

HOW CONFIDENT SHOULD WE BE IN ONTARIO'S ELECTRICITY DEMAND FORECASTS?

On October 16th, 2024, Ontario's Independent Electricity System Operator (IESO) released its [updated electricity planning forecast](#), complete with press conference and photo op. The IESO envisions electricity demand increasing by 75% leading into 2050, not the mere 60% growth projected last year. Industrial expansion, a growing population and imminent electrification combine to explain the new numbers. This forecast is prelude to the full Annual Planning Outlook (APO), which will be available in Q1 of 2025.

IESO forecasts always attract headlines. Divining what might occur in two decades is difficult and watchers enjoy learning which messages the agency sees in its crystal ball. This year, however, the announcement carried extra importance. There were two reasons for this. First, the new forecast represents an enormous 25% increase over last year's estimate. Second, the IESO's numbers provided justification for what came next. The same week that the new forecasts were released the Ontario Government announced a new "vision" for Ontario's energy future.

The government's new vision, [Ontario's Affordable Energy Future: The Pressing Case for More Power](#), outlines an ambitious multi-decade plan for the province's energy sector. There is a lot to this plan. Much of it hinges on realizing those IESO projections.

The challenge, of course, is that long-term predictions involve substantial uncertainty. It is exceedingly difficult to predict the state of the economy, and hence the province's energy needs, two or more decades into the future. Yet, major investment decisions are frequently based on these forecasted future energy demand scenarios, so understanding how effective the agency is at predicting long-term electricity demand becomes especially important. Put differently, how confident should we be in Ontario's electricity demand forecasts?

WHAT CHANGED FROM LAST YEAR?

Before looking at this year's numbers, it's worth asking: what changed over the past 12 months to warrant the IESO's recent upward revision in electricity demand?

To start, casual observation suggests macro headwinds working against energy sector growth. For example, according to Ontario's 2024 Budget (pre-Fall update), short-term economic growth has slowed: ["the economic outlook has deteriorated compared to the 2023 Budget with significantly lower growth projected in 2024, and slightly lower growth in 2025 and 2026. Job growth is also projected](#)

[to be lower in 2024 as a result.](#)” Next, the Federal Government’s new [Immigration Levels Plan](#) sees “stabilized” immigration over the same period, limiting population growth. Finally, the lagging four-quarter average [growth of zero-emissions vehicles registrations](#) has declined (although, it is still positive), and [recent evidence from California](#) hints that EVs require substantially less energy and infrastructure than initially estimated. Taken together, these trends suggest tempering growth expectations, not raising projections.

The rejoinder is that past trends and California’s experience are not informative of future developments in Ontario. Simply look at everything happening in the province. Several battery manufacturing facilities are under construction, Algoma Steel is installing electric arc furnaces, and [Ontario wants to become a hub for electron-hungry AI data centers](#). These trends point to a level shift in demand, a shift that needs to be satisfied.

Fundamentally, there are conflicting narratives about the future of Ontario’s electricity demand. Different perspectives on the province’s economic trajectory imply increased risk. Slow economic growth yields a greater chance of expensive overbuild. Underestimating load during a period of rapidly growing demand means that Ontario might soon run into energy shortages. The risk arises because it is difficult to pin down which scenario is more likely. Managing this risk involves identifying, assessing, and mitigating potential threats that could impact the reliability, affordability, and sustainability of energy supply.

Typically, controlling the difficult risks associated with building the energy sector is achieved through independent regulators. In principle, independent regulators, such as the Ontario Energy Board (OEB), have subject matter expertise and offer political cover for what are often controversial decisions. Recent legislation in Ontario, however, moves the province towards more centralized government control. One example of this trend towards centralization is the draft legislation, [Bill 214, Affordable Energy Act](#). Bill 214 empowers the Lieutenant Governor in Council (i.e., Cabinet) to “to make regulations exempting persons or things from provisions of the Distribution System Code and the Transmission System Code relating to cost allocation or cost recovery.” In the same clause, the Bill strips the OEB of its previous power: “The chief executive officer has no authority to amend or revoke an amendment specified by the Lieutenant Governor in Council for as long as the regulation specifying the amendment is in force.” In essence, the Government is assuming responsibility for more of the risks that affect the energy system, risks embedded in the IESO’s forecasts.

