



White Paper

The Perfect Storm for Ontario Gas Generators

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Shareables

- Ontario faces supply uncertainty as long term supply contracts for gas facilities expire the same time as nuclear capacity retires in the mid-2020's.
- Generators will face two concurrent market systems, with newly developed energy and competitive capacity markets, while legacy capacity contracts are not set to expire until 2025 and onwards.
- The transition towards a low-carbon economy has numerous ramifications for generators - from higher fuel costs due to cap and trade to potential increases in demand for their generation due to electrification.

Executive Summary

The introduction of a cap and trade system in Ontario has shaken the gas generation sector, with many generators facing uncertainty around the recovery of costs associated with the cap and trade program through their supply contracts. Over the next 15 years, change will accelerate. Uncertainties around supply and demand will be compounded by regulatory and structural reform. Ontario is transitioning from a heavily contracted energy-only market to incremental capacity auctions and a reformed energy market. This transformation presents an opportunity to improve efficiency and transparency, but the time line coinciding with nuclear retirements and ongoing long-term contracts still in place will create transitional challenges.

The Perfect Storm

With energy and climate policy advancing the transition towards a low-carbon economy, changes to market design and operations, and the era of long-term supply contracts for gas generators coming to an end, Ontario's electricity sector is heading for over a decade of continuous upheaval. Transitioning from contracted to merchant supply, gas generators will be exposed to market changes and developments more than any other type of supply in the market.

The cap and trade program, lacking in definition post-2020, has imposed a carbon price, with Ontario in the passenger seat of price and policy developments due to the likely linkage with California. Retirements and refurbishments of nuclear units will open a gap of baseload power supply starting in 2023 that will need to be met with reliable and flexible generating sources – without much room to increase emissions on the path to a 37% emission reduction target in 2030. With a largely decarbonized power sector, the emission reduction targets will require the province to take steps towards deep decarbonization of other sectors, such as transportation and the industrial and residential sectors – with potential impacts on the power sector demand due to increased electrification. Market renewal is expected to fundamentally alter the mechanics of the Ontario electricity marketplace and introduce new concepts, such as incremental capacity auctions and a single-schedule energy market. These shifts are expected to occur in a condensed time frame over the next 10 years – when the majority of supply will be regulated through legacy supply contracts, with limited ability for generators to adapt to the changing environment around them.

Demand Uncertainty Persists Through the 2020's

The demand for natural gas generation depends in large part on the provincial demand for electricity. With renewables, hydro and nuclear power unable to quickly respond to changes in load, natural gas generation is the primary balancing resource in the Ontario power system. Demand in excess of non-emitting resources is therefore directly shaping the role for natural gas generation in Ontario.

IESO's Ontario Planning Outlook (OPO)¹ has projected electricity demand in the province through its four scenarios, ranging over 60 TWh in electric load by 2035. While natural gas may only be required for system reliability instead of meeting load requirements in the negative demand growth Outlook A, natural gas generation could surpass even hydroelectric generation to become the second largest supplier of electricity in the OPO scenarios with higher load growth (Outlook C or D).

Ontario Demand Forecasts

In September 2016, the IESO published its Planning Outlook, entailing four demand trajectories for electric demand across the province:

- **Outlook A** – Negative demand growth
- **Outlook B** – Low demand growth
- **Outlook C** – Electrification demand growth
- **Outlook D** – High electrification demand growth

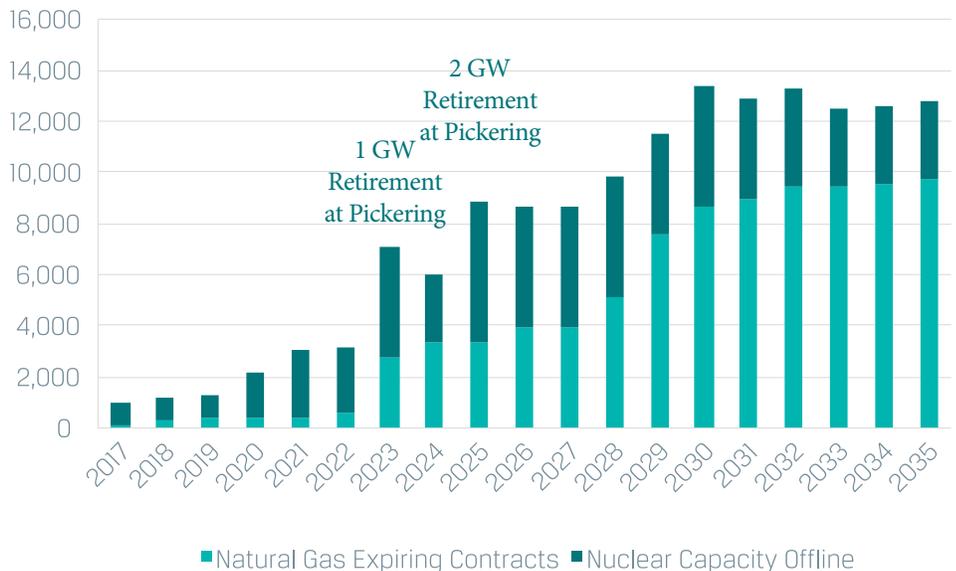
**Nuclear Capacity and Conservation/
Electrification Shape Long-Term Supply
and Demand**

