Annual Planning Outlook

Demand Forecast Module

December 2022

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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, 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. 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. 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 2022 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, and current underlying fuel rate forecasts and economics. The 2022 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 2022 APO long-term demand forecast was developed over the course of winter and spring of 2022, covers the period of 2024-2043 and is produced at the net-demand level.

Building off of the 2021 APO long-term demand forecast, which in itself was an evolution of the 2020 APO, where electricity demand was heavily influenced by the on-going COVID-19 pandemic, public health measures, and emerging societal transforming climate change mitigation measures, the 2022 APO long-term demand forecast focuses on the continuing trend of decarbonization, fuel switching and electrification of the provincial economy. The 2022 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 electric vehicle adoption forecasts, driven by the Government of Canada policy announcements on June 29, 2021 and December 17, 2021 on passenger vehicle and truck sales targets in 2035, accelerating the significant electrification impacts relative to the 2021 APO demand forecast
2. Updated industrial primary metal sector electrification projects, with additional estimated demand and implementation timeline details which build upon the 2021 APO Reference Scenario demand forecast
3. New industrial sector electric vehicle battery cell factories and battery materials processing facilities
4. New industrial sector hydrogen production / electrolysis facilities planned in Ontario
5. Toronto Green Standard planned increases in minimum building energy and emission intensity requirements in the City of Toronto from year 2030, affecting primarily residential and commercial sector buildings
6. Revised agricultural sector west of London area greenhouse product mix assumptions affecting seasonal energy and peak demand
7. Updated recent historical conservation program savings results, increasing near term demand savings included in the forecast
8. Updated Industrial Conservation Initiative forecasted savings that are commensurate with the forecasted increase in overall industrial sector demand
9. Updated reference year demand forecast that incorporates the impacts of the COVID-19 pandemic delta variant emergence and resulting public health management and temporary business closure measures experienced in late 2021 and early 2022 on system level demand which propagates through the outlook period

The net impact of all updates since and confirmation of other assumptions and projection from the 2021 APO demand forecast are an increase relative to the 2021 APO demand forecast in annual energy and winter peak demand through the outlook period, with the differences being greatest in the early 2030s and late 2030s respectively, attributable primarily to electric vehicle adoption, and a relatively lower level of summer peak demand until year 2033, primarily attributable to updated agricultural sector West of London greenhouse assumptions.

The 2022 APO demand forecast is summarized as having robust, consistent growth over the outlook period, strongest in the mid 2020s, trending in the high 2%/year range and steadily flattening to about 1%/year by the end of the outlook period, with an overall annual average growth of 1.8%. 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 winter peaking by 2036.

Figure 1: Net Annual Energy Demand, By Sector

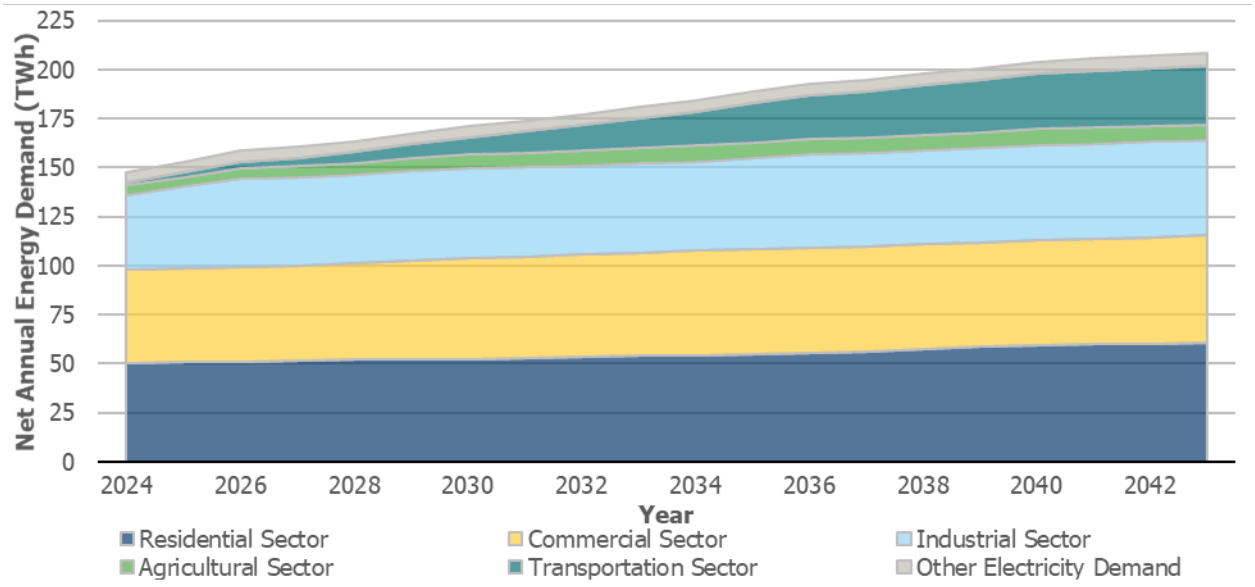
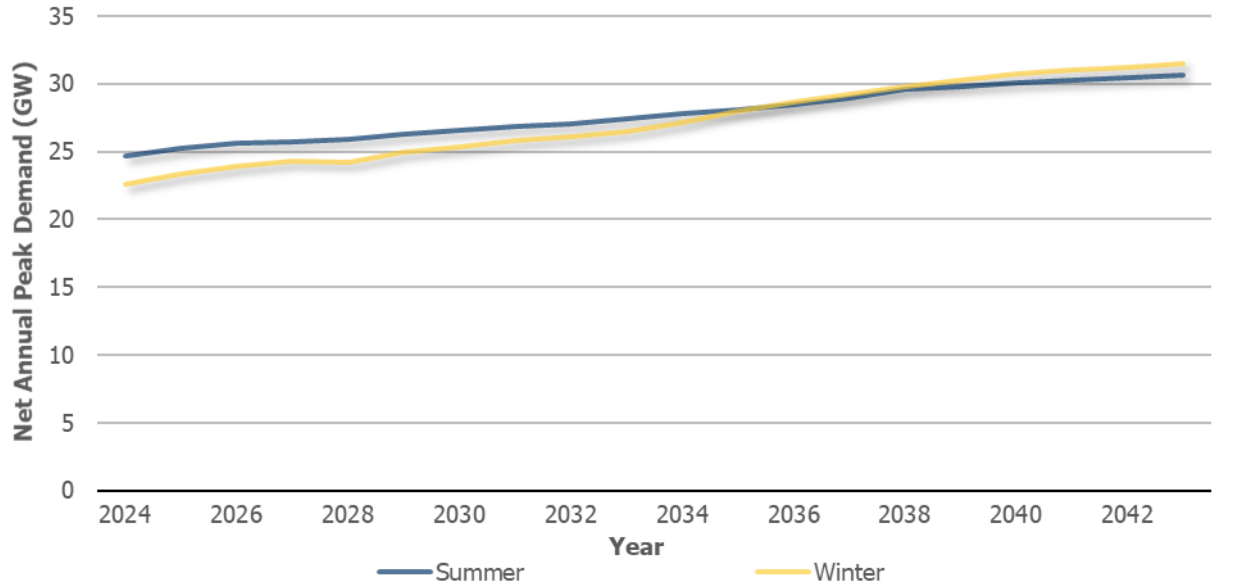


Figure 2: Net Annual Peak Demand, By Season



In the 2022 APO demand forecast, net annual energy demand grows from 147.8 TWh in 2024 to 208.3 TWh in 2043, an increase of 60.4 TWh, 40.9% or an average annual growth rate of 1.8%; net summer peak demand grows from 24.6 GW in 2024 to 30.7 GW in 2043, an increase of 6.0 GW, 24.5% or an average annual growth rate of 1.2%; and net winter peak demand grows from 22.6 GW in 2024 to 31.5 GW in 2043, an increase of 8.9 GW, 39.2% or an average annual growth rate of 1.8% as well.

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 Chapter 4.

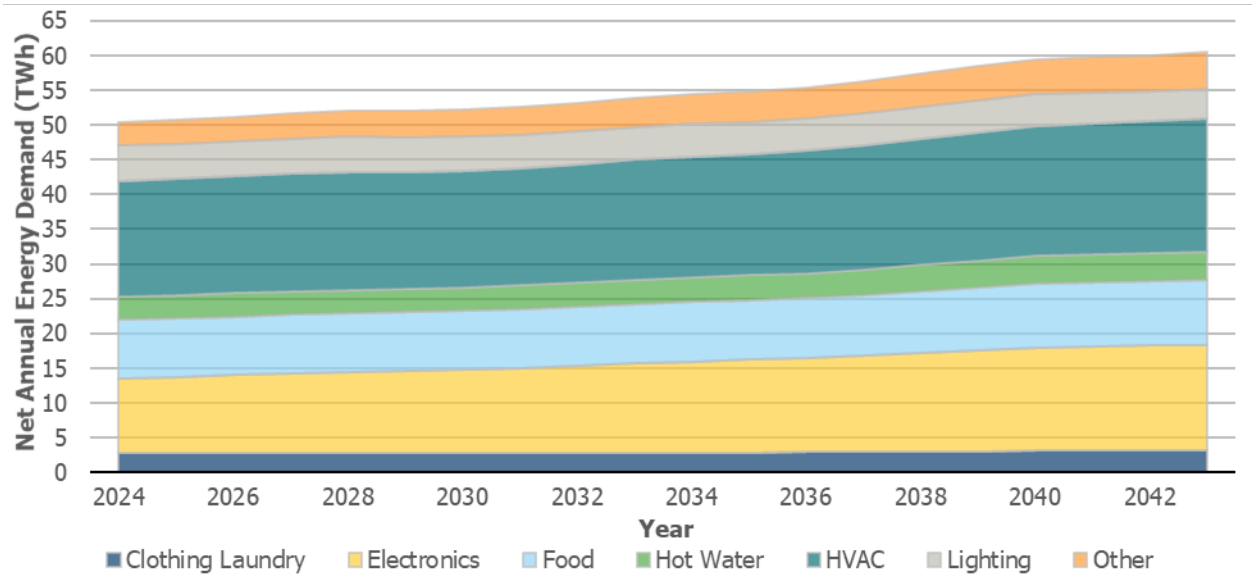
3. Demand Forecast Drivers

3.1 Residential Sector

The main updates to the residential sector are an updated housing stock forecast 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 year's 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 50.5 TWh in 2024 to 60.4 TWh in 2043, an increase of 10.0 TWh, 19.8% or an average annual growth rate of 1.0%.

