy efficiency and emission reduction retrofits. These programs are designed to reduce emission, target various fuel types, and are eligible for Ontario as well as other provinces and territories. The resulted electricity savings in Ontario are estimated as 0.1 TWh in 2026. The Canada Greener Homes Grant stopped accepting new applications since January 2024 and the federal government announced that it would be shifting to a more targeted program later. The IESO is monitoring developments of federal programs and will reflect any changes in future planning outlooks.

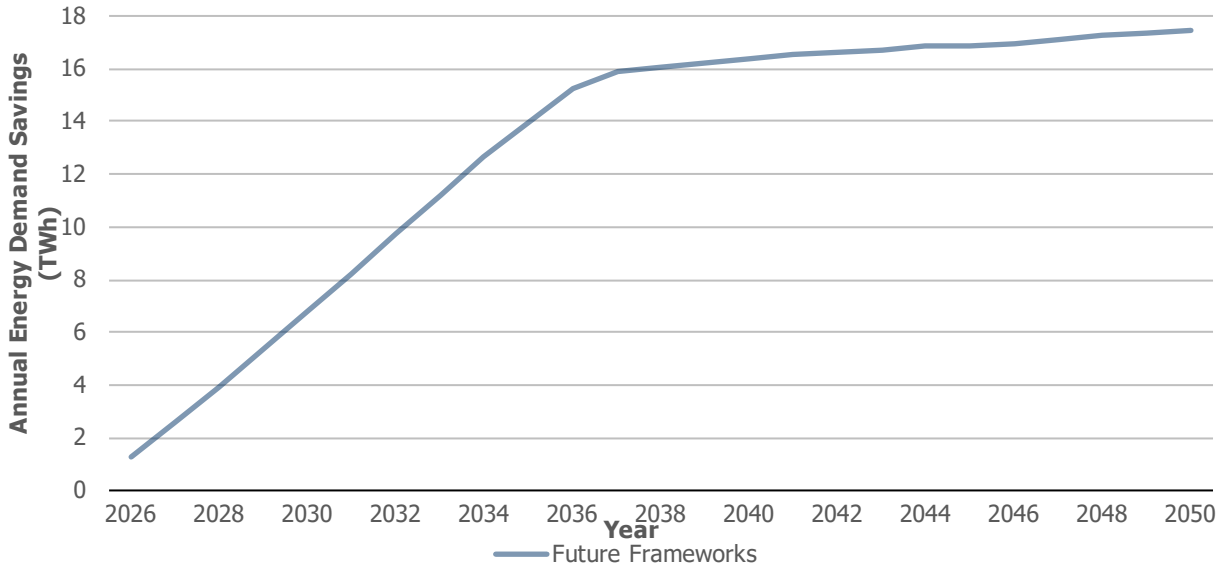
Figure 23: EDSM - Current Program Frameworks - Annual Energy Demand Savings, By Provincial and Federal Programs



3.7.1.3 Long-Term Framework

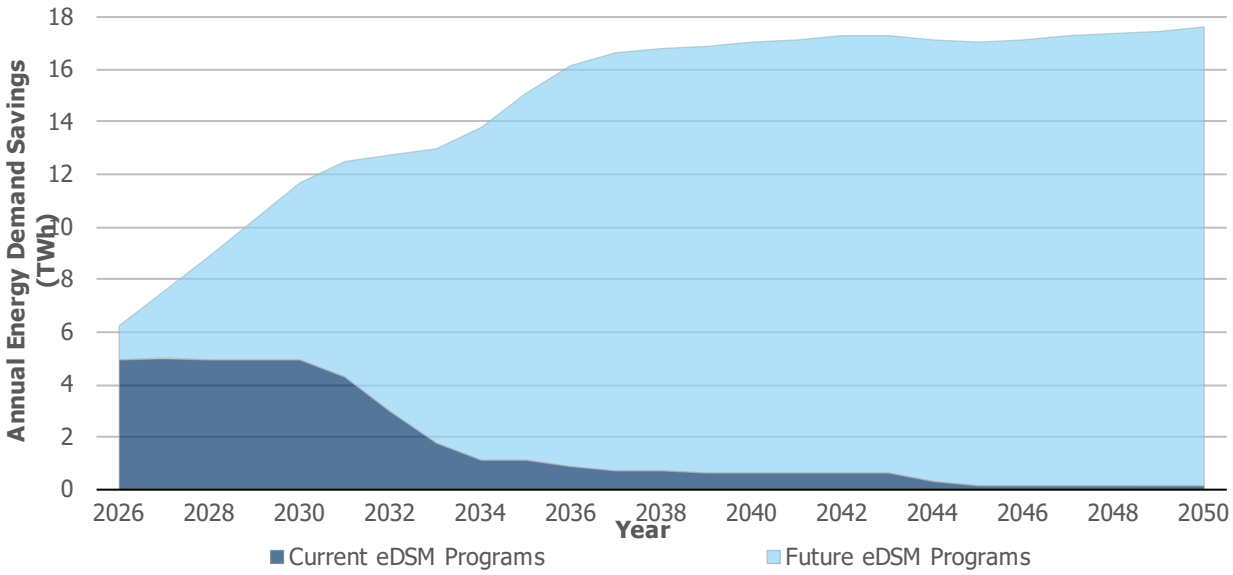
Besides the above-mentioned programs that are already in the market, it is anticipated that eDSM initiatives will continue. For long-term demand forecast and power system planning, the same savings level of the enhanced 2021-2024 Framework is assumed for the entire planning horizon. The annual saving is estimated at 0.76 per cent of gross demand. The long-term programs are expected to save 17.5 TWh in 2050. A portion of the new savings will offset the decayed savings as past eDSM programs expire.

