2024 Annual Planning Outlook

Demand Forecast Module

March 2024

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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 these services and is required for 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 Conservation and Demand Management (CDM) initiatives. 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 2024 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 higher electricity demand in the future, but is based upon committed and confirmed public sector policies, private sector projects, and current underlying fuel rate forecasts and economics. The 2024 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 2024 APO long-term demand forecast was developed over the course of winter and spring of 2023, covers the period of 2025-2050, using year 2024 as a reference year and is produced at the weather normal, zonal hour, net, generator demand level.

The 2024 APO forecast builds off of the 2022 APO long-term demand forecast, which in itself was an evolution of the 2021 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 2024 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 forecast considers a number of factors: all known demographic projections; sector-level market, economic announcements and trends; the current statuses and projections of large commercial and industrial sector projects with significant electricity demand; actual grid-connection request queues; and committed policy. Updates to this forecast since 2022 include:

1. Updated and enhanced 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 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
3. The confirmation of the agricultural sector demand forecast developed in the 2022 APO
4. Updated transportation sector demand attributed to revised assumptions for medium and heavy duty vehicles
5. Updated CDM program historical actual results, and enhanced current IESO funded CDM 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 2022 APO demand forecast are an increase relative to the 2024 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 2024 APO demand forecast is summarized as having robust, consistent growth over the outlook period, strongest in the mid 2020s, trending in the 3 per cent per year range and steadily flattening to about 1 per cent per 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 electric vehicle charging demand coincident with daily winter system peak periods, 2) increased building heating electrification, specifically in the City of Toronto; and 3) decreased agricultural sector greenhouse summer seasonal demand. The Ontario system is expected to become dual peaking by the early 2030s.

Figure 1 | Net Annual Energy Demand, By Sector

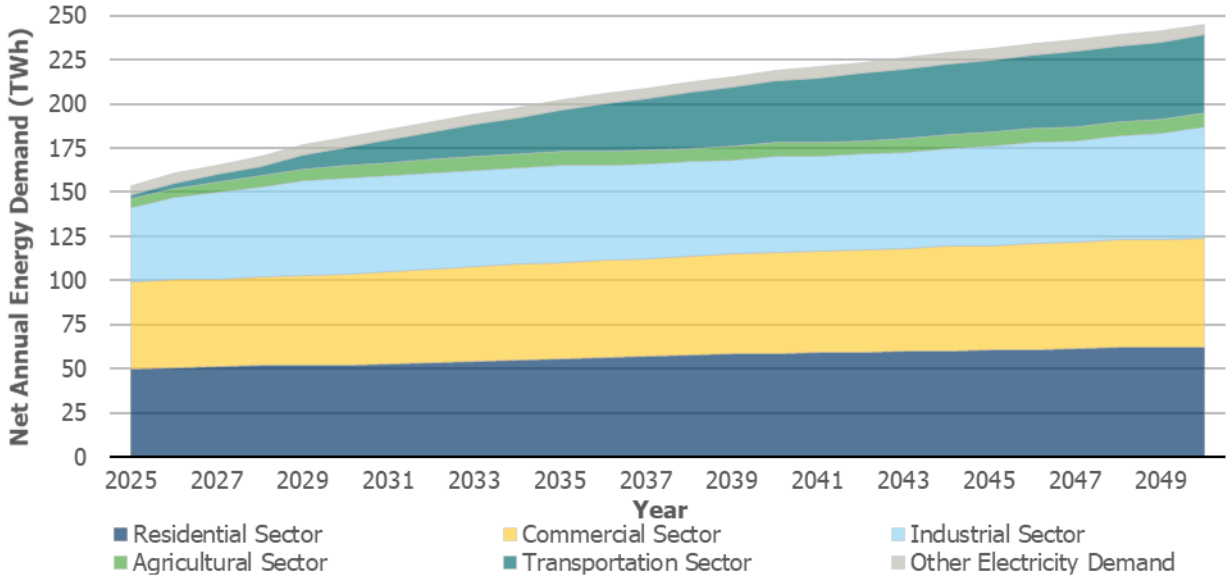
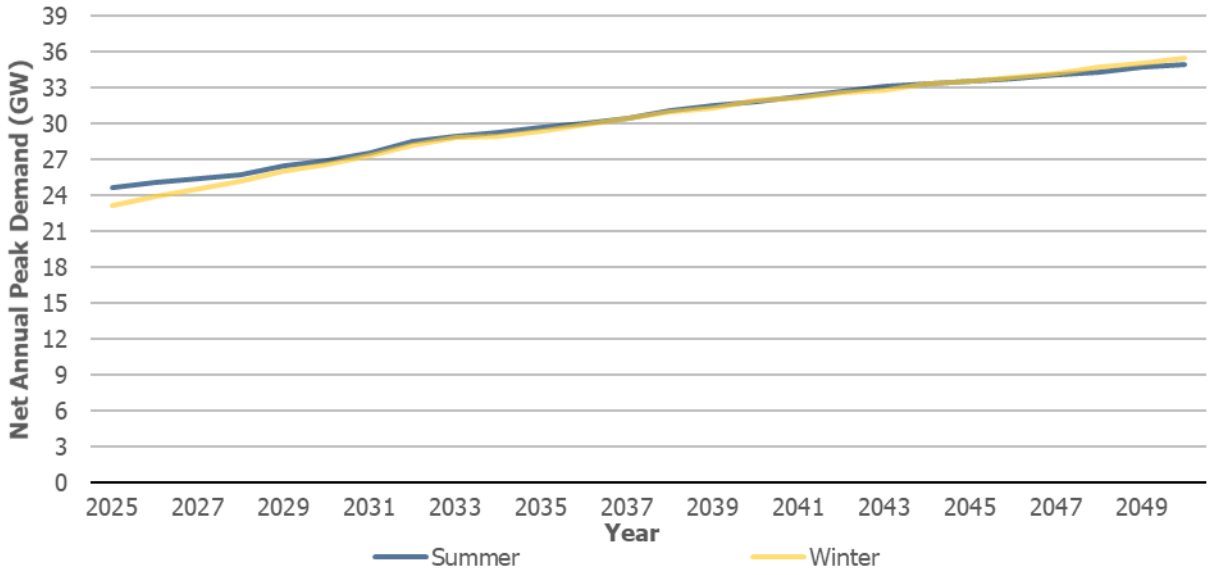


Figure 2 |Net Annual Peak Demand, By Season



In the 2024 APO demand forecast, net annual energy demand grows from 153.9 TWh in 2025 to 245.4 TWh in 2050, an increase of 91.5 TWh, 59.5 per cent or an average annual growth rate of 1.9 per cent; net summer peak demand grows from 24.6 GW in 2025 to 35.0 GW in 2050, an increase of 10.3 GW, 41.9 per cent or an average annual growth rate of 1.4 per cent; and net winter peak demand grows from 23.2 GW in 2025 to 35.5 GW in 2050, an increase of 12.3 GW, 53 per cent or an average annual growth rate of 1.7 per cent.

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.

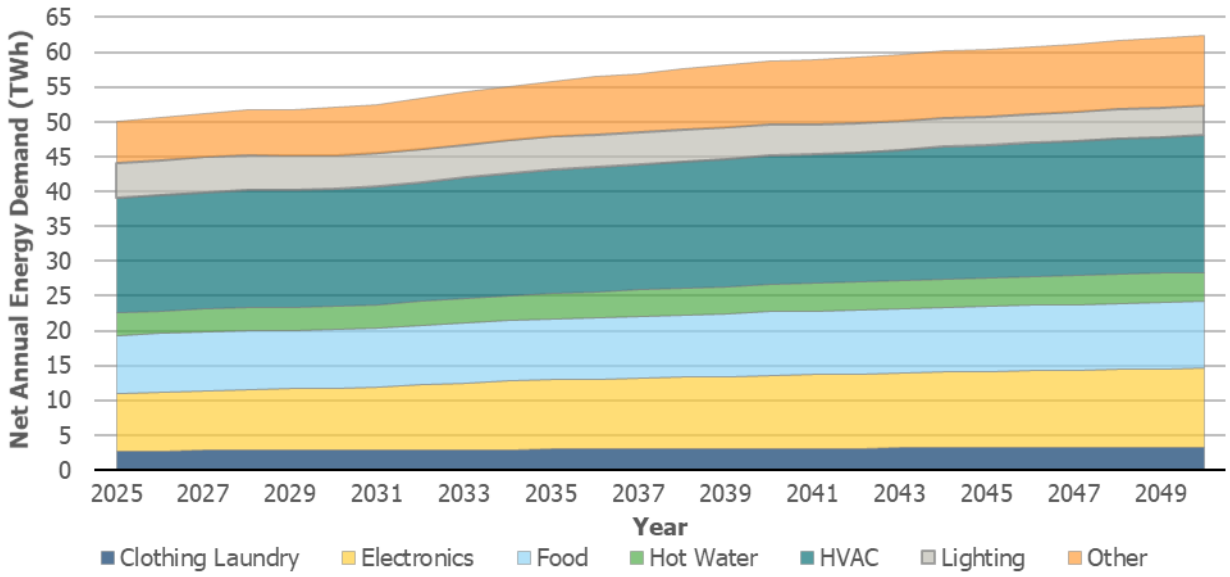
3. Demand Forecast Drivers

3.1 Residential Sector

The main updates to the residential sector are an updated housing stock forecast that reflects the Ontario More Homes Built Faster policy and the inclusion of the Toronto Green Standard (TGS) planned increase in minimum building energy and emission intensity requirements in year 2030. This forecast also confirms 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 50.1 TWh in 2025 to 62.4 TWh in 2050, an increase of 12.3 TWh, 24.6 per cent or an average annual growth rate of 0.9 per cent.

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



While overall average annual increases in energy demand are at 0.9 per cent, consumer electronics, small appliances and other miscellaneous plug-load account for higher than average end-use level demand growth at nearly 2 per cent 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. Figure 4 and Figure 5 demonstrate the growing levels of demand of relevant end-uses in the City of Toronto relative to the rest of the province over the course of the outlook period.