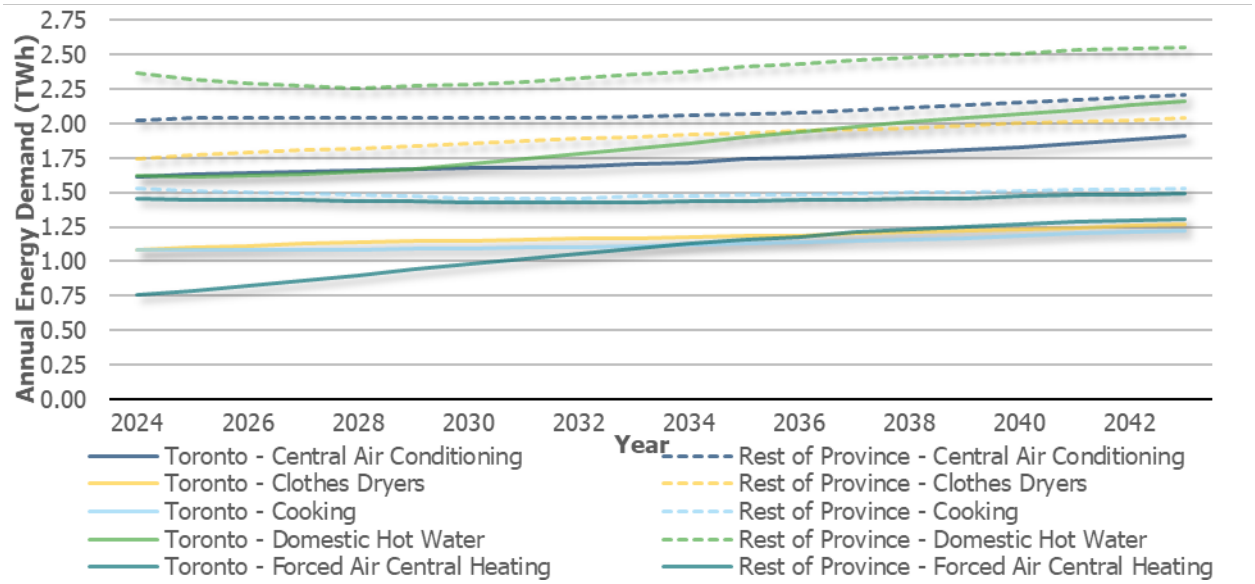
Figure 3: Residential Sector - Net Annual Energy Demand, By End-Use Type



While overall average annual increases in energy demand are at 1.0%, 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.

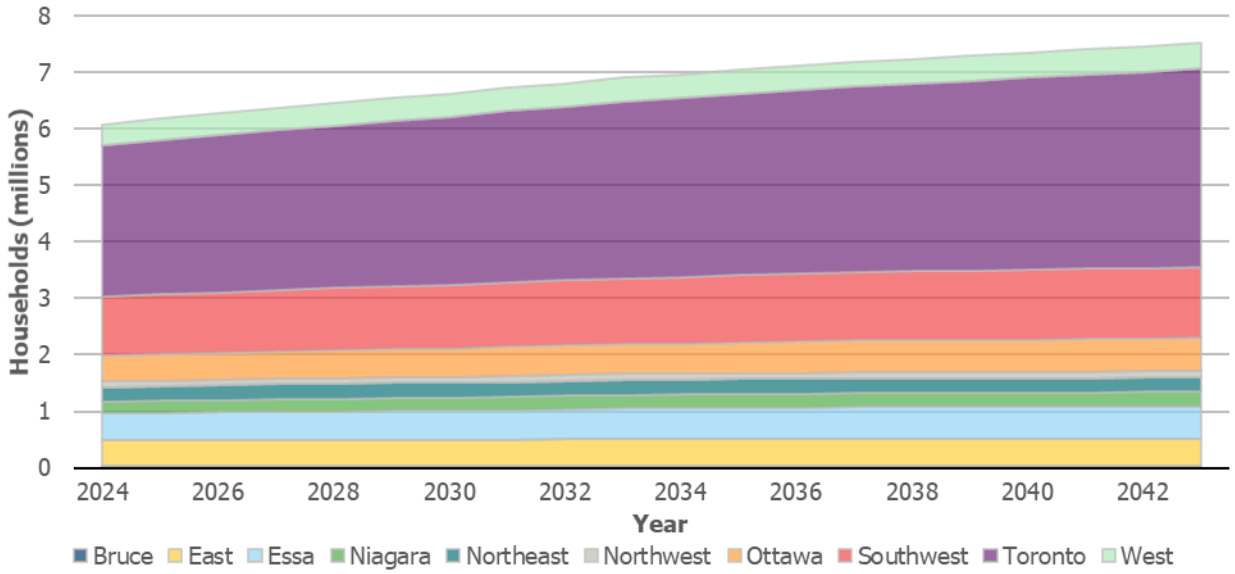
While post 2030 new City of Toronto buildings comprise a small proportion of overall residential sector demand, a clear increase in demand from currently emitting end-uses in Toronto can be seen. While the TGS planned increase in minimum requirement is set for 2030, it is expected that a growing proportion of new buildings will voluntarily meet the standard prior to 2030. In Figure 4, it is demonstrated 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



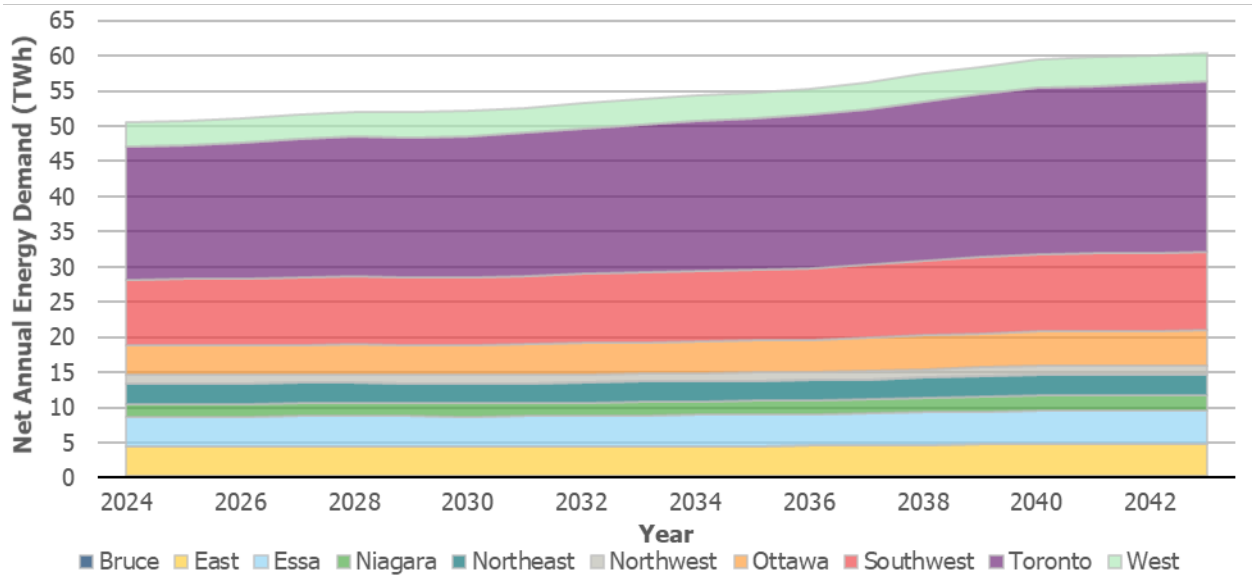
The residential sector's major driver is household count. Overall household count projections are in line with previous forecasts in the 2021 APO, but on a zonal level changes are seen, attributable to the latest pandemic and affordability trends. Projections in the Ottawa zone are lower than previously forecasted from the late 2020s through 2043, and in the Toronto zone, housing counts are lower than previously forecasted in the near term, recovering by the end of 2020s than growing slower than previously expected starting in 2030. Conversely, housing growth forecasts are higher in adjacent zones to Toronto, specifically the Essa, Niagara and Southwest zones. Overall, the number of households is expected to increase by nearly an additional 1.5 million over the outlook period.

