



Annual Planning Outlook: Executive Summary

Ontario's electricity system needs: 2022-2040

Executive Summary

To help ensure the reliability and cost-effectiveness of Ontario's power system, the Independent Electricity System Operator (IESO) regularly evaluates future demand and supply, using the resulting forecasts as the basis to assess near-, medium- and long-term resource and transmission requirements. Informed by ongoing feedback from stakeholders, and taking into account demand drivers, the transmission system and other inputs, the IESO's Annual Planning Outlook (APO) provides a long-term demand forecast, and an assessment of whether resources will be ready and sufficient to meet that demand.

With the emergence of the COVID-19 global pandemic, greater emphasis is placed on the importance of effective planning for a reliable electricity system. Electricity demand forecasting anticipates future requirements for electricity services and is affected by many factors, including historical demand patterns, demographics, energy prices and, increasingly, energy-efficiency programming and distributed energy resources. While forecasts are, by definition, inexact, in 2020 the ongoing uncertainties associated with the duration and impact of COVID-19 have introduced an entirely new layer of complexity to the development process.

COVID-19 Scenarios Reflect Role of Pandemic in Electricity Planning

Given the unprecedented nature of the pandemic, the 2020 APO forecasts demand using two scenarios based on assumptions about the pace of economic recovery during the outlook period. In each scenario, demand is expected to be lower than 2019 APO forecasted levels in the early years of the outlook.

Scenario 1 assumes a shallow economic recession in 2020 and early 2021 followed by a rapid economic recovery in 2021 and 2022, with demand expected to reach pre-pandemic levels by the end of 2022. Under this scenario, net energy demand is expected to be 142 TWh in 2022, and to increase an average of approximately 1 per cent per year over the outlook period to 174 TWh in 2040, an overall increase of 32 TWh.

In contrast, Scenario 2 assumes a deep economic recession until the end of 2021, followed by a slow multi-year economic recovery starting in 2022, with demand not expected to reach pre-pandemic levels until 2024. The demand forecast for Scenario 2 projects annual net energy demand to be 138 TWh in 2022, and to increase an average of approximately 1 per cent per year over the outlook period to 166 TWh in 2040, an overall increase of 28 TWh.

In both scenarios, longer-term demand will exceed 2019 APO forecast levels for a number of reasons. These include the resiliency and stability of the industrial sector, an increase in residential usage reflecting work-from-home arrangements, and rapid growth in indoor agriculture, particularly in southwestern Ontario. Robust near-term growth in the mining sub-sector, new rail transit electrification projects and decreasing electricity prices will also contribute to increased demand over this time period.

As Ontario recovers from the COVID-19 pandemic, and helping consumers manage their energy costs becomes even more important, government has directed a new four-year electricity conservation and demand management (CDM) framework to come into effect January 1, 2021. The 2021-2024 CDM framework will be centrally delivered by the IESO under the Save on Energy brand and will focus on cost-effectively meeting customer needs and the needs of Ontario's electricity system, including achieving provincial peak demand reductions, as well as targeted approaches to address regional and/or local system needs.

Overall, savings from all energy-efficiency programs¹ in Ontario are forecast to grow to 8.3 TWh in 2040 in Scenario 1, and to 7.9 TWh in 2040 in Scenario 2, from a base year of 2019.

Nuclear Refurbishments, Retirements and Contract Expirations Increase Needs

Ontario's diverse supply mix – nuclear (28%), gas (26%), hydroelectric (23%), wind (14%), solar (7%), demand response (2%) and bioenergy (1%) – means that the province is generally well positioned to meet future resource adequacy needs. However, throughout the 2020s, many existing contracts will expire, nuclear refurbishments will be underway, and Pickering Nuclear Generating Station (NGS) will retire.

The capacity adequacy outlook indicates that needs continue to emerge through 2022, without assuming the continued availability of existing resources. Needs are largely summer driven, while winter needs are dependent on growth in the agricultural sector. These needs increase again in the late 2020s and through the 2030s, driven by the Pickering NGS retirement, nuclear refurbishments, expiring contracts, and demand growth. With the continued availability of existing resources, the needs can be met until 2024. The capacity need eventually becomes an energy need, driven by resources with contracts expiring in the late 2020s and early 2030s.

The energy adequacy outlook indicates that Ontario is expected to have a sufficient supply of energy, providing existing resources continue to be available post-contract expiry. That said, the ability of existing resources to remain available will depend on a number of factors, including asset age and condition, need for capital investment, market conditions and available acquisition tools.

Surplus baseload generation is forecast to decrease due to rising demand and the retirement of Pickering NGS, and can continue to be managed through existing market tools.

In 2019, Ontario imported 6.6 TWh of energy and exported 19.8 TWh. While increasing exports in the wake of falling demand in the early months of COVID-19 has significantly reduced costs for consumers, energy exports are expected to decrease sharply in the early 2020s with the retirement of Pickering NGS by 2026 and ongoing refurbishment outages.

In fact, Ontario is projected to become a net importer for the first time since 2005, with the balance of trade expected to return to exports following the completion of nuclear refurbishments in the 2030s. This will mean that the province will need to address transmission constraints at interties that hinder the province's ability to import more electricity.

¹ Includes existing and committed IESO-funded energy-efficiency programs, programs funded by the federal government and the assumption of continued delivery of IESO-funded energy-efficiency programs at current savings levels through the outlook period.

With nuclear retirements, refurbishments and contract expirations driving the need for capacity, reinforcing transmission in key areas of the province will be essential to maintaining reliability. Over the next five years, several major transmission projects to improve the transfer capability of bulk transmission interfaces to and from neighbouring jurisdictions, and ties between the province's 10 electricity zones,² will come into service.

Innovation, New Procurement Options to Play Role in Meeting Future Needs

After a postponement as a result of COVID-19, the IESO held its first capacity auction in December 2020. These auctions, which will evolve over time to reflect lessons learned and open participation to more resource types, are expected to drive down costs through competition, and give the IESO the flexibility to adjust to changing system conditions. While capacity auctions will meet short-term needs, to keep off-contract resources in the market and procure new capacity, the IESO is currently exploring other acquisition tools as part of a Resource Adequacy engagement – target capacities for these will be informed by this APO and future editions.

Established, in part, as a result of stakeholder feedback on the limitations of having a one-size-fits-all procurement mechanism, the Resource Adequacy engagement will develop a robust framework of competitive mechanisms to meet Ontario's resource adequacy needs in the short, medium and long term. In addition to better balancing ratepayer and supplier risk, the framework is expected to support competition and produce efficiencies that will benefit suppliers, the system and ratepayers.

At the same time, the IESO and other system operators are continuing to explore the role of distributed energy resources (DERs) in addressing future energy and capacity needs. In addition to releasing a series of white papers, including two that focus on expanding DER participation in the IESO-administered markets, the IESO has supported a number of DER demonstration projects as outcomes of recommendations made in the IESO's Integrated Regional Resource Plans (IRRP). The latter includes a York Region Non-Wires Demonstration Project, which is using a local electricity market to test the effectiveness of DERs in meeting escalating regional needs, while reducing costs.

As part of its commitment to address barriers to DERs, the IESO has also made headway in its efforts to integrate storage in the system. In September, the IESO released its long-term vision for energy storage and the interim Market Rule amendments will clarify the opportunities for storage in today's markets.

² Visit the IESO's [zonal map](#) illustrating the 10 electrical zones.

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