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

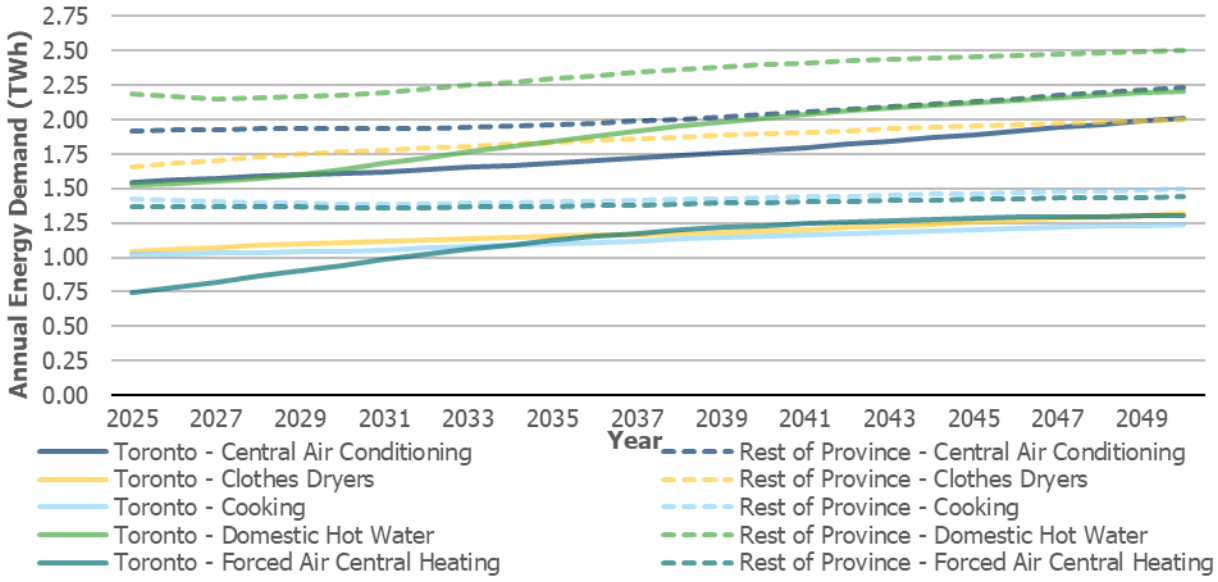
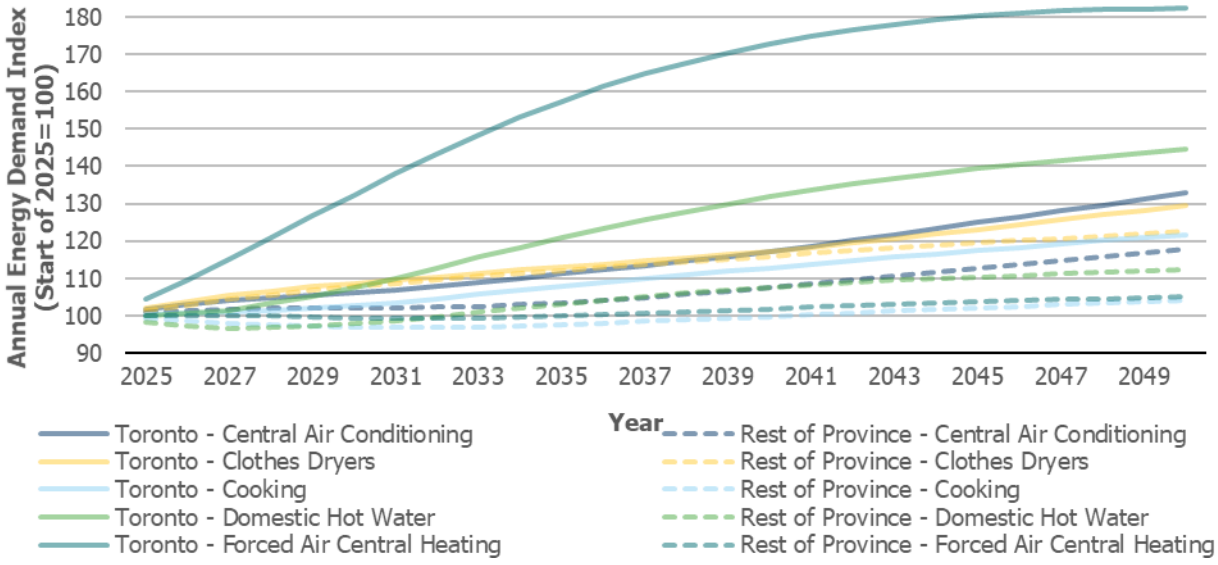


Figure 5 | Residential Sector - Building Electrification, Energy Demand Change Since Start of 2025, By End-Use & IESO Zone



The residential sector's major driver is the household count. Overall household count projections are notably higher than previous projections used in the 2022 APO. Projections in the Ottawa and Toronto zones have reversed previously lower forecasts from the late 2020s through 2050 which were due to decreased affordability. Overall, the number of households is expected to increase by nearly an additional 1.5 million over the outlook period as highlighted in Figure 6 and Figure 7.

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

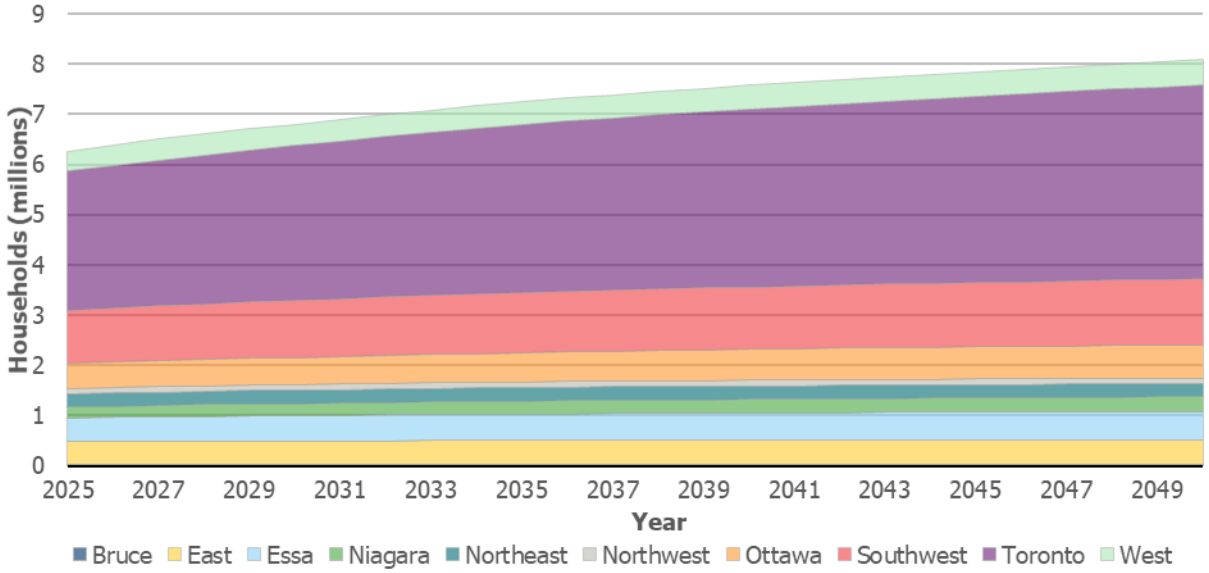
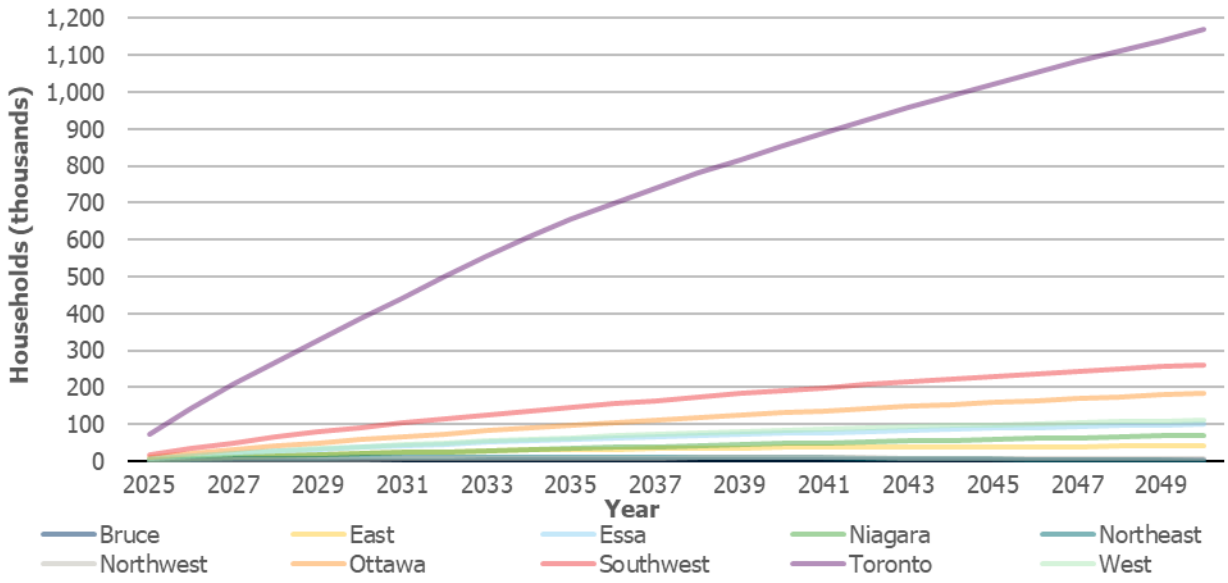


Figure 7 | Residential Sector - Household Count Growth Since Start of 2025, By IESO Zone



Despite growth in housing stock in all zones, the Ottawa, Toronto and Southwest 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 Figure 8 and Figure 9.