Figure 5: Residential Sector - Household Count, By IESO Zone



Despite changes in zonal housing stock growth rates, the Toronto and Southwest zones continue to comprise the highest residential sector demand zones, growing to 24.1 TWh and 11.1 TWh by 2043 respectively while northern Ontario zones see largely flat demand over the outlook period.

Figure 6: Residential Sector - Net Annual Energy Demand, By IESO Zone

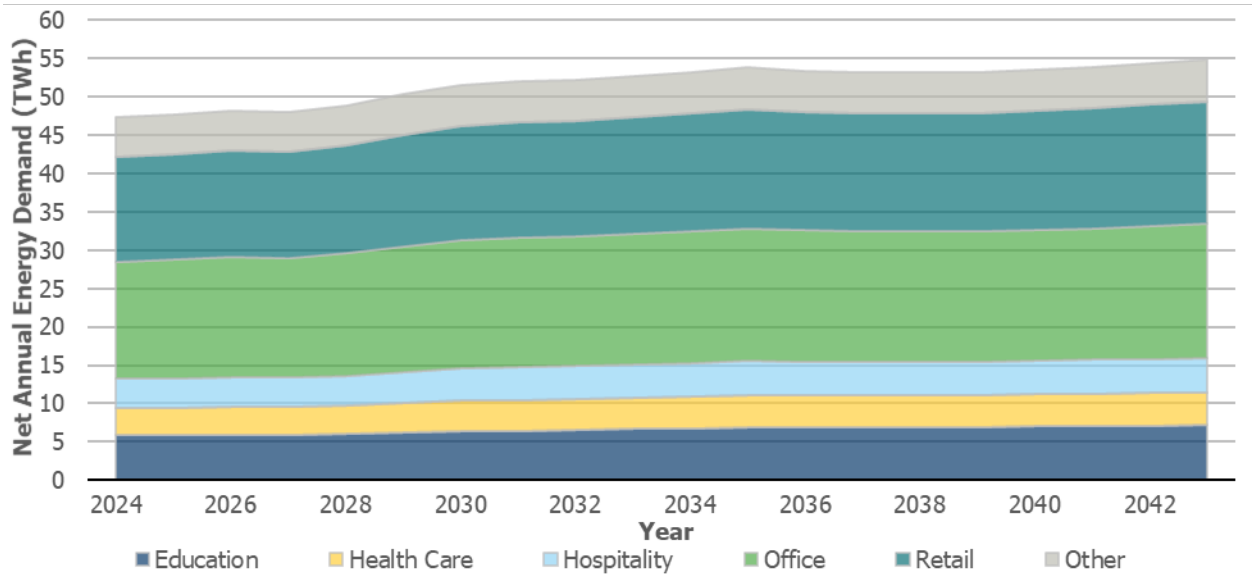


3.2 Commercial Sector

The main updates to the commercial sector are an updated building floorspace forecast and similarly to the residential sector, the inclusion of the Toronto Green Standard (TGS) planned increase in minimum building energy and emission intensity requirements in year 2030. Previous year's forecast assumptions of 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 47.4 TWh in 2024 to 54.8 TWh in 2043, an increase of 7.5 TWh, 15.8% or an average annual growth rate of 0.8%.

Figure 7: Commercial Sector - Net Annual Energy Demand, By Sub-Sector Type

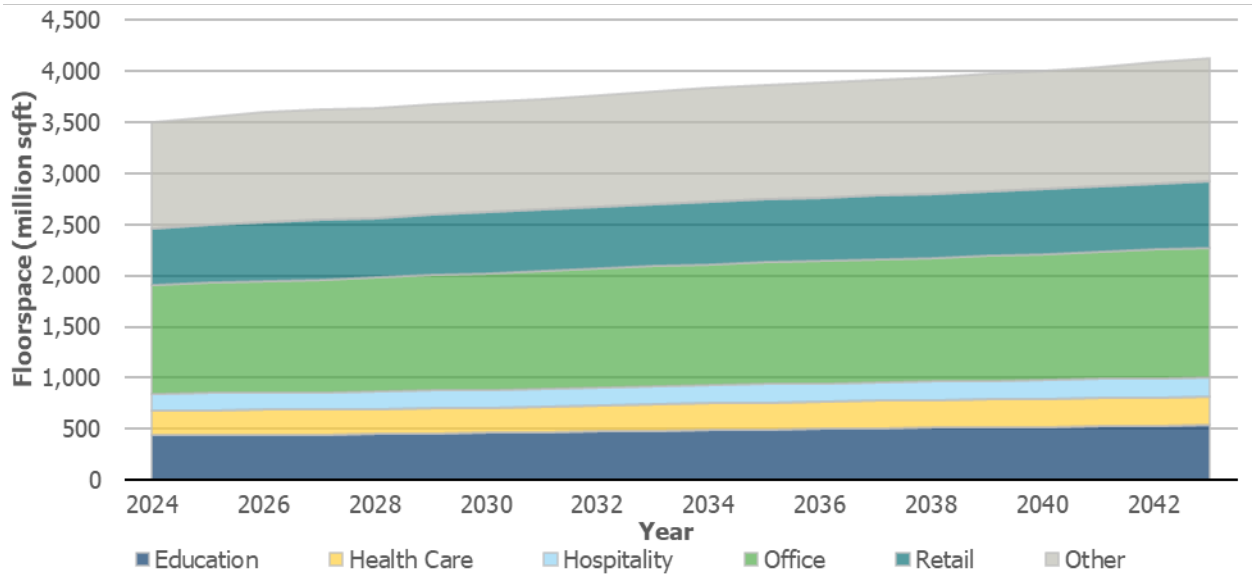


Commercial sector building floor space continues to be the major driver of commercial sector energy demand, and the commercial sector building floor space forecast has been updated with the latest available projections by sub-sector for the Ontario economy. Major themes in the commercial sector energy 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 the wake of changes to the retail real estate landscape, e-commerce and other technological advances

Figure 8: Commercial Sector - Floor Space, By Sub-Sector Type



The 2022 APO demand forecast is largely consistent with the 2021 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:

- Marginally higher floor space, in general for all sub-sectors and zones for the outlook period with some exceptions being the Essa Zone and for the education sub-sector.
- COVID-19 pandemic recovery and economic and commercial floor space expansion concluding in the near-term with lower overall rates for the remainder of the outlook period

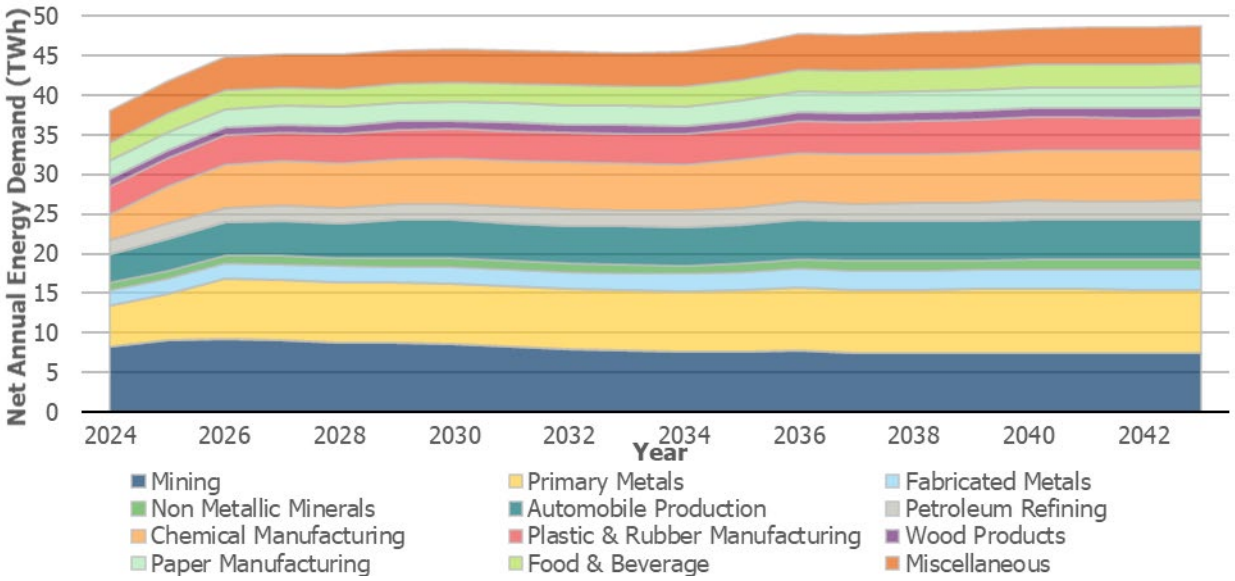
As economic conditions evolve over the immediate near term, the IESO continues to evaluate the state of the commercial sector and its electricity demand drivers and will refresh its long term electricity demand forecasts on an annual basis.

3.3 Industrial Sector

The Ontario industrial sector is undergoing 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 38.1 TWh in 2024 to 48.7 TWh in 2043, an increase of 10.6 TWh, 27.7% or an average annual growth rate of 1.3%.

Figure 9: Industrial Sector - Net Annual Energy Demand, By Sub-Sector



In the 2021 APO demand forecast, strong industrial sub-sector growth is seen concentrated in the mining and primary metal sub-sectors and with projects supported by policy initiatives.