Supply		Demand
1.3 GW Gas Capacity Additions, Minimal Retirements	2017 - 2020	No Significant Demand Changes
No Large Additions or Retirements Projected	2020 - 2023	Little Uncertainty, Conservation Funding Unclear
Retirement of 3 GW at Pickering in 2023 and 2025	2023 - 2025	Conservation Progress Will Shape Demand Trajectory
Nuclear Refurb Program Through 2033	2025 - 2035	Electrification Could Increase Demand Significantly

Even the negative demand growth scenario, however, includes over 30 TWh of conservation measures, an increase of 250% over current conservation levels. Should conservation not materialize as projected, even the OPO's lower demand growth scenarios (Outlooks A and B) could see demand growth at a time when Pickering retires and units at Bruce and Darlington are being refurbished. The components that define the demand scenarios are furthermore the result of policy directives and programs not defined beyond 2020, such as the Conservation First Framework² and the cap and trade program.

Supply uncertainty in Ontario exists mainly due to the nuclear retirements and refurbishments overlapping with the expiration of natural gas contracts and the uncertain future of gas capacity in the new capacity markets. The \$20 billion nuclear refurbishment program is expected to lead to the refurbishment of over 7.5 GW of capacity at the Bruce and Darlington sites, while 3 GW of capacity are expected to retire at the Pickering facility. As shown in Exhibit 1, contracts of large natural gas facilities start expiring when supply is needed most – during Pickering's retirement in 2023 and onwards.

EXHIBIT 1: EXPIRING NATURAL GAS CONTRACTS AND NUCLEAR CAPACITY OFFLINE (MW)



Source: IESO

Market Design Changes During Testing Times

The IESO is currently engaging stakeholders in a market renewal process, which is expected to re-shape the electricity system in Ontario. While exact design elements and components are to be confirmed through further stakeholder discussions, the market renewal focuses key elements of the wholesale energy market operations and incremental capacity auctions.

² <http://www.ieso.ca/sector-participants/conservation-delivery-and-tools/conservation-first-framework>



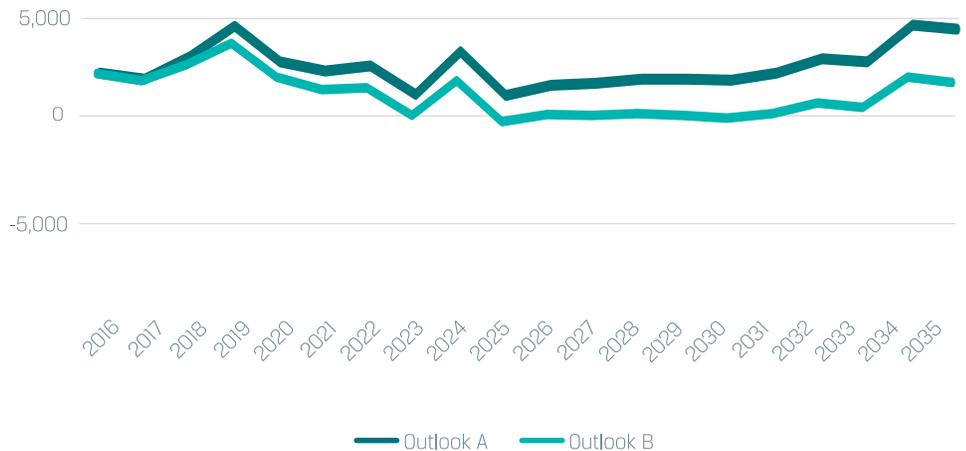
Each element of the market renewal process alone could profoundly alter the electricity system in the province. The energy market reform seeks to improve the efficiency of the Ontario marketplace, introducing market structures akin to those found in electricity markets in the US. The energy market will be based on locational marginal pricing (LMP), and will eliminate the current dual schedule pricing and dispatch system that is unique to Ontario in exchange for a day-ahead market with a single schedule market, enhanced real-time unit commitment and more frequent intertie scheduling.

After decades of procuring resources through long-term contracts, the IESO is shifting towards a competitive, market-based approach of meeting capacity requirements. Incremental capacity auctions will be designed to provide price signals to incentivize market entry to lowest cost resources.