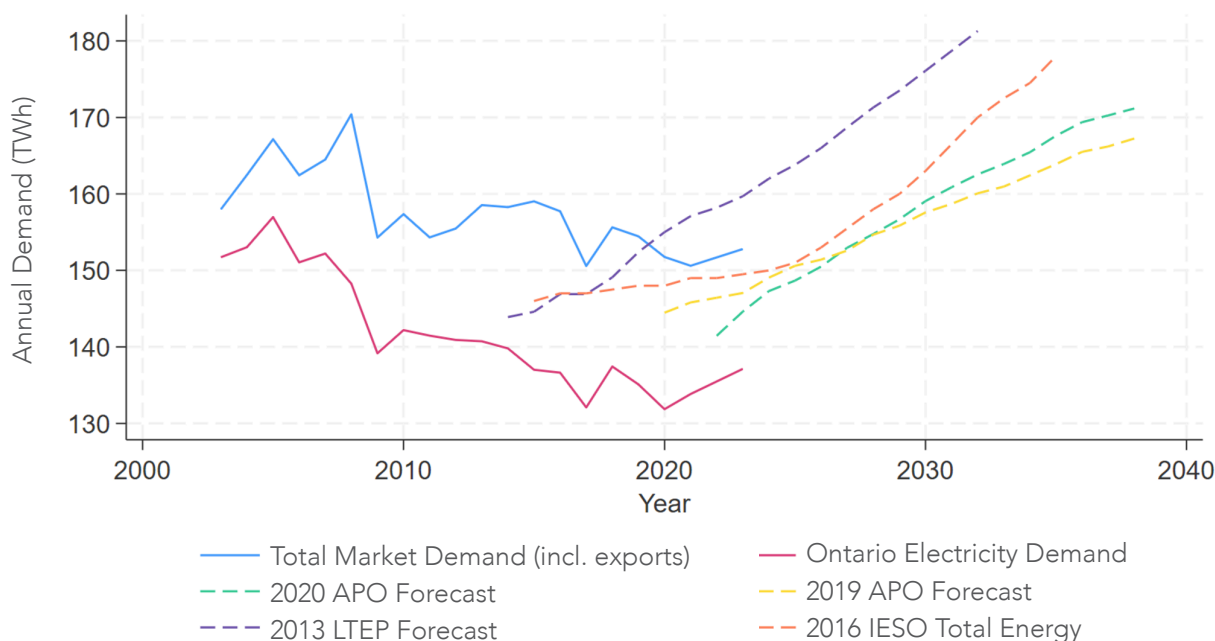
EXAMINING A DECADE OF FORECASTING ONTARIO ELECTRICITY GROWTH

Because so much of Ontario’s energy vision depends on load growth, there is merit in understanding how closely the electricity demand aligned with previous forecasts. How much faith should we put into the evidence supporting Ontario’s new energy vision? Of course, answering this question is impossible in 2024. Only with hindsight will we be able to evaluate the IESO’s current predictions. Still, lessons can be gleaned by studying previous forecasts. Put differently, we can ask what do we learn when we compare electricity demand forecasts from 10 years ago to what actually occurred in the province.

The following figure compares Ontario’s actual annual electricity demand to forecasted electricity demand. Two solid lines are presented. Both represent actual market demand for 2003 through to the end of 2023. The solid blue is Total Market Demand including exports. The solid red line is the electricity demand exclusively from Ontario. (The data are from the [IESO website](#).)