Figure 24: EDSM - Future Program Framework Assumption - Annual Energy Demand Savings



Overall, the historical programs, the existing eDSM framework and initiatives, and the anticipated future programs contribute to the electricity savings in the province over time. The level of annual electricity demand savings from all eDSM programs in Ontario is forecast to fluctuate between 16 TWh and 18 TWh between 2025 and 2050.

Figure 25: EDSM - Annual Energy Demand Savings, By Current & Future Programs

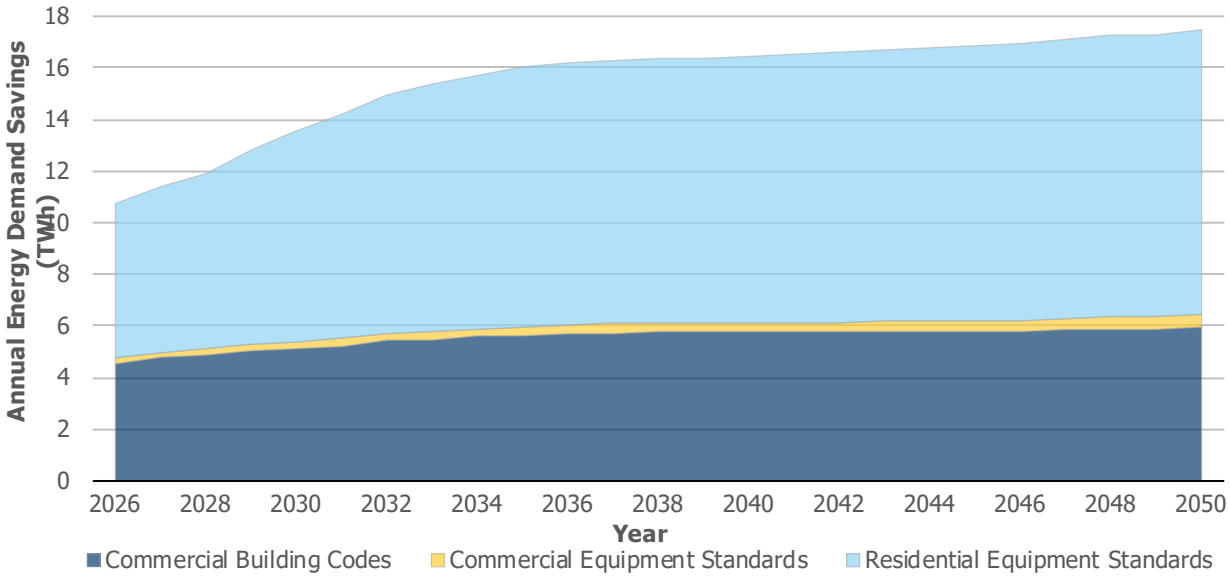


3.7.2 Codes and Standards Regulations

Building codes and equipment standards regulations are effective energy-efficiency tools, as they have no ratepayer cost, and have broad market coverage. The IESO estimates savings

attributable to codes and standards by comparing the demand forecast at the gross level to the demand forecast adjusted for the impacts of regulations. Most savings will come from the residential and commercial sectors. It is estimated that savings from codes and standards will grow from 10.8 TWh in 2026 to 17.5 TWh in 2050.