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

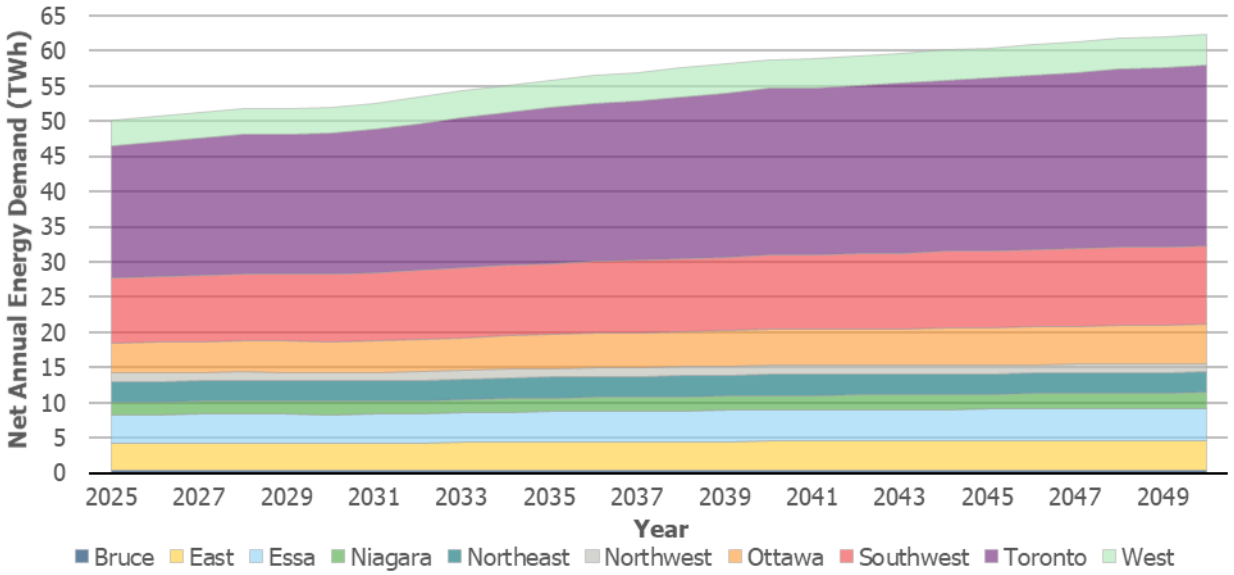
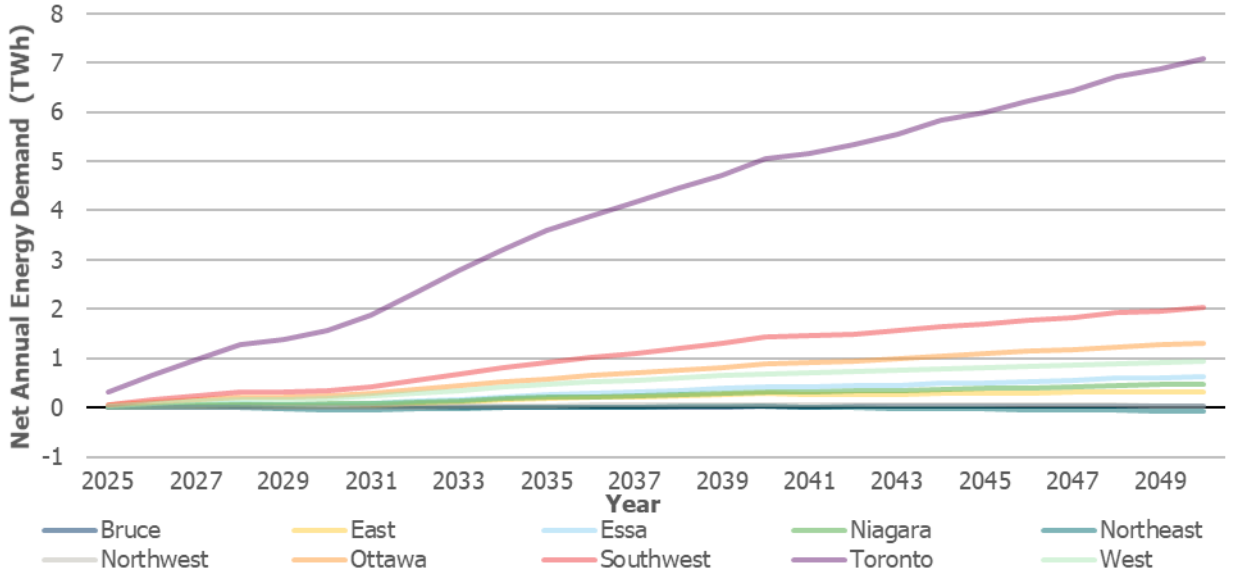


Figure 9 | Residential Sector - Net Annual Energy Demand Growth Since Start of 2025, By IESO Zone



3.2 Commercial Sector

The commercial sector demand forecast continues to be largely inline with the 2022 APO. The main drivers to future changes in commercial sector demand are an increased building floorspace forecast and, similarly to the residential sector, the Toronto Green Standard (TGS) planned increase in minimum building energy and emission intensity requirements in year 2030. Persisting forecast assumptions from previous years' forecasts include work-from-home trends, the resulting decreased weekday office occupancy and associated electricity demand, and continued economic recovery from COVID-19 pandemic related pubic health mandated temporary business closures; and continued long-term digitalization of the economy with decreased office space requirements and increased e-commerce affecting retail and warehouse sub-sector space.

Net annual energy demand grows from 49.3 TWh in 2025 to 61.8 TWh in 2050, an increase of 12.5 TWh, 25.3 per cent or an average annual growth rate of 0.9 per cent.

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

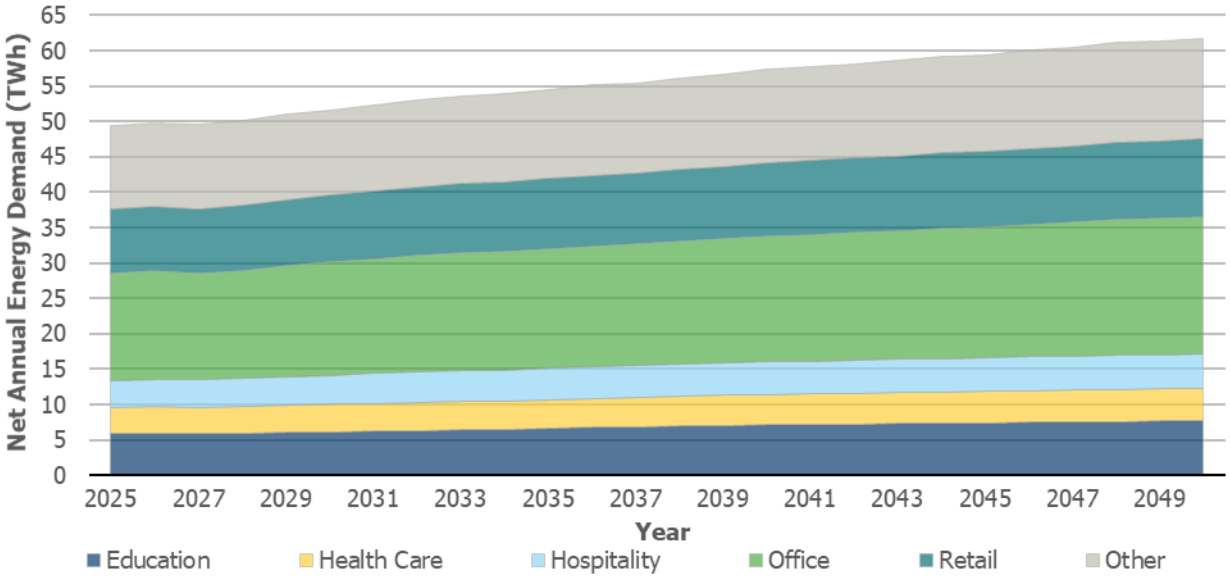
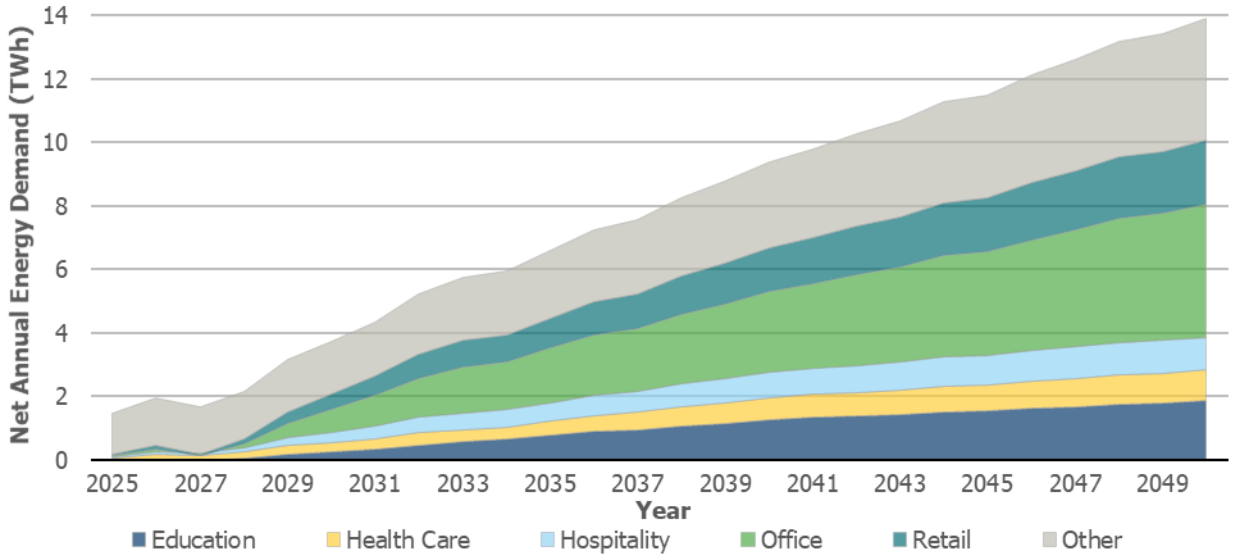


Figure 11 | Commercial Sector - Net Annual Energy Demand Growth Since Start of 2025, By Sub-Sector Type



Commercial sector building floor space continues to be the major driver of commercial sector energy demand. 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