As the market renewal process is ongoing, the IESO has initiated the transition towards competitive contracting, not extending several non-utility generator (NUG) contracts. Some NUG facilities with contracts that expired in 2016 did not receive extensions and have since mothballed. Other contracts were re-negotiated to provide capacity payments in the short term without delivery obligations for the facilities. Preventing new long-term contract structures is a first step to move towards the capacity auction system, as facilities that retire or fall out of the supply mix do not contribute to meeting the reserve requirement, increasing the need for capacity to be procured at a future auction.

Despite the mothballing or retirement of these small NUGs, substantial need for capacity is unlikely to materialize by the time the first auction is planned for in 2020. A market roll-out at times when the need for capacity isn't yet evident will allow for adjustments and improvements in the early stages, but the lack of demand for capacity will put generators, most notably NUGs that face contract expirations between now and the early 2020s, in the position of requiring revenues from the sale of a product that is not needed.

EXHIBIT 2: SUMMER PEAK CAPACITY SURPLUS BY OPO OUTLOOK (MW)

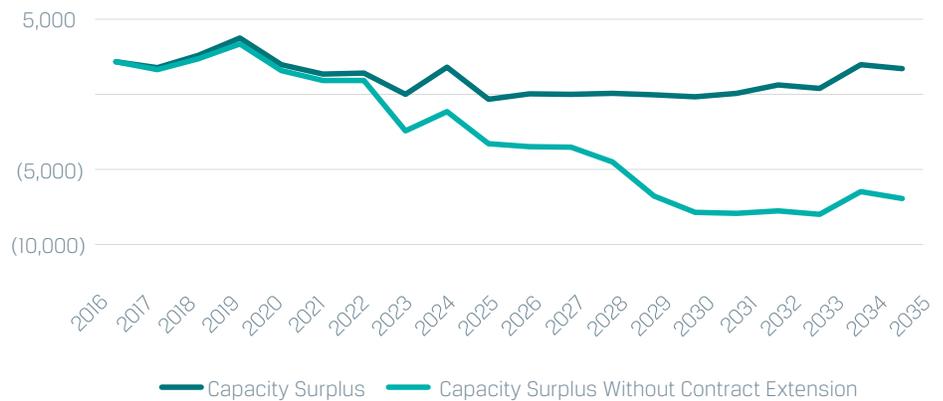


Source: IESO OPO



The functions of the capacity market will be put to the test in the period from 2023 – 2030. Even if all the NUGs that face contract expiration between now and 2022 are assumed to retire, a capacity surplus of over 500 MW in 2022 would see capacity auctions only needing to start in 2023. For units rolling off contract before a competitive market is fully established, the decision to keep the facility operational versus a retirement of the facility will in large part be driven by the value of the capacity that facility owners expect to be able to realize in the auctions. As shown in Exhibits 2 and 3, under the Outlook B demand scenario, a supply deficit between 2025 and 2030 is projected unless all facilities with expiring contracts remain in the supply mix. These gas facilities will have to compete with potential new resources in the capacity market to continue to receive capacity payments, which are currently provided under their supply contracts. This competition will test the new capacity market's ability to procure low-cost resources if for the province.

EXHIBIT 3: SUMMER PEAK CAPACITY SURPLUS IN OPO OUTLOOK B (MW)



Source: IESO OPO

During the market renewal process, the IESO will aim to transition the power system from contracted to competitive market procurement. This challenge is compounded by the retirement of Pickering and the bundling of other market reforms, requiring both the IESO and stakeholders not just to get it right, but too get it right the first time.

Long-Term Supply Contracts: The End of an Era

Phase I – NUG re-contracting

The NUG contract structures with \$/MWh generation tariffs have resulted in the less efficient, older gas units generating baseload electricity, while efficient, large combined cycle units balance the peak and provide operating reserves. Due to the varying terms of the initial NUG contracts from the 1980's and 1990's, NUG contract expirations occur between 2010 and 2020.

Long-Term Natural Gas Contracts are Being Phased Out Over the Coming Decade

Individual NUG Contract Negotiations	2010 - 2015
Suspension of NUG extension negotiations	2015 - 2017
Expiration of majority of remaining NUG contracts	2017 - 2021
Natural Gas contracts expire, unlikely to be renewed	2023 - 2035

In 2010, as NUG contracts started to expire, the IESO initiated negotiations with generators to extend or re-negotiate their agreements. Given new priorities of emission reductions and system efficiency, the government of Ontario directed the IESO to suspend the negotiations with NUG facilities in December 2014. At that time, many NUGs were still on their legacy contracts, while other contracts had already been re-negotiated. Since the suspension of the negotiations, several facilities have retired or entered into enhanced dispatch agreements, providing them with fixed capacity payments until the end of the contract period without delivery obligations.