Figure 26: EDSM - Regulations - Annual Energy Demand Savings, By Type



3.8 Industrial Conservation Initiative

Included in the APO long-term demand forecast as a distinct driver is the Industrial Conservation Initiative (ICI), a load modifying critical system peak demand pricing program that incents eligible customers to reduce their demand during system peak demand hours by associating program participant's own demand levels with their Global Adjustment charges.

To determine forecasted future ICI response, ICI attributed demand observations at the seasonal and zonal level from the latest available ICI Base Period were determined. The respective seasonal maximum hourly ICI response was applied to the forecasted system peak demand hour in the top 15 annual peak days in each year of the forecast. ICI response in other hours of the system peak day were scaled as a proportion of the daily system demand profile above a certain threshold relative to the daily system peak demand. This revised methodology for the 2025 APO accounts for changes in annual peak demand day hourly demand profiles from a typically late afternoon peaks to a flatter demand profile anticipated in the later years of the outlook period. These profiles are demonstrated in Figures 28 and 29.

Figure 27: 2026 System Peak Demand Day Demand and ICI Profile

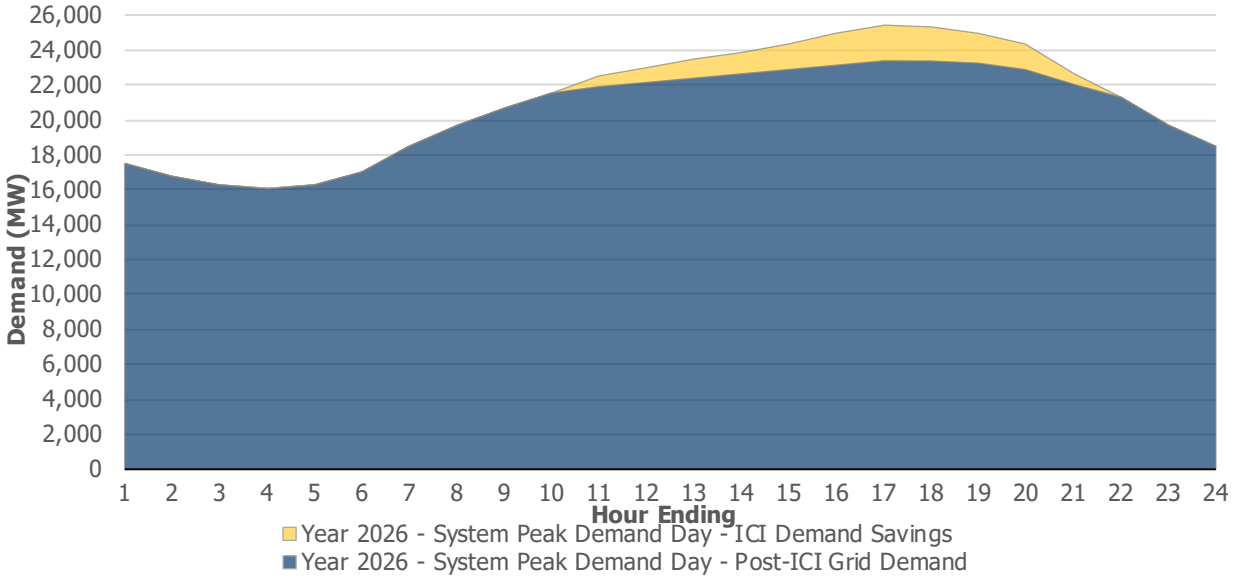
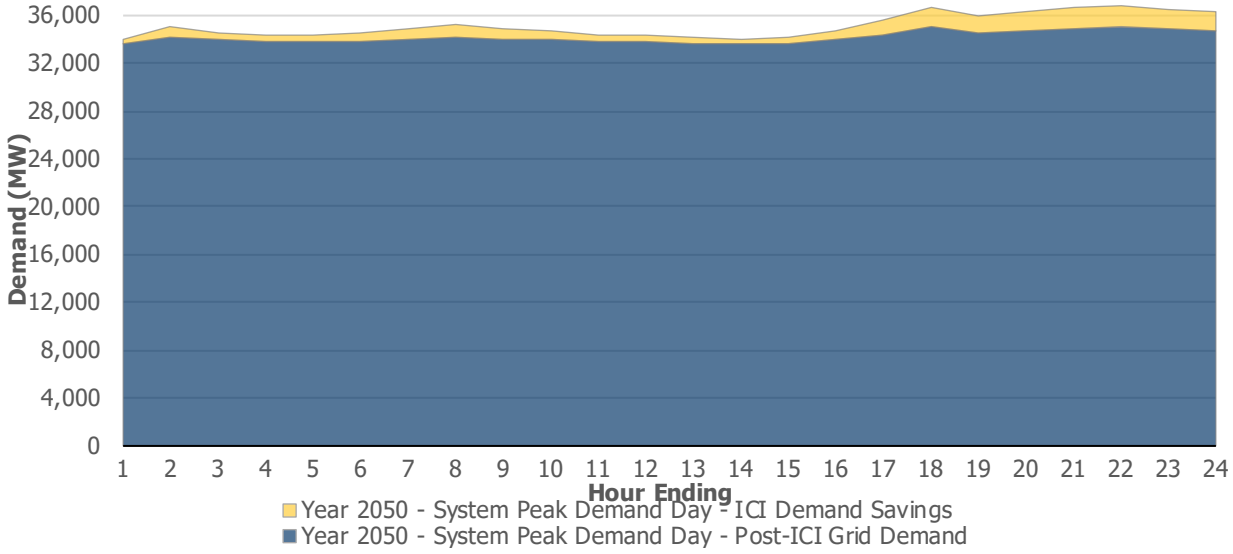
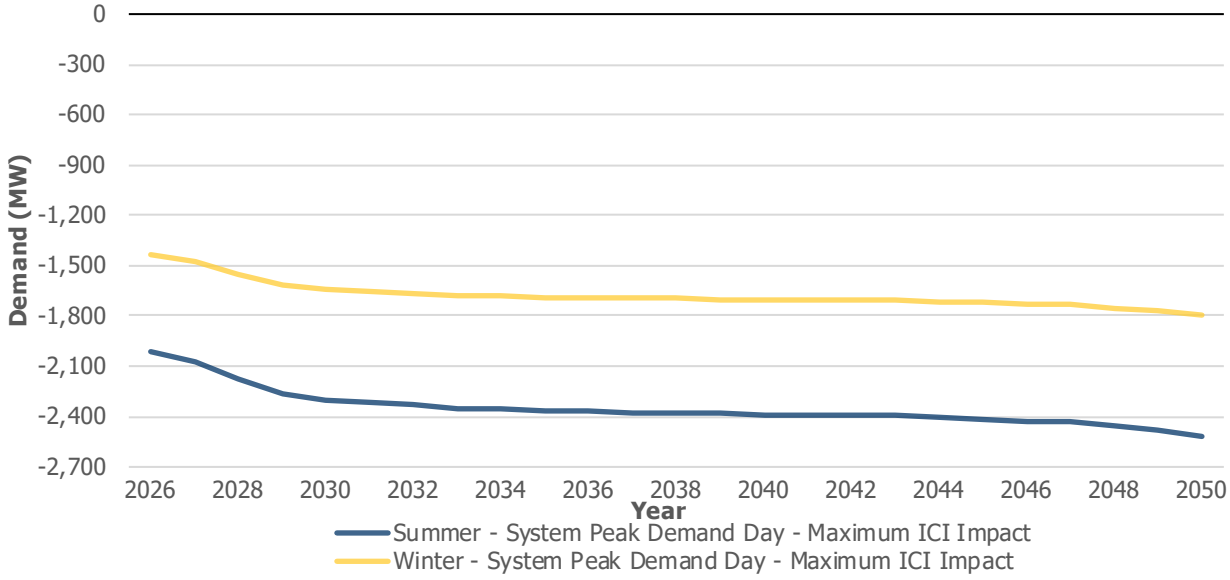


Figure 28: 2050 System Peak Demand Day Demand and ICI Profile



With the anticipated increase in industrial sector demand levels in the early to middle portions of the outlook period, a commensurate increase in ICI response is expected. Correspondingly a growth factor was applied to the ICI response profiles over the years industrial sector demand growth is expected.