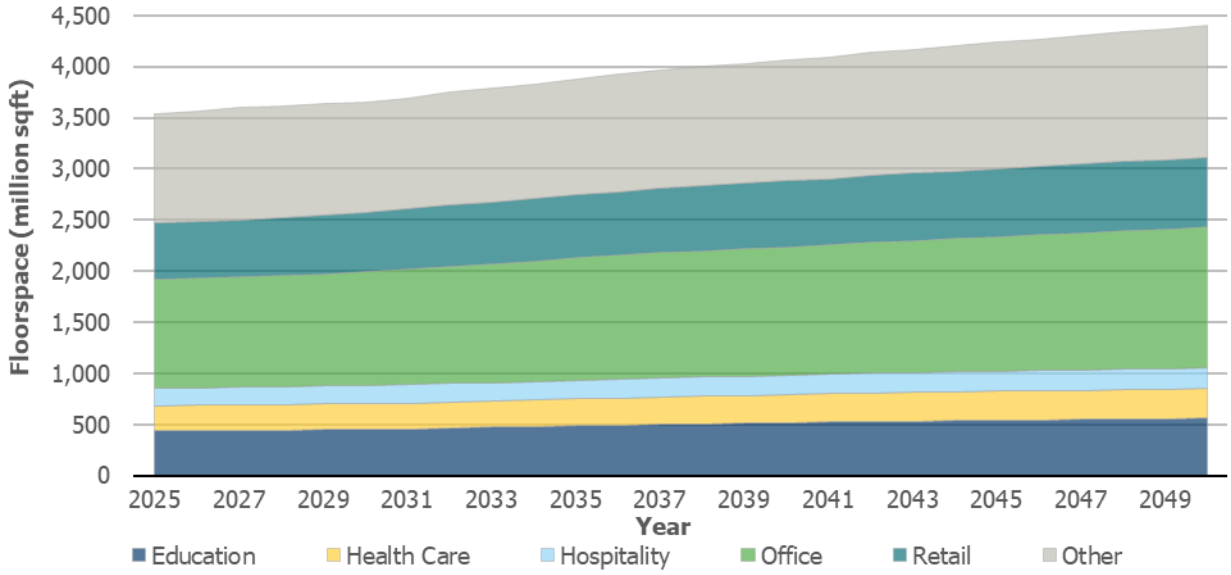
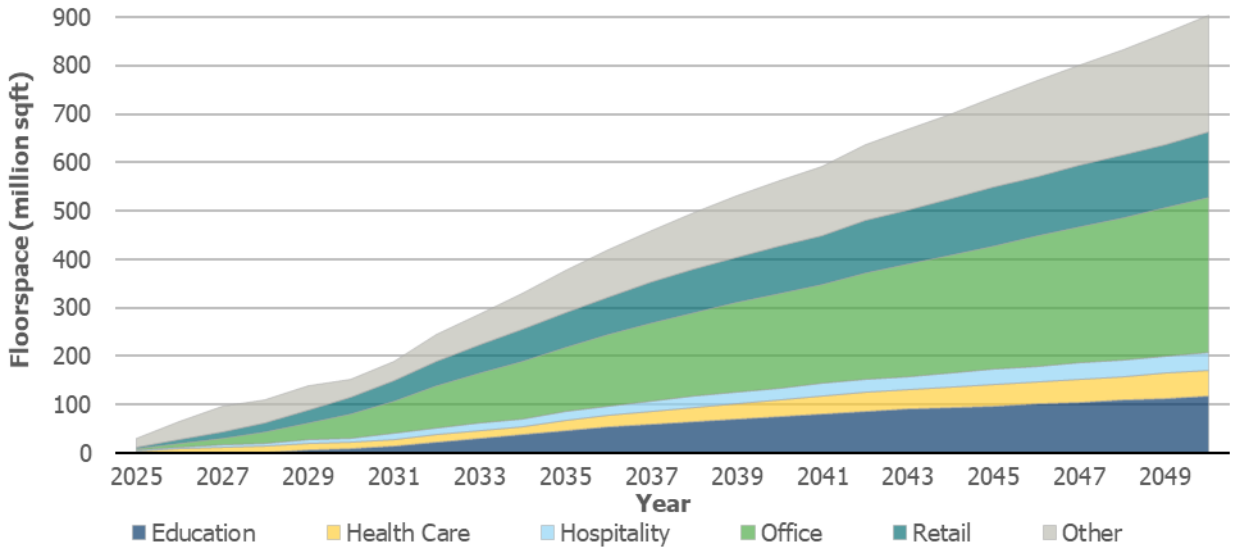


Figure 13 | Commercial Sector - Floor Space Since Start of 2025, By Sub-Sector Type



The 2024 APO demand forecast is largely consistent with the 2022 APO and assumes that the average annual growth rate of the total commercial floor space is 0.9 per cent and includes updated assumptions of:

- A notable increase in data centre floorspace in the immediate term
- Relatively flat commercial sector building floor space growth through the end of the 2020s reflective of current economic conditions, before returning to returning to a persisting period of slow growth through the end of the outlook period.

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 41.9 TWh in 2025 to 62.9 TWh in 2050, an increase of 21.0 TWh, 50.1 per cent or an average annual growth rate of 1.6 per cent.

Figure 14 | Net Annual Energy Demand, By Sub-Sector

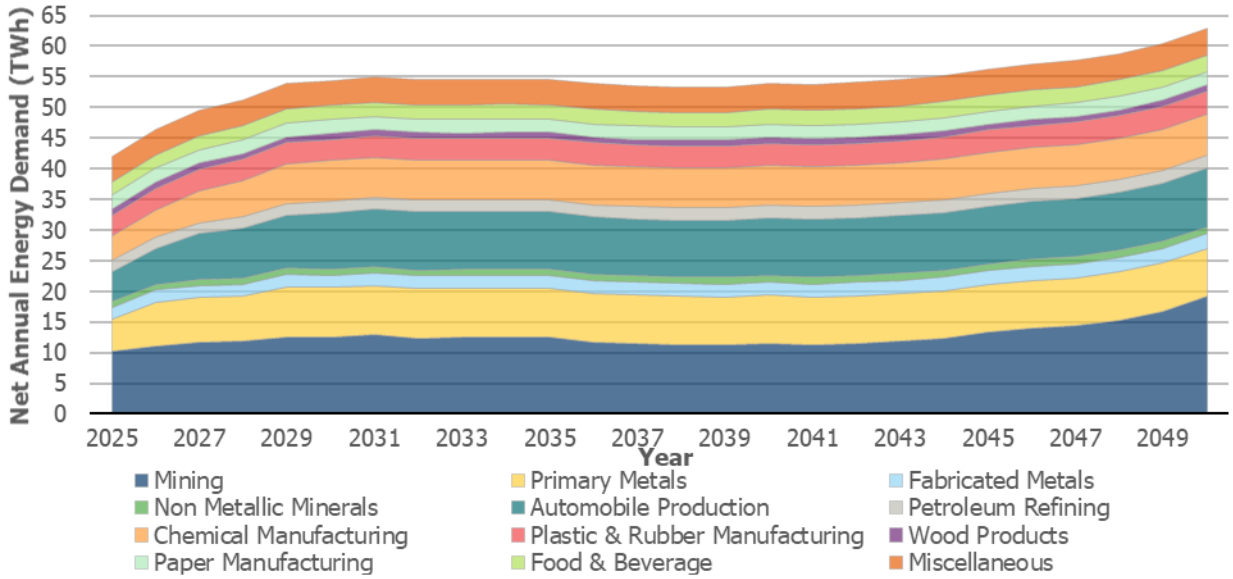
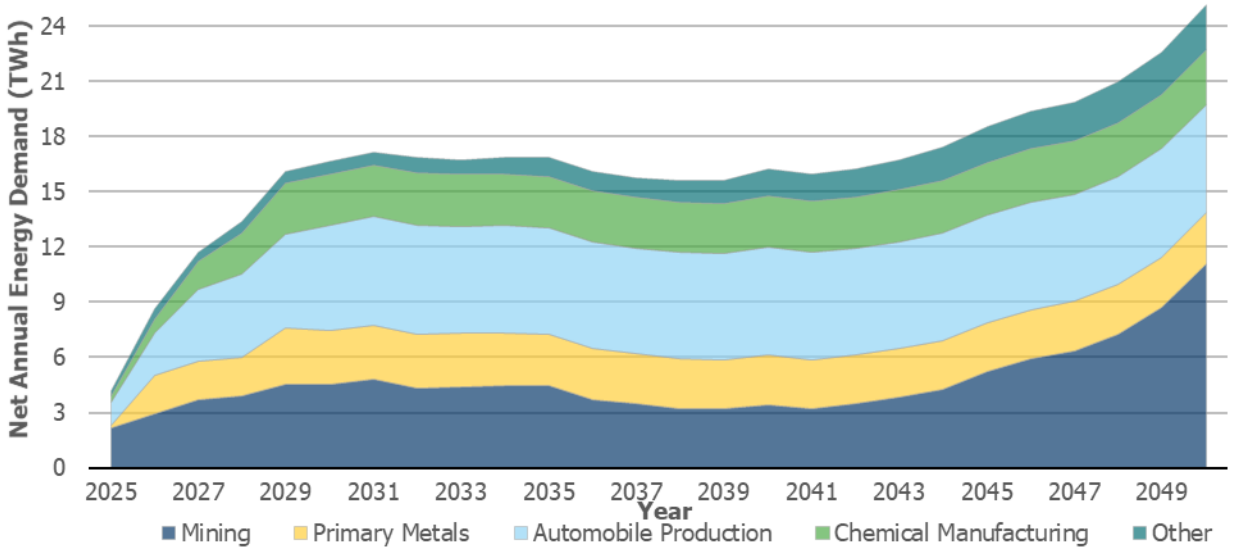


Figure 15 | Industrial Sector - Net Annual Energy Demand Growth Since Start of 2025, By Sub-Sector



Consistent with past APO demand forecasts, the 2024 APO forecasts strong industrial sub-sector growth, concentrated in the automobile production, mining, primary metal and chemical sub-sectors. This growth help establishes long-term electrification / decarbonization trends, with several projects supported by policy initiatives.

The Ontario automotive sub-sector continues to expand, with the Volkswagen Group announcing on March 13, 2023 its plans to construct an electric vehicle battery factory in the St. Thomas area, which is expected to lead to the creation of a local supply chain. Stellantis and LG Energy reconfirmed their plans on July 5, 2023 to construct an electric vehicle battery factory in the Windsor area. 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 1.0 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) of the outlook period as existing projects, planed expansions or extensions deplete their resource deposits and reach their end-of-lives. Electricity demand is forecasted to peak in the early 2030s, then slowly decline through the early 2040s before growing through the end of the outlook period. The net result of the industrial mining sub-sector over the entire forecast period is an increase of about 0.20 GW in electricity demand in year 2031 from year 2025 levels, a return to year 2025 levels in year 2042, then growth of about 0.9 GW by year 2050 as a result of various mining project implementations, expansions, extensions, and conclusions.

In the primary metals sub-sector, decarbonization and electrification is underway in the form of the implementation of 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 announcement of Algoma Steel project and the July 30, 2021 announcement of ArcelorMittal Dofasco project, each supported by the Governments of Canada and Ontario. These industrial projects are expected to achieve full commercial operation by year 2026 with a significant and distinct increase in demand. These steel production facilities are expected to add up to 0.4 GW in electricity demand.

The Ontario chemical production sub-sector is expanding with the July 13, 2022 commitment of Umicore to construct a battery materials processing facility located in Loyalist Township, 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 0.5 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.