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. Strong electricity demand growth is predicted in the mining sub-sector as new mining operations reach commercial operation, and existing mines complete expansions or extensions in the early to mid 2020s. Electricity demand is then forecasted to slowly decline in the late 2020-mid 2030s as existing mining operations reach their respective end-of-lives. The net result of the industrial mining sub-sector over the entire forecast period is an increase of about 0.15 GW in electricity demand from year 2024 levels 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 planned implementation of electric arc furnaces in the provincial steel production sub-sector that was announced in mid-2021. The 2022 APO demand forecast has specifically 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 materialize in the mid 2020s and 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 0.5 GW in electricity demand.

The Ontario automotive sub-sector is expanding with the March 23, 2022 commitment of Stellantis N.V. and LG Energy Solution to build Canada's first large scale lithium-ion battery production plant located in Windsor. Other supporting sub-sector production facilities have been accounted for as well in the industrial sector demand forecast. Together these projects are expected to add 0.45 GW in electricity demand.

The Ontario chemical production sub-sector is also 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. The chemical sub-sector projects are expected to add an additional 0.5 GW in electricity demand.

Apart from the aforementioned mining, primary metal, automobile production 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.

Figure 10: Industrial Sector – Incremental Project Characterization

#	Sub-Sector	Projects	Zone	Incremental Demand (GW, from year 2024)	Characterization
1	Mining	Multiple mining projects	Northeast Northwest	0.15	Growth through 2026, decline through 2032, then flat through 2043
2	Primary Metals	Multiple steel producer electric arc furnace projects	Northeast Southwest	0.5	Growth through 2026, flat through 2035, then slow growth through 2043
3	Automobile Production	Multiple electric vehicle battery factories	West	0.45	Growth through 2030, then mostly flat through 2043
4	Chemical Production	Battery materials processing; Multiple hydrogen production electrolysis projects	West Southwest Niagara Northwest	0.5	Growth through 2027, then slow demand increases through 2040

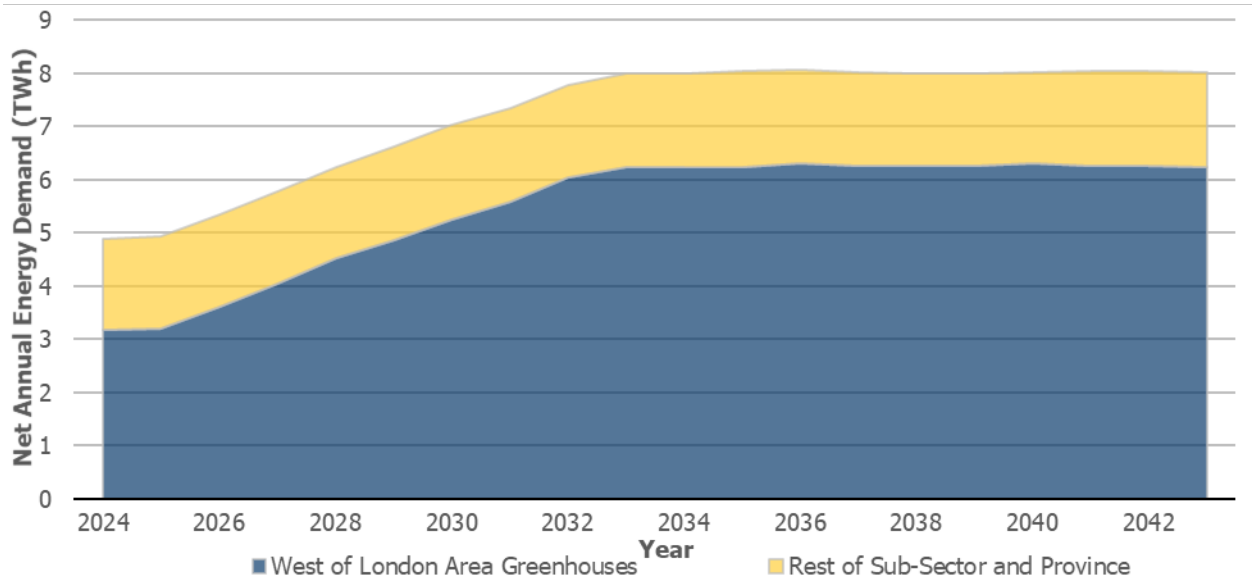
3.4 Agricultural Sector

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 enhance production and crop yields of various fruits, vegetables, flowers and cannabis.

Consistent with previous APOs, this 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.

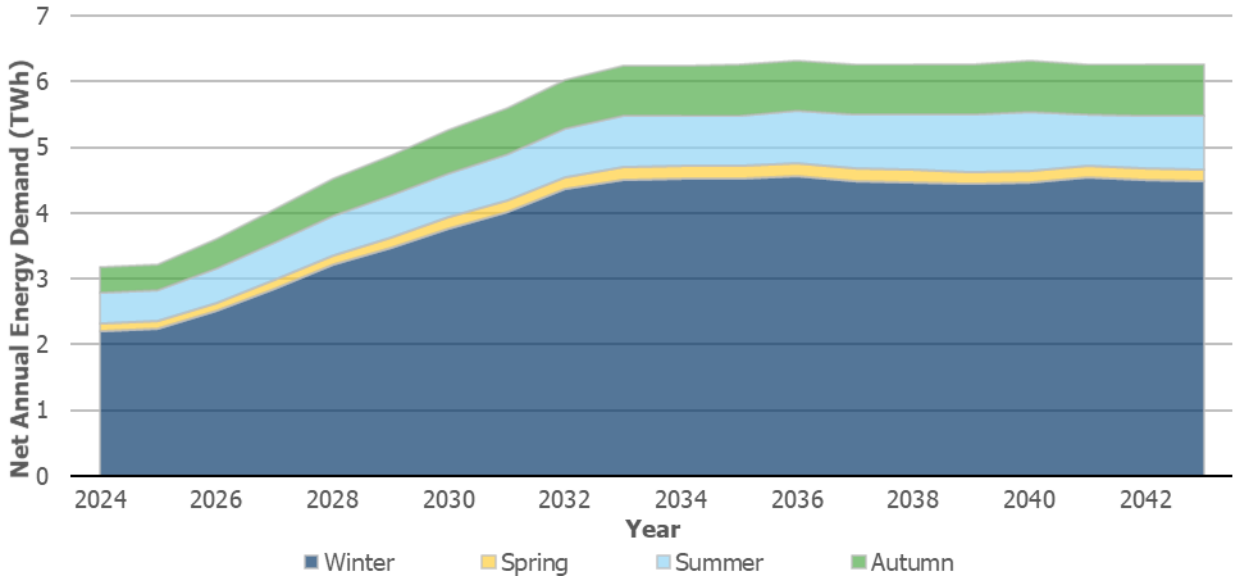
Net annual energy demand grows from 4.9 TWh in 2024 to 8.0 TWh in 2043, an increase of 3.1 TWh, 27.7% or an average annual growth rate of 1.3%.

Figure 11: Agricultural Sector - Net Annual Energy Demand, By Sub-Sector & IESO Zone



A major update in the 2022 APO agricultural sector long-term demand forecast is a change in assumption in terms of greenhouse product output. 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 12.

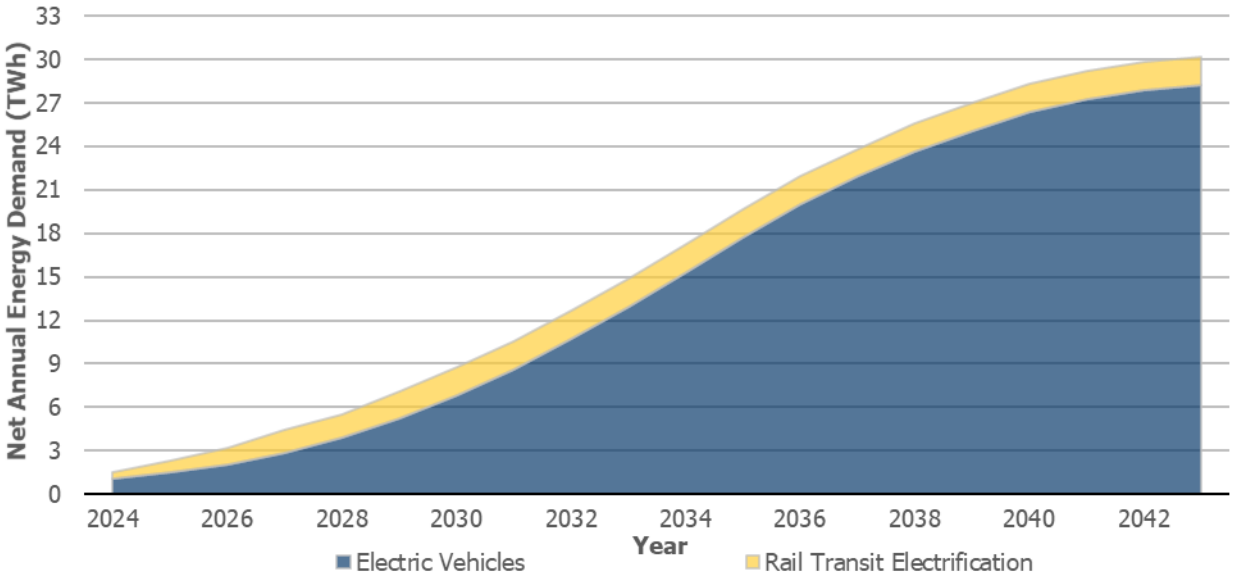
Figure 12: Agricultural Sector - West of London Area - Greenhouse - Net Annual Energy Demand, By Season



3.5 Transportation Sector

Net annual energy demand grows from 1.5 TWh in 2024 to 30.1 TWh in 2043, an increase of 28.6 TWh, 1,901.7% or an average annual growth rate of 17.1%.