Figure 29: Industrial Conservation Initiative Maximum Annual Impact

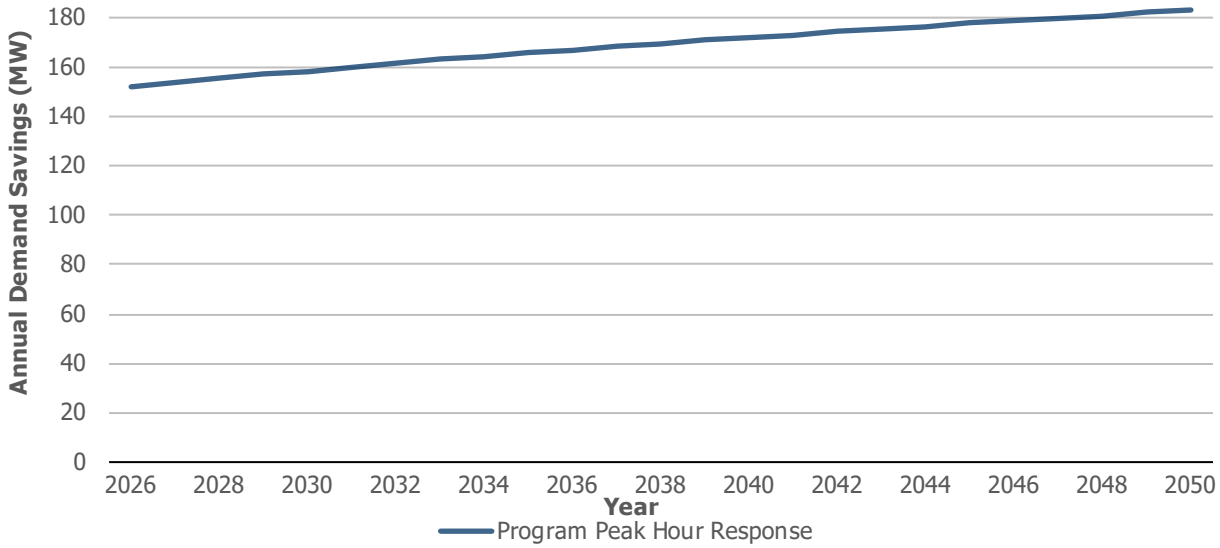


These system reduction impacts have been applied to the demand forecast to the forecasted top 15 system peak days in each year of the outlook period. Industrial Conservation Initiative response is recognized as an uncertainty in the APO long-term demand forecast, especially as more large step loads connect. IESO reviews the observed responses and refines its ICI impact methodology on an annual basis.

3.9 Residential Demand Response

New for the 2023 is the Peak Perks residential demand response program launched on May 25, 2023 that offers a financial incentive to eligible participants with a smart thermostat connected to central air conditioning to automatically adjust their thermostat by two to four degrees, during summer peak demand for up to 3 hours per event, up to ten events per year, between July and September. It is estimated that this program will achieve up to 152 MW of demand savings in 2026, and assumed the program will persist through the end of the outlook period, growing to 183 MW demand savings by 2050, inline with forecasted increases in residential central air conditioning adoption.