Table 1 | Industrial Sector – Incremental Project Characterization

#	Sub-Sector	Projects	Zone	Incremental Facility Level Demand (GW, from year 2025)	Characterization
1	Mining	Multiple mining projects Long term project electrification Initiation of a growth cycle in the long term period	Northeast Northwest	1.1	Growth through the early 2030s, decline through 2041, then continued growth through the end of the outlook period
2	Primary Metals	Multiple steel producer electric arc furnace projects	Northeast Southwest	0.6	Growth through 2029, flat through the end of the outlook period
3	Automobile Production	Multiple electric vehicle battery factories	West Southwest Niagara	1.0	Growth through 2030, then mostly flat through the end of the outlook period
4	Chemical Production	Battery materials processing; Multiple hydrogen production electrolysis projects	East West Southwest Niagara	0.5	Growth through 2029, then mostly flat through the end of the outlook period

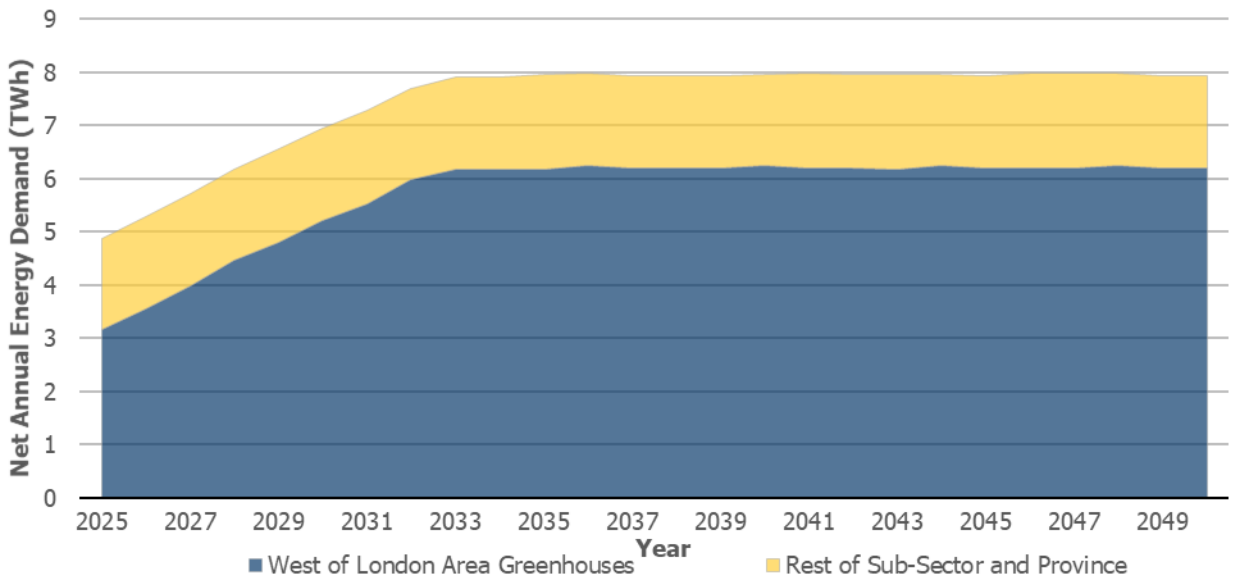
3.4 Agricultural Sector

Consistent with the 2022 APO, demand for electricity from Ontario's agricultural sector continues to grow, driven primarily by greenhouse expansion and the associated proliferation of greenhouse lighting in the West Zone. Grow lights are used to enhance production and crop yields of various fruits, vegetables, flowers and cannabis.

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.

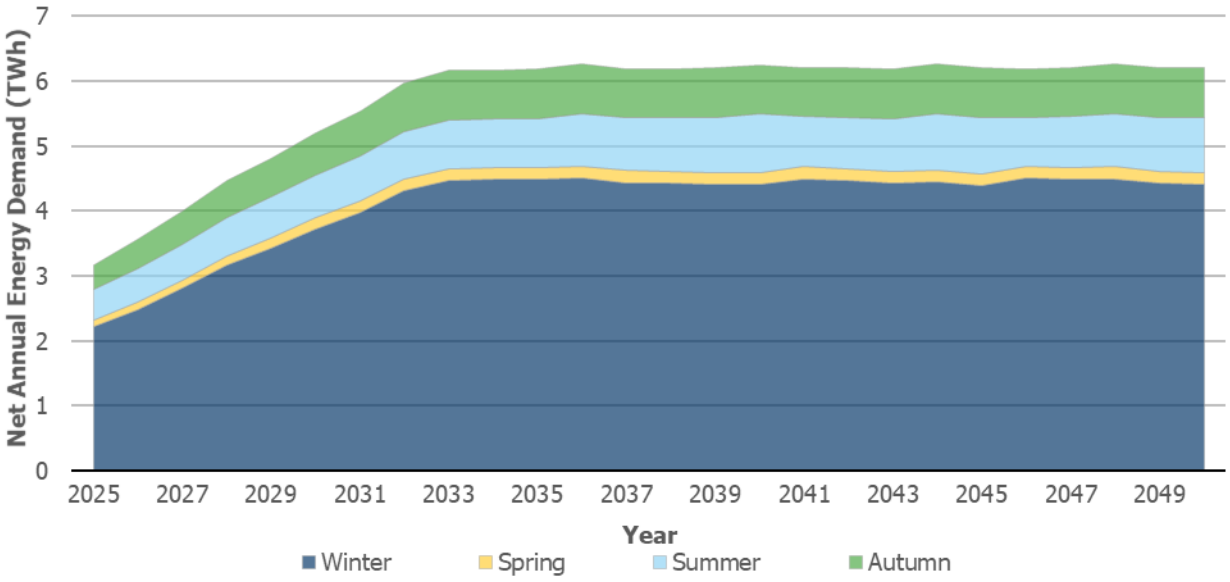
Net annual energy demand grows from 4.9 TWh in 2025 to 7.9 TWh in 2050, an increase of 3.1 TWh, 62.6 per cent or an average annual growth rate of 12.8 per cent.

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



The aforementioned bulk power system planning report and its supporting market research findings confirmed previous forecasts of total greenhouse implementation and utilization. However, it is expected that 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 significant 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.

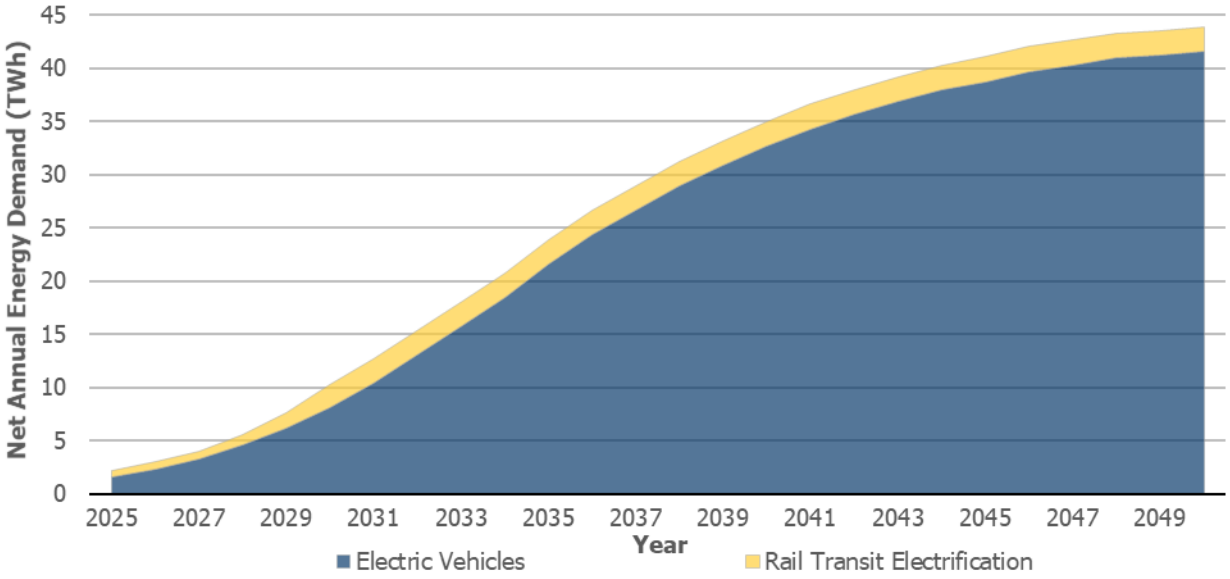
Figure 17 | Agricultural Sector - West of London Area - Greenhouse - Net Annual Energy Demand, By Season



3.5 Transportation Sector

Net annual energy demand grows from 2.2 TWh in 2025 to 43.9 TWh in 2050, an increase of 41.7 TWh, 1,911.6 per cent or an average annual growth rate of 12.8 per cent.

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



3.5.1 Electric Vehicles

There were 151 thousand electric vehicles (EV) registered in Ontario by the end of 2023, representing nearly 1.7 per cent of automobiles on the road in Ontario. The electricity demand attribute to them was about 450 GWh a year, representing 0.3 per cent of total electricity consumption in the province. Policy measures, improved technology, matured production, and consumer preference continue to contribute 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 required for EV charging is forecast to increase exponentially and thus 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 enacted regulations that will require manufacturers and importers to meet annual zero emission vehicle (ZEV) sales targets. These will begin for the 2026 model year, with a requirement that at least 20 percent of new light-duty vehicles offered for sale be ZEVs, and will increase annually to at least 60 percent 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 per cent 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. To develop the electricity demand forecast for the M/HDEV, the IESO referred to the forecast of other provinces and relied on a consultant study. It is projected that the number of M/HDEV in the province will increase from nearly one thousand in 2025 to over 90 thousand 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 TWh in 2050.

3.5.2 Rail Transit

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 rail transit will be over 2 TWh by 2030. The IESO is pursuing additional information and the demand forecast will be updated in future APOs with new information as it becomes available.

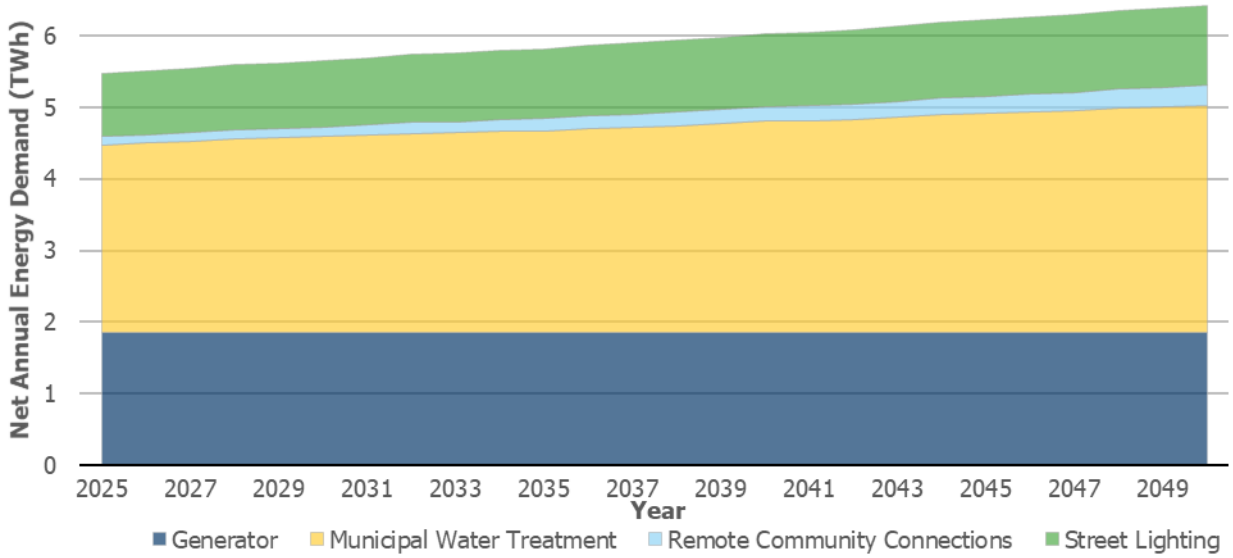
Overall, rail transit demand is forecast to grow from 0.6 TWh in 2025 to 2.3 TWh in 2050.