Figure 13: Transportation Sector - Net Annual Energy Demand, By Mode



3.5.1 Electric Vehicles

There were over seventy-one thousand electric vehicles (EV) registered in Ontario by the end of 2021. The electricity demand required to power them was nearly 300 GWh a year, representing about 0.2% of total electricity consumption in the province. Many projections foresee that EV adoption will continue to grow significantly over the next decade in Ontario, Canada, and around the world. The electricity demand of EV charging is forecast to increase exponentially and EV charging is one of the fastest growing end uses of the APO's demand forecast.

The Canadian government set a mandatory target for all new light-duty cars and passenger trucks to be zero-emission by 2035, with an interim target of 60% by 2030. The APO's light duty EV (LDEV) forecast in Ontario is in line with the government targets, reaching 1.7 million by 2030 and 7.3 million by 2043.

A number of transit agencies in the province have plans to electrify their bus fleets and the federal government has programs in place to support bus electrification. Electric buses, including transit buses and school buses, operating in the province are forecasted to reach 11,300 by 2043. It is a challenge to explicitly forecast the number of other categories of vehicles such as medium and heavy duty vehicles. The total number of these vehicles are small and their operation characteristics vary significantly from one to another. There are debating opinions from various organizations on what fuel types will power them (e.g. hydrogen fuel cell vs. battery). The APO assumes that charging demands of EVs other than LDEV and e-bus equal to 5% of charging demand of LDEV's. The IESO is carrying out more studies and will update forecast when new information becomes available.

Besides the number of EVs on road, the average driving distance and fuel efficiency are two other factors that affect charging electricity demands. Net annual energy demand grows from 1.1 TWh in 2024 to 28.2 TWh in 2043, an increase of 27.2 TWh, 2,597.5% or an average annual growth rate of 18.9%.

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 the early planning stage, in a procurement process, or under construction. Their electricity demands are estimated with limited information. The IESO is pursuing additional information and the demand forecast will be updated with new information when it becomes available.

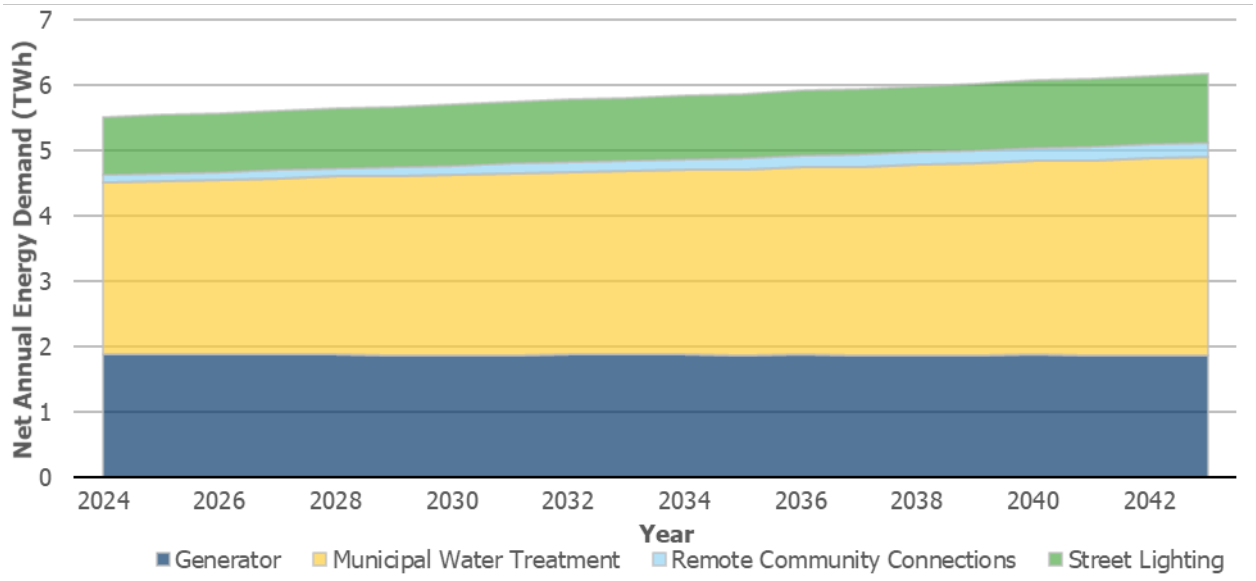
Net annual energy demand grows from 0.5 TWh in 2024 to 1.9 TWh in 2043, an increase of 1.5 TWh, 319.4% or an average annual growth rate of 7.8%.

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 1.5 TWh in 2024 to 30.1 TWh in 2043, an increase of 28.6 TWh, 1,901.7% or an average annual growth rate of 17.1%.

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

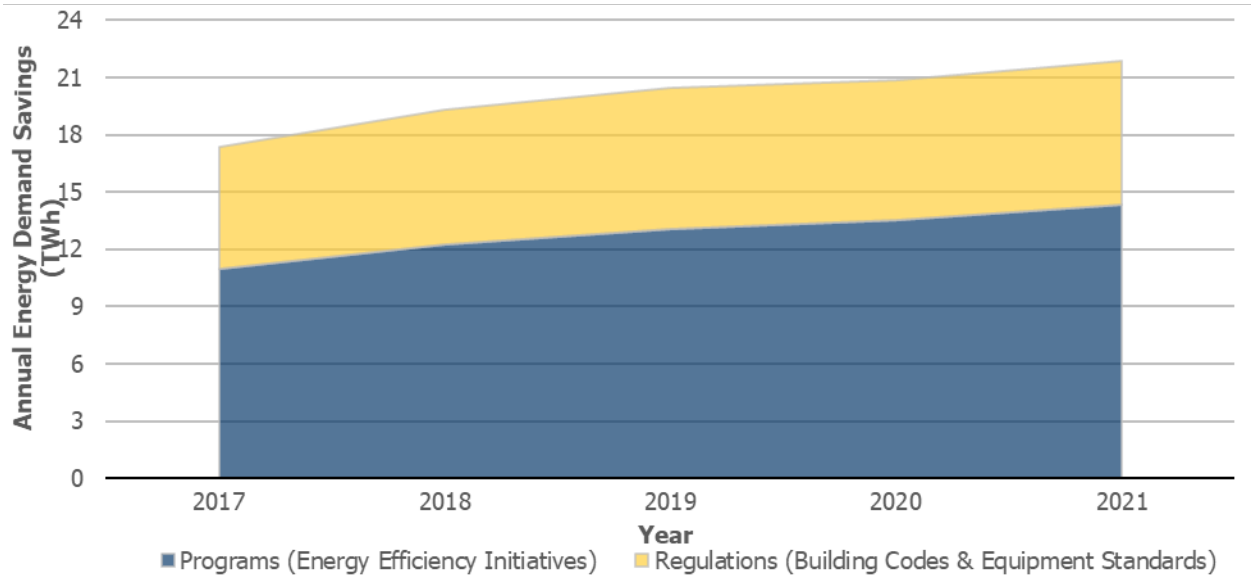


3.7 Conservation

Conservation has made a significant contribution to electricity services in Ontario and has been integral to maintaining a reliable and sustainable electricity system. The resulting electricity savings can be attributed to two main categories, conservation programs, and building codes and equipment standards regulations.

It is estimated that the programs implemented between 2006 and 2021 have contributed approximately 14.3 TWh electricity savings in 2021. Building codes and equipment standards regulations have delivered approximately 7.6 TWh electricity savings in 2021.

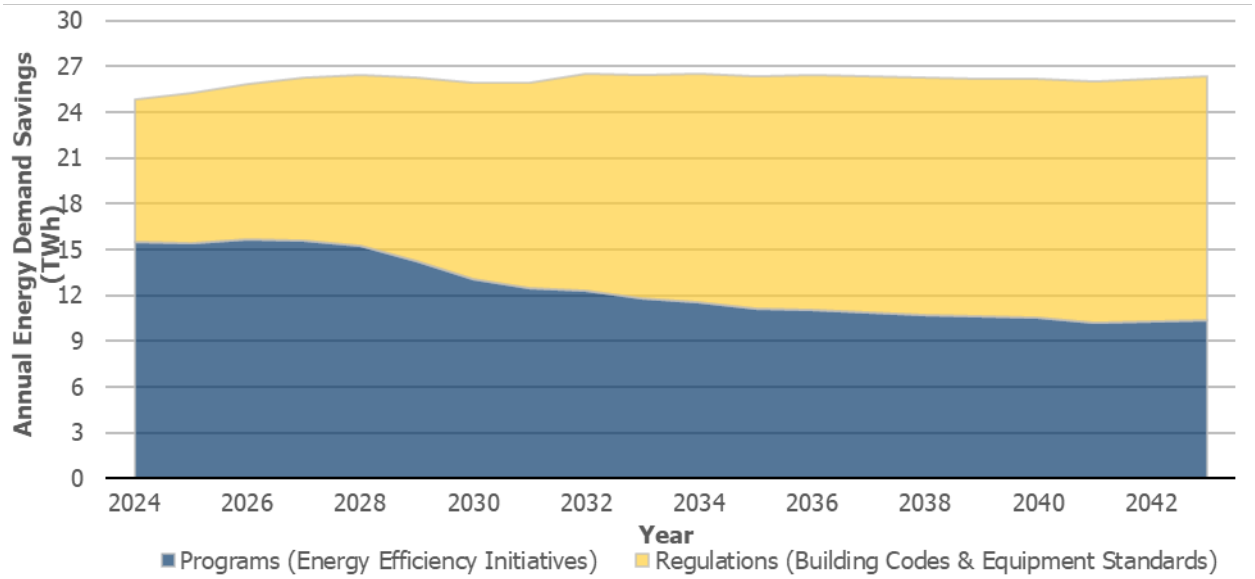
Figure 15: Conservation - Historical - Annual Energy Demand Savings, By Type



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 conservation since 2006 and future programs and regulations will contribute between 24.2 and 26.5 TWh in annual electricity demand savings over the outlook period.