Several trends are immediately obvious. First, demand declined for roughly 10 years before flattening in 2015. Since 2015, Total Market Demand has averaged roughly 153 TWh per year, while Ontario Electricity Demand has equaled approximately 135 TWh. Second, the gap between Total Market Demand and Ontario Electricity Demand has increased over the past decade. Ontario now exports proportionally more electricity than in the early 2000s. Over the past 6 years, Ontario exported an average of 11.5 TWh/year or slightly more than 8.5% of domestic demand.

Annual Long-term Electricity Demand Forecasts



The solid lines in the figure should be compared with the dashed lines. The dashed lines illustrate a series of forecasts for Ontario's long-run electricity demand, going back to 2013. (To be fair, the IESO offers a series of projections. This analysis uses the references cases where these were identified.) The 2019 and 2020 estimates are from the IESO's Annual Planning Outlook. The internet Wayback Machine was needed to dig up limited data on the 2013 Long-term Energy Plan and 2016 IESO forecast as these were unavailable on the IESO website.

Instantly noticeable are the trend differences between the actual compared with forecasted electricity demand. Reality points downward, while the forecasts point upward. Put differently, the IESO tends to predict load growth, even while realized demand in the province remained stagnant. Indeed, the projections tend to systematically overestimate Ontario Electricity Demand, even in the short- to medium-run. The oldest estimate, the decade-old 2013 LTEP, overshot 2023 Total Market Demand by 7.0 TWh and Ontario Demand by 22.6 TWh, a 16.5% over-estimate. (This is evident by comparing the dashed purple line to the solid blue and red lines.) Unfortunately, the LTEP is not a fair, apples-to-apples comparison. Some of this overestimate is attributable to efficiency improvements and embedded generation. Nonetheless, the 2016 forecast overshot Ontario's 2023 electricity demand by 12.4 TWh. This starts to reveal a pattern that we need to be cognizant of when planning the future of Ontario's energy system.

To return to the theme, it is not that the IESO is wrong when their guesses don't match the 2023 experience. The difference between what is predicted and what happened reflects the uncertainty and

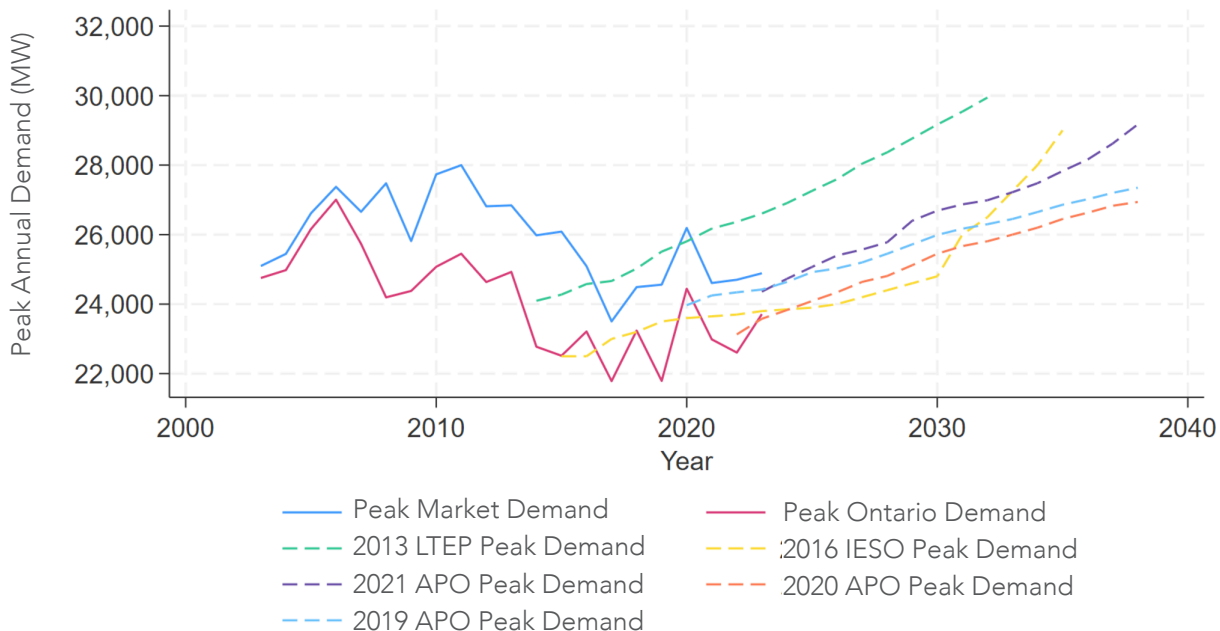
risk underpinning the IESO forecasts. Importantly, this risk doesn't disappear with a new energy vision. Rather it suggests that risk should be prominent in debates about Ontario's energy future.