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 2025 to 6.4 TWh in 2050, an increase of 1.0 TWh, 17.6 per cent or an average annual growth rate of 0.7 per cent.

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

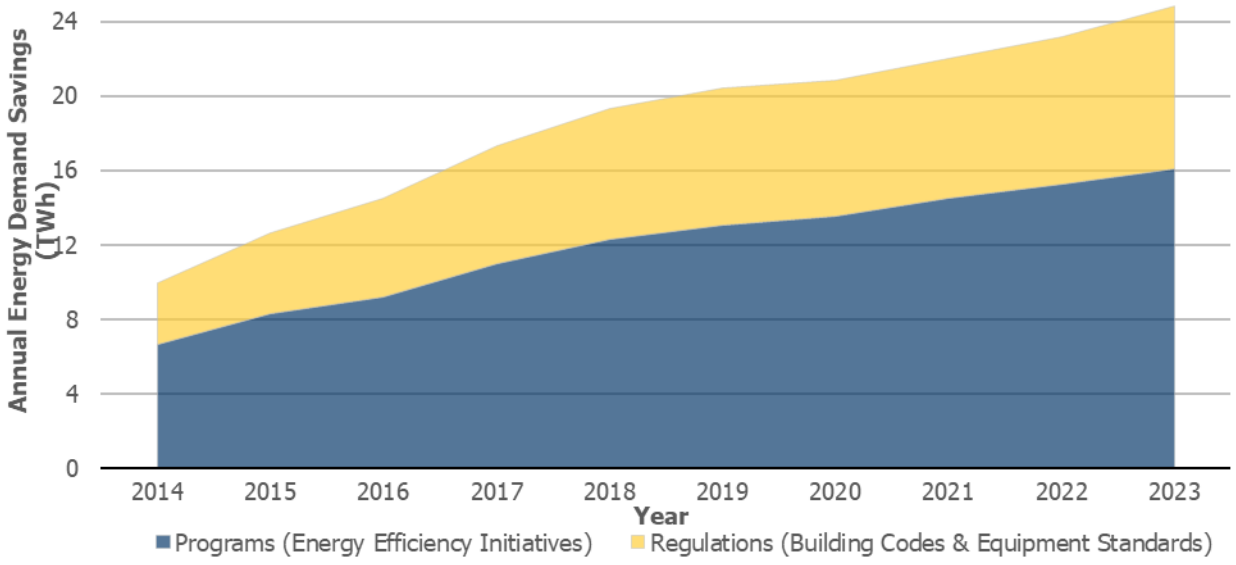


3.7 Conservation and Demand Management

CDM programs help businesses and people lower their energy costs and cut emissions. The resulted savings usually persist a number of years after energy efficiency 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 16.1 TWh electricity savings in 2023. Building codes and equipment standards regulations have delivered approximately 8.8 TWh electricity savings in 2023.

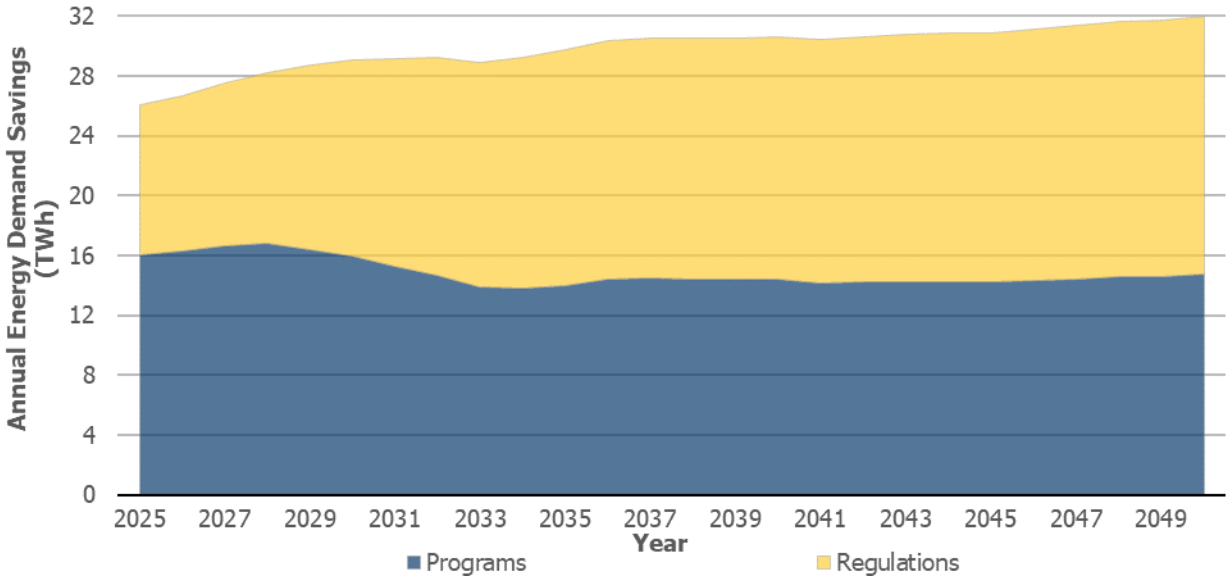
Figure 20 | CDM - Historical - Annual Energy Demand Savings, By Type



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 CDM since 2006, and current and future programs and regulations will contribute between 26.1 and 32.0 TWh in annual electricity demand savings over the outlook period.

Figure 21 | CDM - Forecast - Annual Energy Demand Savings, By Type



3.7.1 Programs

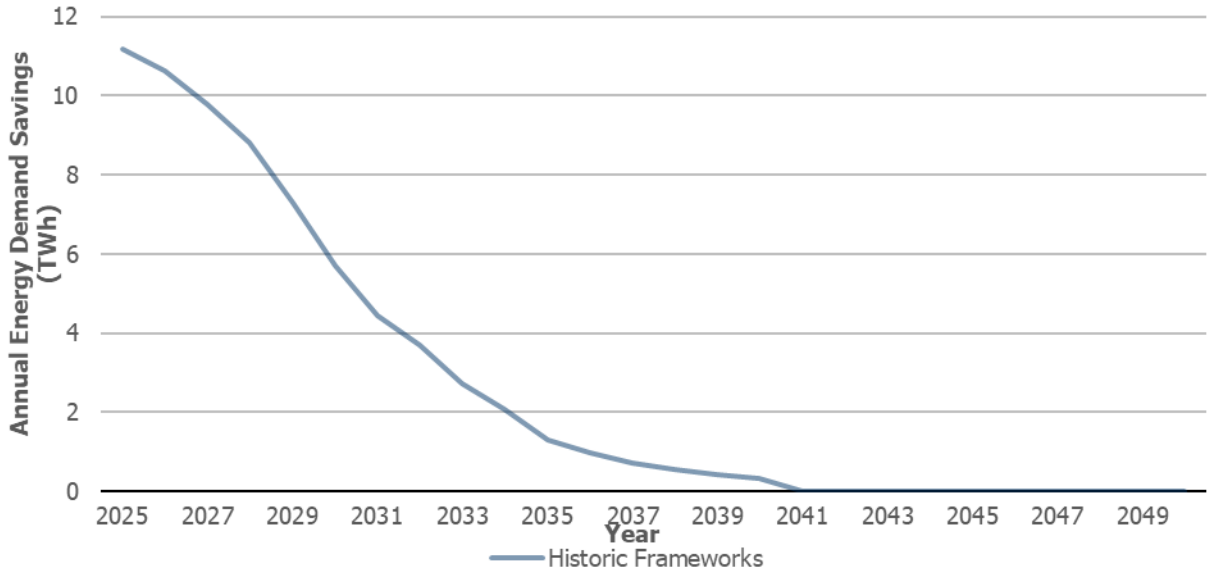
CDM through energy efficiency programs help businesses and people lower their energy costs and cut emissions.

3.7.1.1 Historical Frameworks

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

From 2025, annual energy savings achieved from historical frameworks expire as energy efficiency measures that achieve such energy savings reach their end-of-life.

Figure 22 | CDM - Historical Program Frameworks - Annual Energy Demand Savings

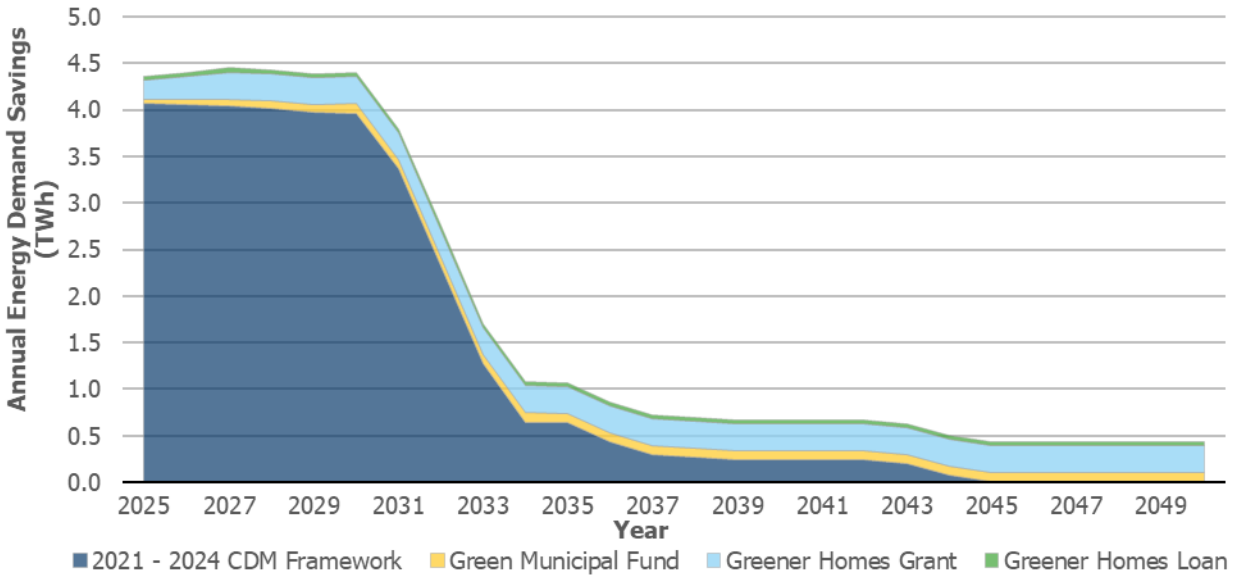


3.7.1.2 Current Frameworks

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 2022, the IESO undertook a Mid-Term Review of the Framework to, among other tasks, review the alignment of the framework's savings targets and budget with the province's forecasted system needs. The IESO projected in its 2022 APO that there would be a need for additional electricity capacity and the 2022 AAR identified necessary actions to ensure system reliability, including new energy efficiency programs. In October 2022, the IESO received a ministerial directive in connection with the Framework to enable additional CDM programming through a budget increased to a total of $1 billion. It is forecast that the enhanced Framework will achieve 4 TWh annual savings when fully implemented in 2026. As part of the framework enhancements, the IESO launched a new demand response program for residential consumers discussed separately in Section 3.9.