Figure 16: Conservation - Forecast - Annual Energy Demand Savings, By Type



3.7.1 Programs

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

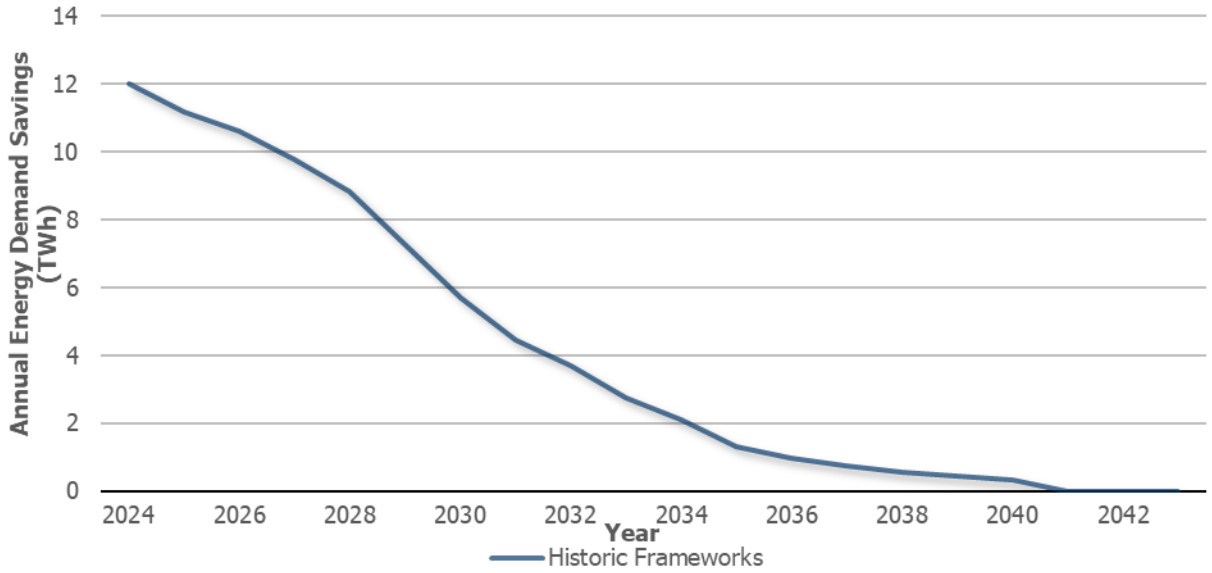
3.7.1.1 Historical Frameworks

Conservation savings resulting from programs typically persist a number of years after energy efficiency measures are implemented. Historical programs from 2006 to 2021 continue to contribute to electricity savings.

A couple of framework initiatives will result in new savings over the next two decades. The 2015-2019 Conservation First Framework and Industrial Accelerator Program wind downs and the 2019-2020 Interim Framework program project completion deadlines have been extended for two years beyond 2020 given the current market conditions such as the COVID-19 pandemic and related supply chain issues. It is estimated that about 0.6 TWh savings are materialized in 2021 and 2022.

From 2024, annual energy savings achieved from historical frameworks decay as energy efficiency measures that achieve such energy savings reach their end-of-life.

Figure 17: Conservation - Historical Program Frameworks - Annual Energy Demand Savings



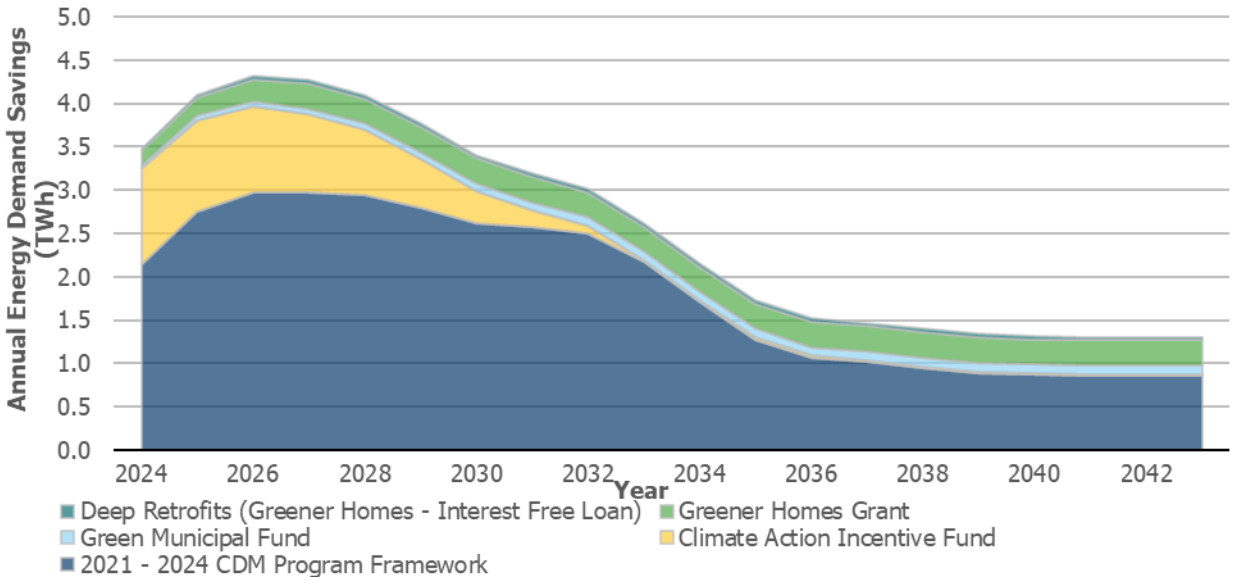
3.7.1.2 Current Frameworks

The current conservation program frameworks include the delivery of the IESO 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. When fully implemented, the annual savings are forecasted to reach 3.0 TWh in 2026.

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 currently forecasted system needs. Additionally, in 2022, at the request of the Minister of Energy, the IESO developed options on an expedited basis for additional and expanded CDM programming to contribute to meeting system needs identified in the IESO 2021 Annual Acquisition Report (AAR), and received a directive to proceed with these options on October 4, 2022. Changes to savings targets resulting from this directive and any subsequent directive associated with the Mid-Term Review /or AAR report back will be reflected in the next Annual Planning Outlook.

In addition to the IESO managed provincial programs, a number of initiatives funded by the federal government are underway, which will result in electricity savings in Ontario. The Climate Action Incentive Fund is expected to achieve 1.1 TWh electricity savings in Ontario by 2024. The Green Municipal Fund, which is managed by the Federation of Canadian Municipalities, is expected to result in electricity savings of 0.1 TWh by 2032 in Ontario. The Greener Homes Grants and the Greener Homes Loan programs help home owners implement emission reduction measures. The combined electricity savings of these two programs in Ontario are estimated to be 0.3 TWh by 2027. 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 and will be updated when more information is available.

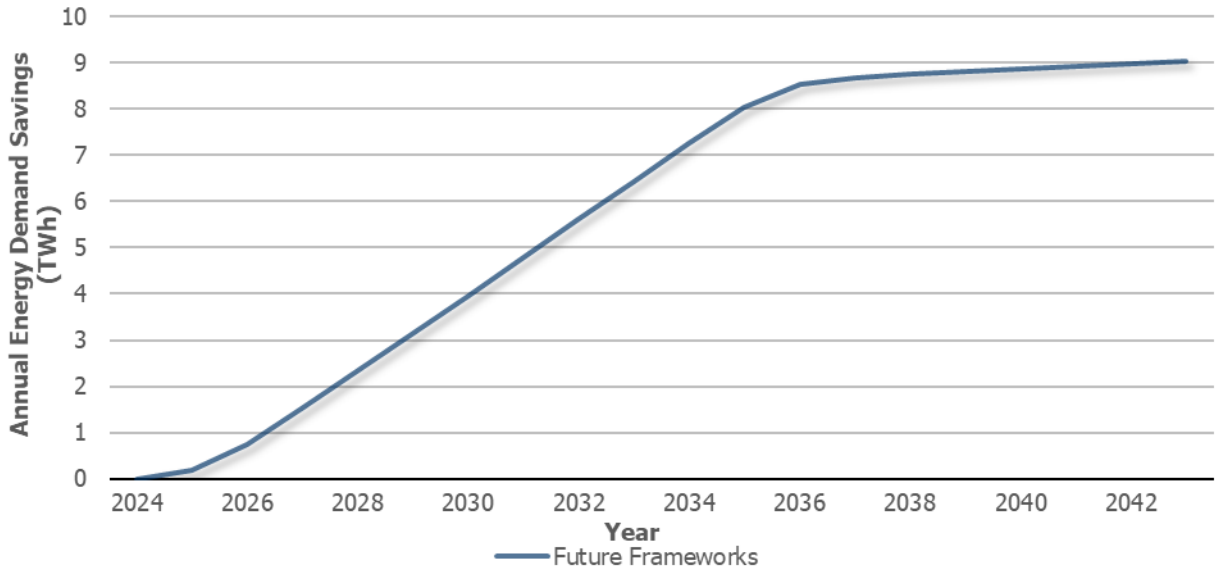
Figure 18: Conservation - Current Program Frameworks - Annual Energy Demand Savings, By Framework