Figure 30: Residential Demand Response - Annual Demand Savings

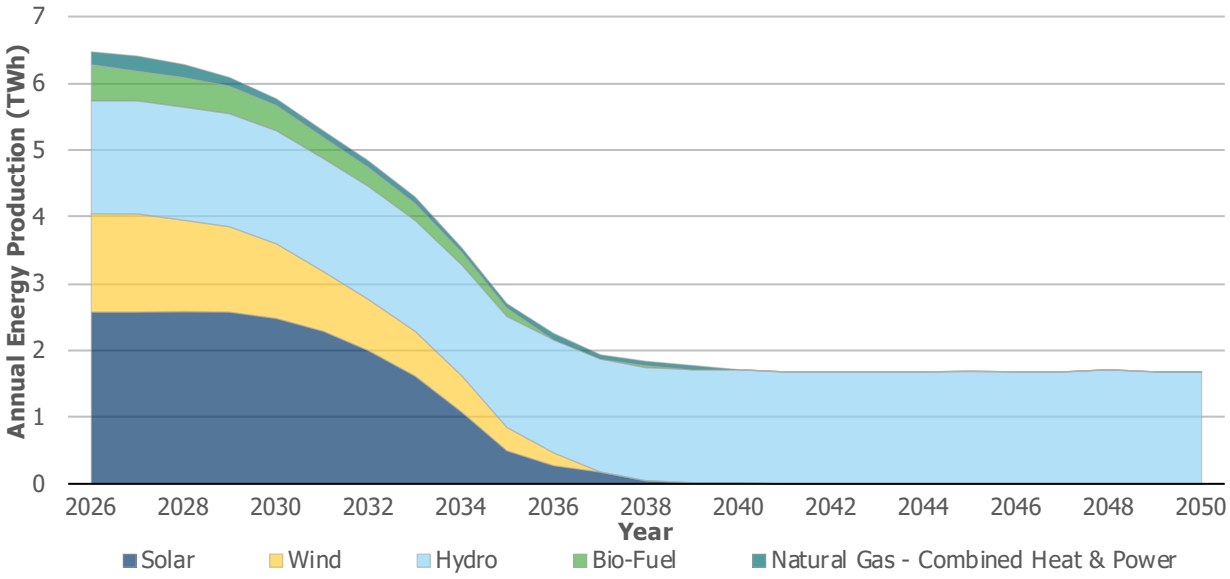


3.10 Embedded Generation

The IESO 2025 APO long-term demand forecast is produced at the net-demand level that represents demand from a bottom-up basis and is the energy required to be supplied by all generators, regardless of market participation, and of which subsequent APO resource adequacy and transmission security assessments are conducted. In addition to presenting demand at the net-demand level, since the 2021 APO, a grid-demand level forecast data has been published that includes the forecasted impacts of embedded generation over the outlook period, and represents the energy required to be supplied by market participant generators only.

The embedded generation forecast for the purposes of publishing the grid-demand level demand forecast in the APO considers the current tally of directly distribution and transmission system connected embedded generators and reflects assumptions of discontinued availability of existing embedded generation resources in each resource's post contract expiry period. With this assumption, embedded generation production forecasts are decreases steadily over the outlook period.

Figure 31: Embedded Generation - Annual Energy Production, By Fuel Type



4. Demand Forecast Uncertainties

With the constantly evolving state of the COVID-19 pandemic, recovery from the year 2020 economic recession and the drive toward climate change mitigation, decarbonization and electrification, it is becoming more difficult to make accurate long-term demand forecasts. The total system demand forecast is uncertain as a result of uncertainties in individual sector level forecasts, which collectively constitute total system demand.

Over the course of the outlook period, electricity demand is influenced by a number of dependencies, including: the state of the economy, public health and policy responses related to the COVID-19 pandemic, status of vaccine rollouts, climate change mitigation, fuel switching and electrification project development, demographic changes, government policy, emerging technology, end-use trends, fuel prices, and other considerations. Within the outlook period, the forecast accuracy level of confidence is highest in the near term (years 1-5 or 2026-2030), decreasing in time with a medium degree of confidence in the medium term (years 6-10 or 2031-2035), relatively lesser degree of confidence in the long term (years 11-20 or 2036-2045) and least degree of confidence in the super long term (years 21-26 or 2046-2050).

In this APO cycle, apart from the aforementioned, the IESO faces new demand forecast challenges:

- Heat Pump and Space Heating Uncertainties: With space heating energy use representing approximately 60% of the total energy use for both residential and commercial sectors, electrifying this end use will prove quite challenging for power system planners. Heat pumps are identified as the main space heating technology used in electrification. Heat pumps are expected to consume less energy than the traditional resistive electric heating systems, but 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, unclear replacement path, and government policy.
- Data Centre Uncertainties: With the rise of cloud computing and artificial intelligence, the need for data centres is growing across North America. There are significant number of data centres looking to connect in Ontario. These data centres are considerably larger than current data centres in the order of 100-1000 MW and need to be transmission-connected. There is a high amount of uncertainty as to if all of the data centres will materialize and how quickly they will materialize.
- EV Supply Chain Uncertainties: Various automotive and automotive supplier companies have announced plans to build new manufacturing facilities in Ontario totaling more than 1,500 MW of new load. A significant number of additional projects are under active exploration.

To complement the publication of the 2025 APO, the IESO authored a series of technical papers, each exploring these areas of considerable long-term demand uncertainty in greater detail. The IESO continues to monitor and interpret electricity demand drivers, public policy and

other factors to continuously improve demand forecasts. These factors will help inform updates to electricity demand and will be incorporated into future APOs.

Independent Electricity System Operator
1600-120 Adelaide Street West
Toronto, Ontario M5H 1T1

Phone: 905.403.6900
Toll-free: 1.888.448.7777
E-mail: customer.relations@ieso.ca

ieso.ca

@IESO_Tweets
facebook.com/OntarioIESO
linkedin.com/company/IESO