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 the commercial sector, with a focus on reducing the consumption and emissions of various fuels. The Canada Greener Homes Grant and the Canada Greener Homes Load programs help home owners across the country implement energy efficiency and emission reduction retrofits. These programs are designed to reduce emissions, target various fuel types, and operate in Ontario as well as other provinces and territories. The resulted electricity savings in Ontario are estimated as 0.4 TWh by 2027. The IESO is monitoring federal announcements regarding the evolution of the Canada Greener Homes Grant program and relevant changes will be reflected in future APOs.

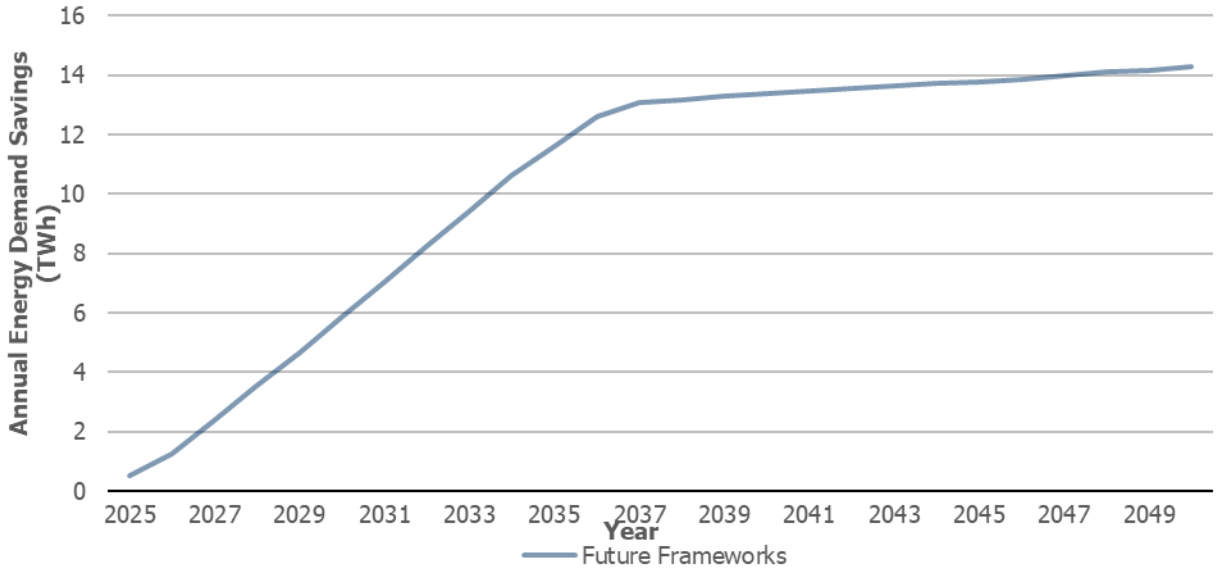
Figure 23 | CDM - Current Program Frameworks - Annual Energy Demand Savings, By Framework



3.7.1.3 Long Term Framework

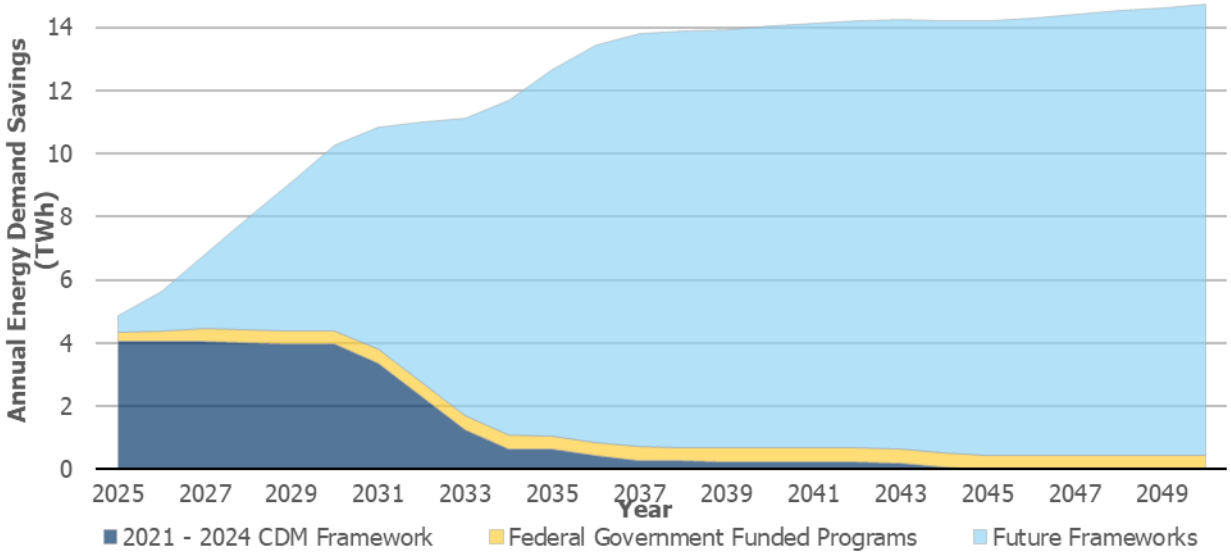
Besides the above mentioned programs that are already in the market, it is anticipated that conservation and demand management initiatives will continue. For long term demand forecast and power system planning, the same savings level of the enhanced 2021-2024 CDM Framework is assumed for the entire planning horizon. The annual savings are estimated at 0.62 per cent of gross demand. The long term programs are expected to save 14.3 TWh in 2050. A portion of the new savings will offset the expiring savings from historical CDM programs.

Figure 24 | CDM - Future Program Framework Assumption - Annual Energy Demand Savings



Overall, the historical programs, the existing CDM 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 CDM programs in Ontario, past, present and future, is forecast to fluctuate between 13.8 TWh and 16.8 TWh between 2025 and 2050.

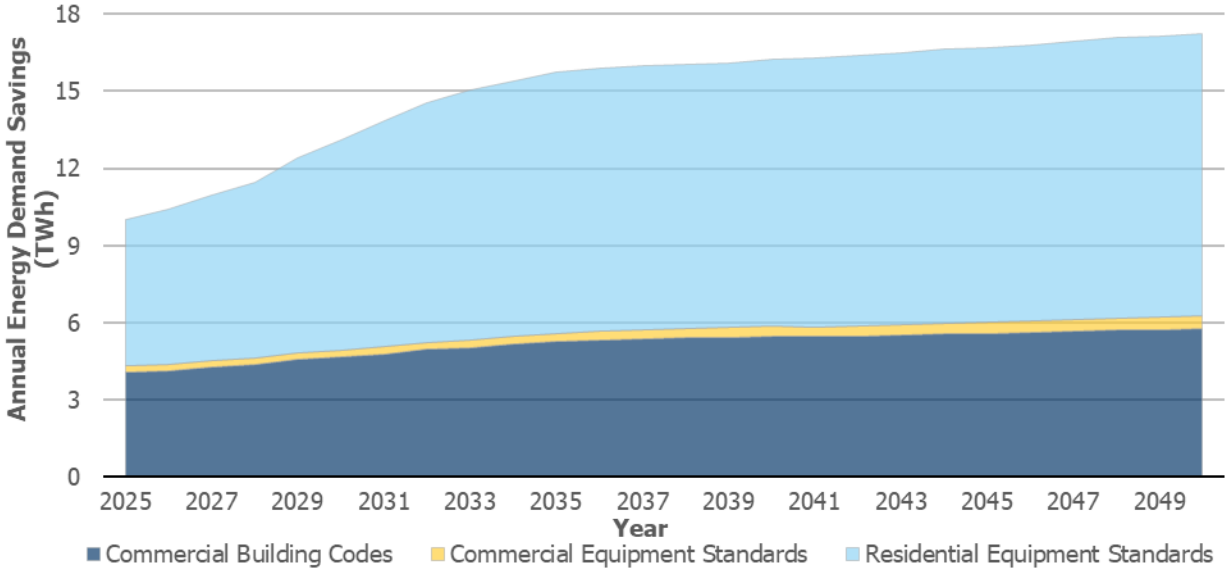
Figure 25 | CDM - Annual Energy Demand Savings, By Current & Future Frameworks



3.7.1.4 Codes and Standards Regulations

Building code 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 10.0 TWh in 2025 to 17.3 TWh in 2050.

Figure 26 | CDM - 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 peak system 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 2024 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 Figure 27 and Figure 28.