3.7.1.3 Long Term Framework

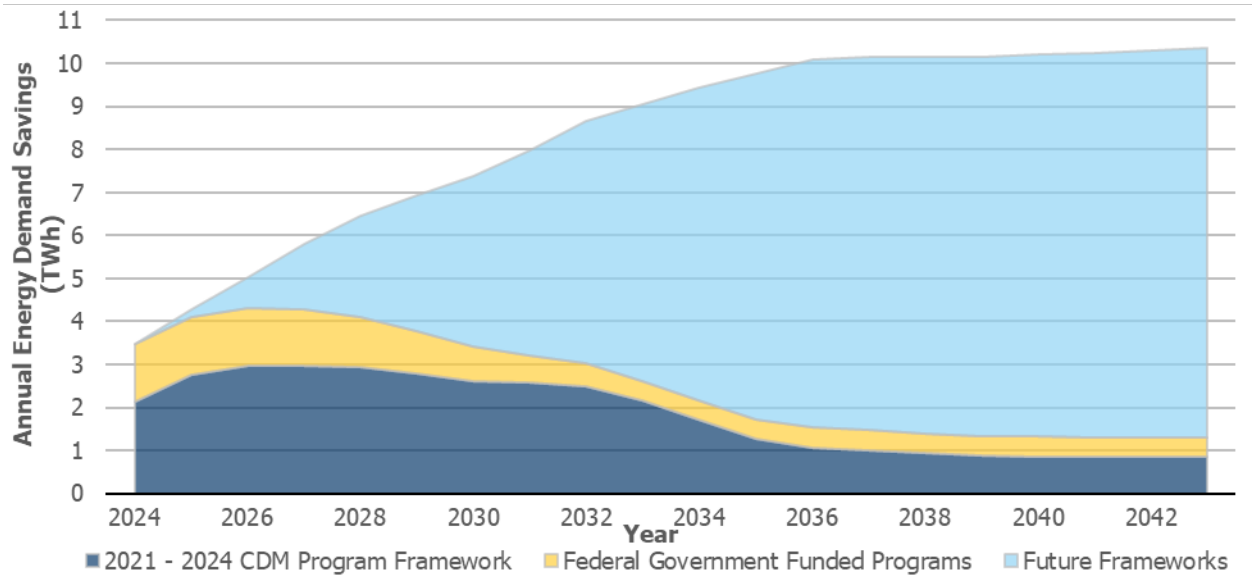
Besides the above mentioned programs that are already in the market, it is anticipated that conservation initiatives will continue. For long term demand forecast and power system planning, the same savings level of 2021-2024 Framework is assumed for the entire outlook period. The annual savings are estimated at 0.47 per cent of gross demand. The long term programs are expected to save 9 TWh in by 2043.

Figure 19: Conservation - Future Program Framework Assumption - Annual Energy Demand Savings



In aggregate, current and long-term conservation frameworks are expected to deliver 10.4 TWh in annual electricity savings in 2043.

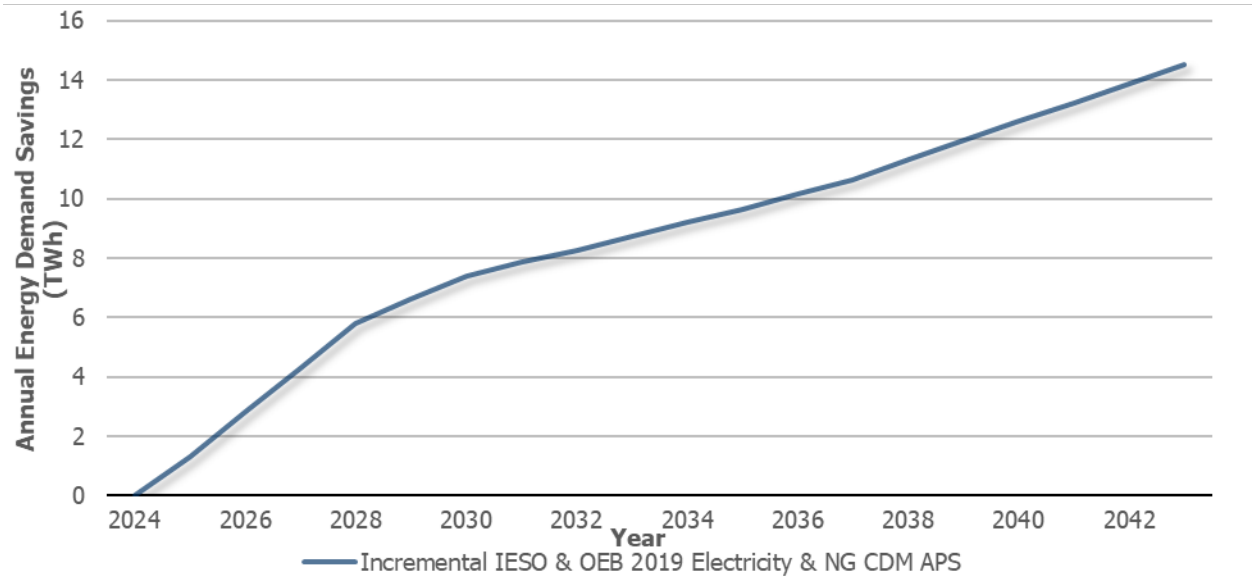
Figure 20: Conservation - Annual Energy Demand Savings, By Framework



3.7.1.4 Incremental Conservation Potential

Separate from the annual energy conservation savings considered in the reference demand forecast, there is considerable potential to achieve incremental savings as identified and quantified in the IESO and Ontario Energy Board Electricity and Natural Gas Conservation Achievable Potential Study completed in 2019, which is estimated to be 14.5 TWh of annual energy conservation savings by 2043.

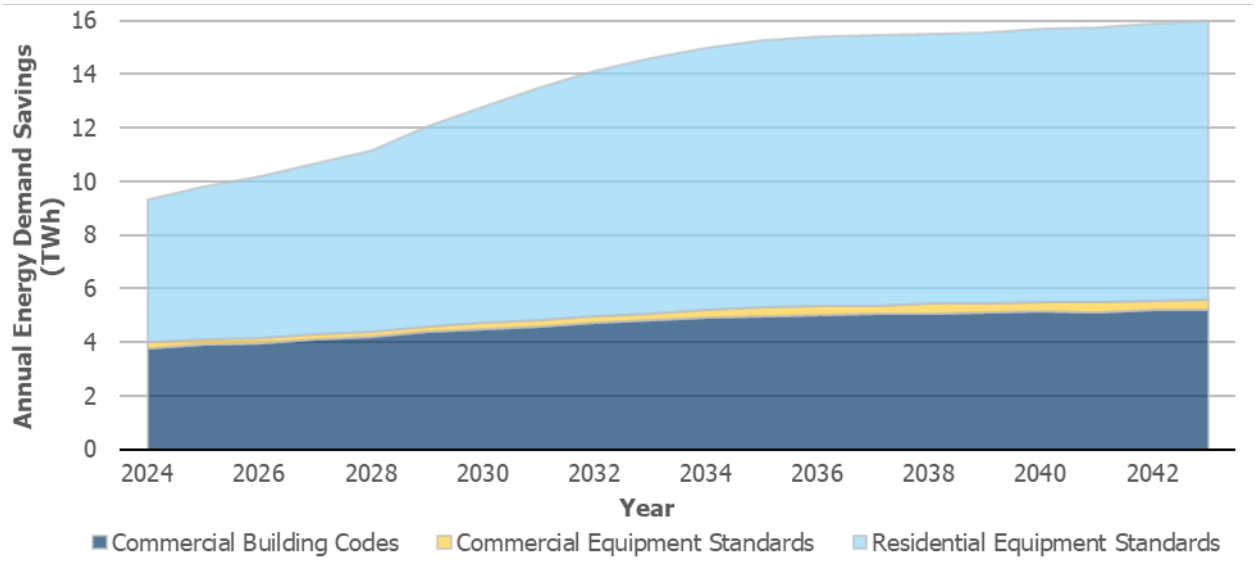
Figure 21: Conservation - Incremental Potential Future Program Framework Assumption - Annual Energy Demand Savings



3.7.2 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 8.9 TWh in 2023 to 15.8 TWh in 2042.

Figure 22: Conservation - 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, demand observations at the system level from the latest available ICI Base Period were reviewed and stratified into average response profiles attributable to the summer top 5 system peak days and the second top 5 system peak days (days 6-11), similarly for the winter and by IESO Zone. In year 2024, for both the summer and winter, in the top 5 system peak day profile, a response of 1,300 MW is expected in the system peak hour and in the second top 5 system peak day profile, a response of 650 MW is expected. These profiles are demonstrated in Figures 23 and 24.