Phase II - CES and cap-and-trade

Ontario's cap and trade program requires fuel distributors to purchase and surrender allowances in accordance with the emissions generated from the fuel consumption at their clients' facilities. The costs associated with acquiring these allowances are passed on to their clients through an Ontario Energy Board approved fuel surcharge. Natural gas-fired facilities are exposed to this increase in their fuel bill and will pass this cost increase onto the consumer through their market bids.

While market revenues earned in the wholesale market allow for cost recovery of the incurred fuel surcharge, Clean Energy Supply (CES) contracts may require specified coverage of CO₂ costs in the contract in order to avoid a negative revenue impact. As many of the CES contracts were signed in the late 2000's, well before cap and trade systems were contemplated in Ontario, these contracts may not include specific terms accounting for the carbon costs. As carbon costs rise under a declining emissions cap, so will the impact of incomplete CO₂ coverage on the long-term supply contract revenues.

Phase III - Market Renewal and contract expiration

Ontario's transition from an energy-only market with a dual-scheduling pricing and dispatch system, to a single-schedule energy market with incremental capacity auctions will occur in a setting where the majority of large gas generators are still contracted. While existing capacity-based contracts will likely be honored through their term, the change in market design will alter the way facilities operate and participate in the market. Facilities will need to be flexible and nimble in order to adjust to changing market environments, while remaining in compliance with their contract terms.

Any negotiations with the IESO need to be assessed on a holistic basis, with not only current carbon challenges in mind, but also evaluating the challenges associated with competing in a changing market environment.

Transition to Low Carbon Economy Will Shape Electricity Demand

Ontario's cap and trade program went into effect on January 1st 2017, with the aim of facilitating the transformation of Ontario into a low carbon economy. Proceeds from the allowance auctions are intended to implement measures identified in the Climate Change Action Plan to fund this transition. The success of these individual measures and the composition of the implementation portfolio will have repercussions for not only the supply and demand balance, but also the fundamental structure of the power system. Energy efficiency measures and increased deployment of distributed resources will decrease electricity demand, while electric vehicle deployments, switching to electric heating and potential bill rebates would translate to higher demand for electric generation.

Additionally, a unique feature of Ontario's cap and trade program – the allocation of allowances in the power sector – has been the subject of debate. For generators, the cap and trade policy is implemented akin to a carbon tax, with the fuel distributor charging a fuel surcharge tied to the carbon price – removing the flexibility and optionality of a liquid carbon market to achieve compliance.

Prepare now to Survive in the Future

Gas generators in Ontario have a maze of challenges to navigate. In order to chart a course that leads to long-term sustainability and success, two themes are paramount:

- 1. Timing Matters** – Prospects in the new and reformed energy and capacity market will depend in large part on the timing of contract expirations and the then prevailing supply and demand balance. The ability to participate in the newly formed capacity market, with incentives sufficient to support large gas-fired generators coming off contract, will vary from year to year, influenced by the success and status of the nuclear refurbishment process.
- 2. Positioning Early for Post-Contract Success** – By 2030, the large majority of gas-fired generators in Ontario will no longer operate on a long-term contract. The success of each individual facility will be determined in the reformed energy and capacity markets, and impacted by the direction in which the cap and trade system develops. Seizing upon potential opportunities in this changing landscape requires preparation and knowledge of how these markets function both in Ontario and in other Canadian provinces or US states.

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About the Authors



Felix Amrhein has three years of experience modeling carbon policies and their impact on the energy sector in North America. He has led modeling of several studies on federal and regional carbon policies, including the Clean Power Plan. Having worked out of the United States and out of Toronto, he also has conducted analysis on emission reduction measures within the Ontario climate change action plan.



Duncan Rotherham has more than 19 years of experience providing a wide range of services to North American and international industry, utilities, and public-sector organizations in the planning, design, and implementation of energy and environment and management systems. Mr. Rotherham has worked on the forefront of the energy and environmental markets as well as sustainability for the past 15 years. He has led work for utilities, financial services companies, government, and industry. He has supported the development of energy, emissions and sustainability strategies, target setting and compliance/risk management tools. In the past two years, he has led ICF's analytics related to Ontario's climate and energy policy and impacts on natural gas, electricity utilities and energy end users.



Mike Sloan leads ICF's Natural Gas and Liquids Advisory Services practice. Mr. Sloan has over 35 years of experience in the energy field. His areas of expertise include analytical and regulatory support for gas utilities, natural gas storage valuation and assessment, natural gas pipeline economics, natural gas avoided costs, natural gas and propane asset valuation, analysis of propane and natural gas liquid and petrochemical markets and demand, and market due diligence for asset sales, acquisitions, and financing.

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