Figure 27 | 2025 System Peak Demand Day Demand and ICI Profile

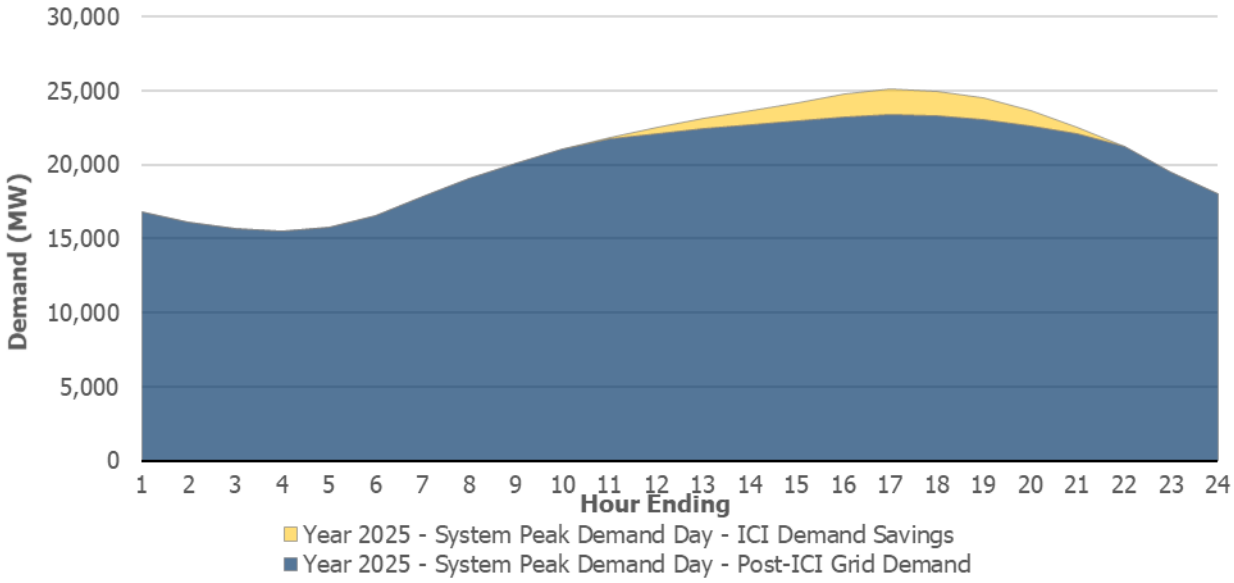
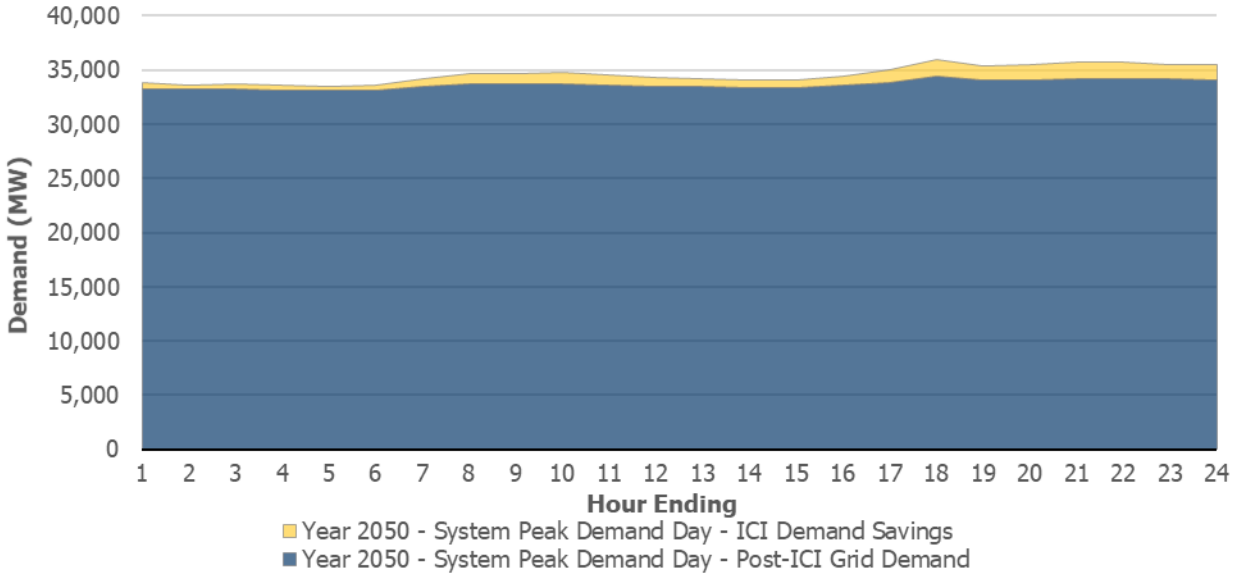
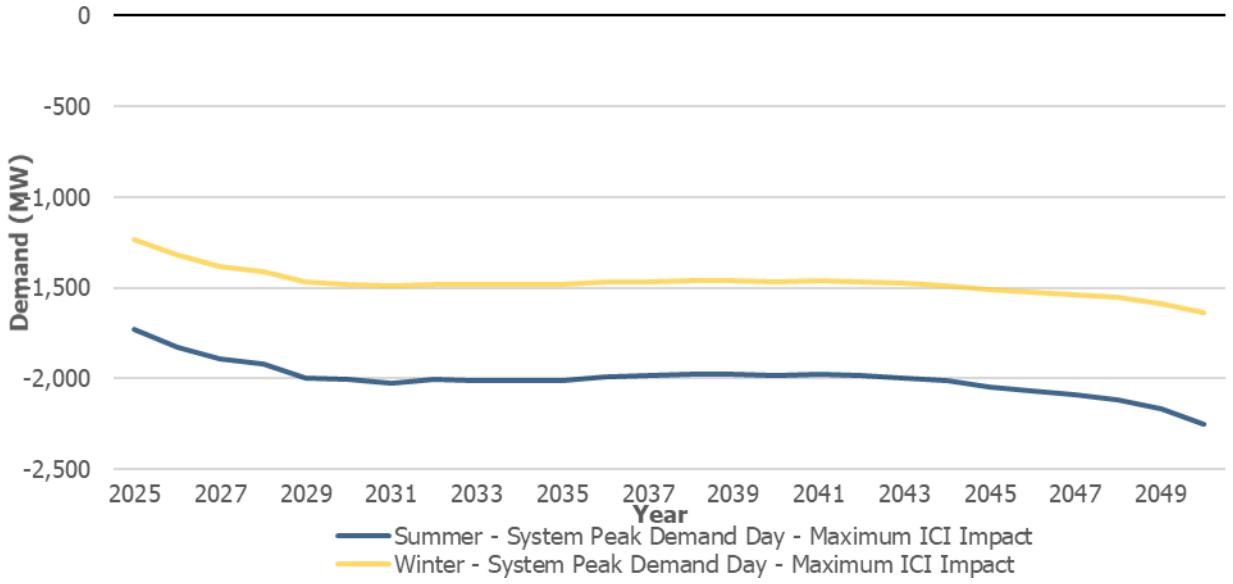


Figure 28 | 2050 System Peak Demand Day Demand and ICI Profile



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 during the years industrial sector demand growth is expected.

Figure 29 | Industrial Conservation Initiative Maximum Annual Impact

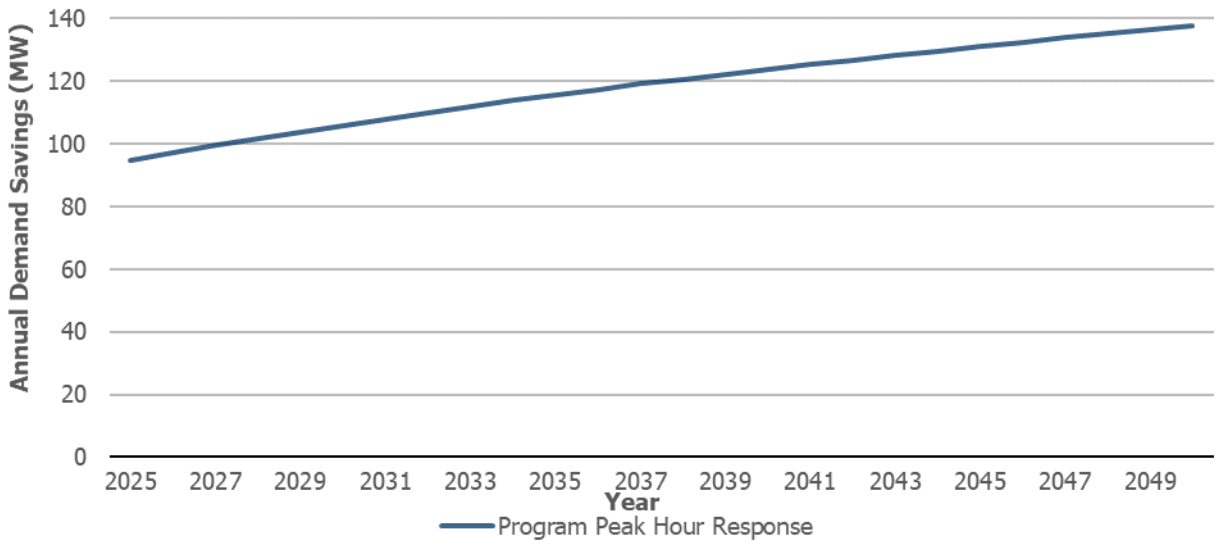


These system reduction impacts have been applied to the forecasted top 15 system peak days in each year of the outlook period. Industrial Conservation Initiative response is recognized as an uncertainty in the APO long term demand forecast and the IESO reviews the observed responses and refines its ICI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

3.9 Residential Demand Response

New for the 2024 APO is the Save on Energy Peak Perks residential demand response program launched on May 25, 2023, a program that offers a financial incentive to eligible participants with a smart thermostat connected to central air conditioning. The program requires them to automatically adjust their thermostat by two to four degrees during summer peak demand for up to 3 hours per event, and up to ten events per year between July and September. It is estimated that this program will achieve up to 95 MW of demand savings in 2025, and assumed the program will persist through the end of the outlook period, growing to 138 MW demand savings by 2050, inline with forecasted increases in residential central air conditioning adoption.

Figure 30 | Residential Demand Response - Annual Demand Savings

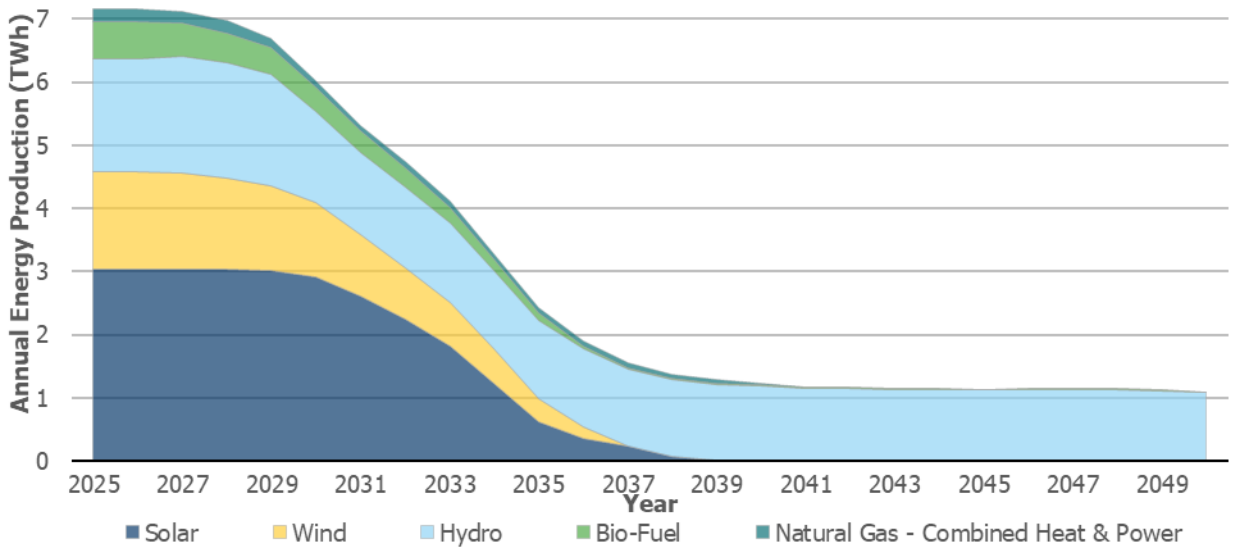


3.10 Embedded Generation

The IESO 2024 APO long-term demand forecast is produced at the net-demand level which 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, the resulting economic changes, and the drive towards 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, policy responses related to the COVID-19 pandemic, 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 2025-2029), decreasing in time with a medium degree of confidence in the medium term (years 6-10 or 2030-2034), relatively lesser degree of confidence in the long term (years 11-20 or 2035-2044) and least degree of confidence in the super long term (years 21-26 or 2045-2050).

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.

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