Figure 23: Industrial Conservation Initiative - Daily Profiles

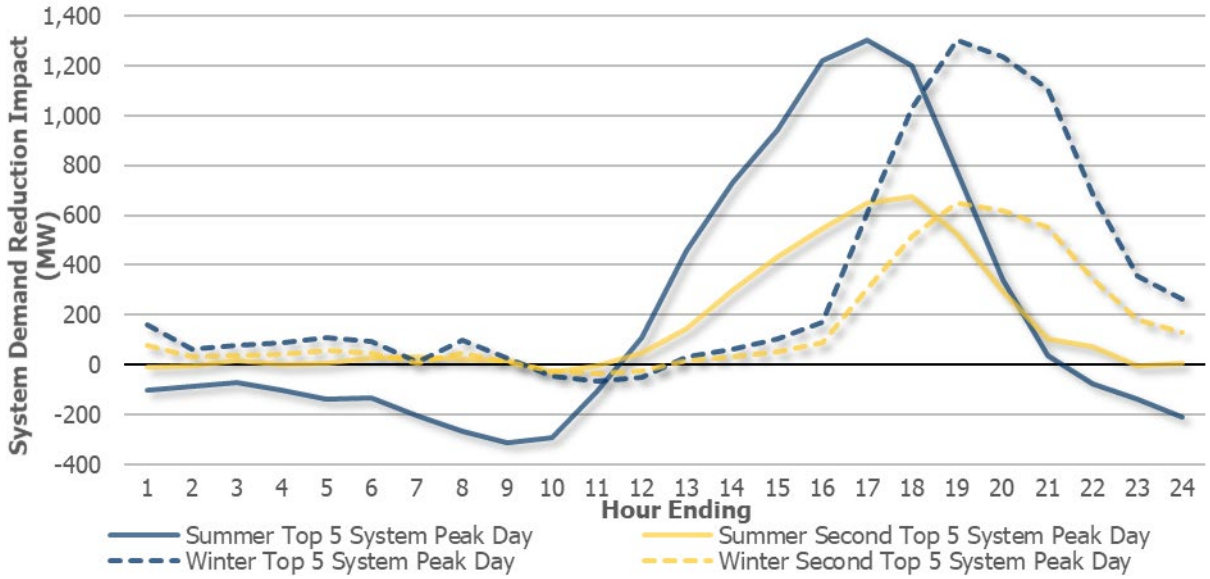
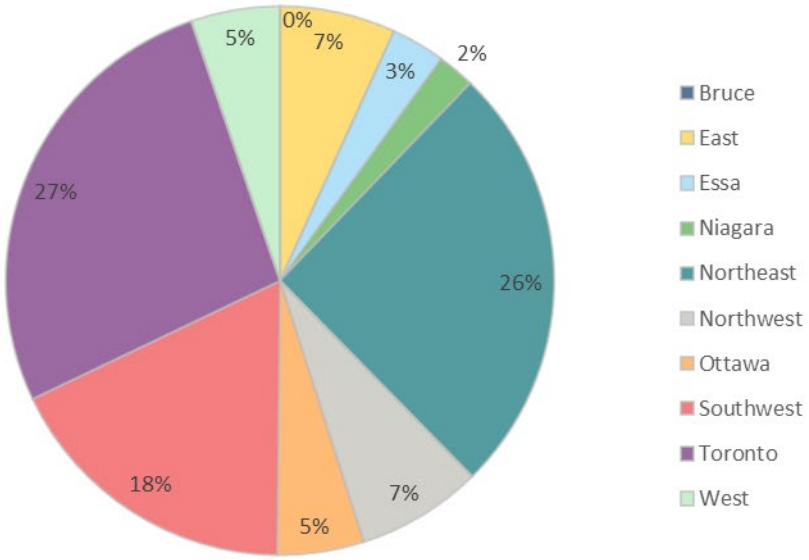
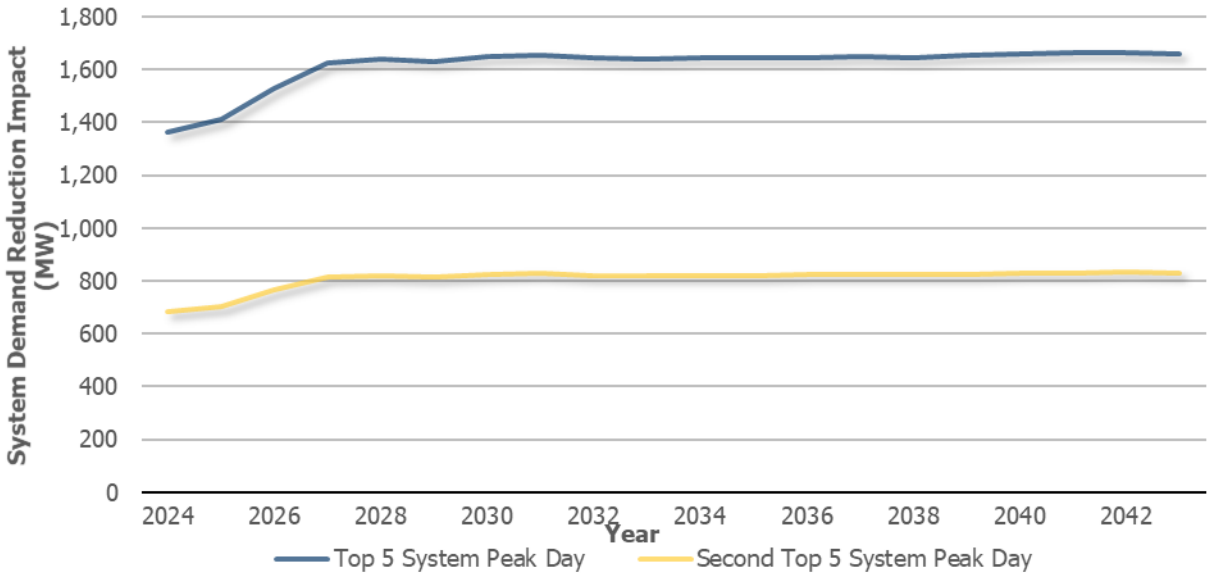


Figure 24: Industrial Conservation Initiative - Response, By IESO Zone



New for the 2022 APO long term demand forecast was the recognition that with the anticipated increase in industrial sector demand levels in the early portions of the outlook period, a commensurate increase in ICI response could reasonably be expected. Correspondingly a growth factor was applied to the ICI response profiles over the years industrial sector demand growth is expected.

Figure 25: Industrial Conservation Initiative - Annual Profiles



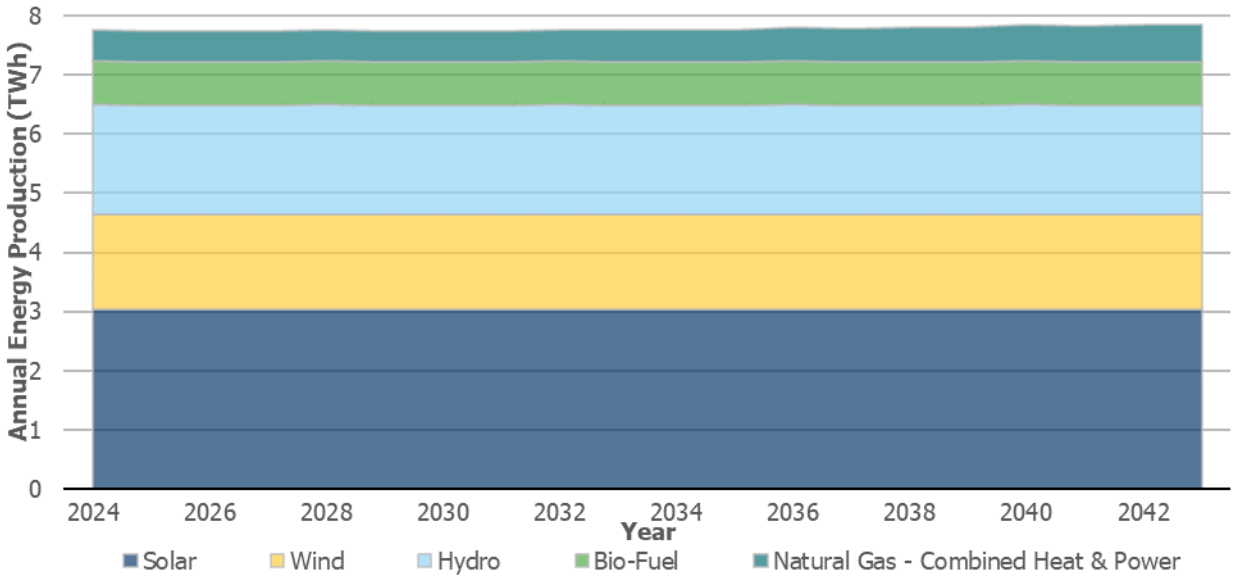
These system reduction impacts have been applied to the demand forecast to the forecasted top 10 system peak days in each year of the outlook period. Industrial Conservation Initiative response is recognized as an uncertainty in the APO long term demand forecast and the IESO reviews the observed responses and refines its ICI impact methodology on an annual basis.

3.9 Embedded Generation

The IESO 2022 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 makes an assumption of continued availability of existing embedded generation resources in each resource's post contract expiry period. With this assumption, embedded generation production forecasts are effectively steady over the outlook period.

Figure 26: 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 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, 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 2024-2028), decreasing in time with a medium degree of confidence in the medium term (years 6-10 or 2029-2033) and relatively lesser degree of confidence in the long term (years 11-20 or 2034-2043).

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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