THE IESO IS GOOD AT PREDICTING PEAK LOAD

Annual demand is clearly important. Forecasting peak demand is also important. To this end, the IESO formulates predictions about Ontario's expected peak power requirements within a given year. The October 15th release contained new estimates for future peak demand too (27,000 MW by 2030).

The next figure replicates the previous one and adds the 2021 APO estimate. Instead of looking at demand summed across all hours in a year, however, the figure plots the single highest hour (i.e., the peak hour) within a given year. As above, solid lines are realized demand, while the dashed lines are the forecasts.

Annual Peak Demand Forecasts



The figure shows Ontario's all-time peak electricity demand occurred in 2006. The market's all-time peak occurred in 2011. It also highlights that, notwithstanding the 2013 LTEP, the IESO is quite good at predicting peak Ontario demand.

Of course, there is a fundamental difference between annual energy needs and peak demand. Overall demand is fundamentally an infrastructure problem. Peak demand is different. Economic efficiency maintains that peak demand is best addressed via pricing, rather than new build. To state this another way, smart electricity pricing is a substitute for infrastructure when addressing peak load. Smart pricing also helps manage risk. Excess capacity is expensive. If we can avoid building too much, we should do that. Peak pricing, [in whatever form it takes](#), helps align behaviour with the operational needs of the grid, ultimately making the system more affordable and efficient.

A NEW ERA FOR ONTARIO'S GRID?

Forecasting is hard. While it is reasonable to predict what might occur in one or two years, determining what will happen in 2050 is extremely difficult. (Of note, [Hydro-Quebec only forecasts 10 years into the future](#), while [Manitoba Hydro provides numbers for the next 20 years](#).) The IESO is an expert agency, and the only player offering official, publicly available forecasts of system growth. Yet, historically, the IESO appears to systematically over-estimate Ontario's long-term electricity demand. Ontario still needs to build for future load growth, but prudence is needed when determining precisely how much.

Ultimately, electricity system planning boils down to three questions:

- How much energy do we need?
- What sources should we use to generate that energy?
- Who and how will we pay for new infrastructure?

Answering these questions involves walking a tightrope. The goal is to build an energy system that maximizes overall social benefit to Ontarians. Build too much and Ontario's energy costs will be unnecessarily high. Run short of power and we may constrain economic growth in particular industries or regions in the province. Develop the wrong mix and there may be unnecessary environmental externalities or reliability risks.

According to the IESO and Ontario's Ministry of Energy and Electrification, we are entering a new era. Ontario is destined to become an "[energy superpower](#)," one that exports energy to our neighbours. As with all long-term plans, humility is wise. Successful energy planning usually requires independent oversight and built-in offramps. It is difficult to overlook the similarities between the October 16th announcement and what was expected in previous forecasts. The way to ensure that Ontario chooses the right amount of capacity, using the appropriate mix, while keeping costs affordable is to develop institutions and mechanisms that protect against scenarios where load fails to materialize. We don't want to pre-maturely commit to expensive solutions that we don't need, regardless of what the numbers predict.

Finally, while forecasts and plans are needed, so is independent review. Perhaps, there's merit in subjecting IESO forecasts to something like a biennial review. Meaningful independent review, not a meagre stakeholdering process, offers myriad participants an opportunity to obtain external perspectives on the inevitable risk inherent in electricity demand forecasts.

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