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RECABONIZATION:
LOSING GROUND ON ELECTRICITY SECTOR EMISSIONS

The province is now moving in the wrong direction on greenhouse gas (GHG) emissions in Ontario's energy sector. In the absence of new nuclear baseload generation, natural gas will fill the baseload void – and Ontario will lose a decade of progress in combatting electricity sector carbon emissions.

RECARBONIZATION

Since the closure of Ontario's final coal-fired power plants in 2014, the province has had one of the cleanest electricity grids in the world. Approximately 94 percent of Ontario's electricity generation comes from hydroelectric, nuclear, and renewable wind and solar – all greenhouse gas emission-free sources.

However, the province has begun to reverse course, and is now moving in the wrong direction on greenhouse gas (GHG) emissions in Ontario's energy sector. The most recent forecast from the IESO shows that GHG emissions from electricity production will more than double over the next ten years, and almost triple over the next 20 years[1].

This alarming increase in GHG emissions is directly related to the province's increasing reliance on natural gas generation. By 2040, depending on the fate of PNGS, 24 percent of Ontario's electricity production could be from natural gas generation, a rate that is four times current levels. As natural gas is the only major carbon-emitting source of electricity generation in Ontario, there is a direct relationship between increased natural gas generation and GHG emissions.

ONTARIO'S CHANGING SUPPLY MIX

Over the last two decades, Ontario has taken great strides in eliminating carbon emissions from its electricity grid by removing the primary source of carbon emissions: coal-fired generation. In 2005, coal accounted for 19 percent of electricity generated in the province, and as a result, electricity generation emitted almost 34 megatonnes of CO2, accounting for 17 percent of the province's total emissions.

By 2014, coal-fired generation was completely removed from Ontario's electricity grid. And now, in 2020, the only GHG emitting form of electricity generation is the 6 percent of electricity generated by natural gas to provide peaking power. In 2018, the province's electricity system emitted 3.8 Mt of GHG emissions, or only 2.3 percent of total GHG emissions in the province.

BASELOAD POWER: The minimum amount of electricity needed to be supplied to the electrical grid at any moment. Baseload power must be supplied by constant and reliable sources of electricity.

PEAKING POWER: Electricity required by the grid when demand exceeds the baseload supply. Common peaking periods might include hot summer days when air conditioners are used. Peaking power supply is dispatchable, meaning they can be turned on or off and their output can be changed.

Almost all of the remaining emissions coming from Ontario's electricity generation can be attributed to the reliance on natural gas generation to provide peaking power during periods of high demand. While ratepayers have made a significant investment in adding renewables like wind and solar to the grid – paying for long-term contracts with private generators – renewables alone lack the reliability to meet the province's additional energy needs during periods of peak demand, and as an intermittent source of energy cannot be dispatched when needed.

A recent study by the IESO examined whether it would be possible to remove natural gas from the province's supply mix by 2030. In it, the IESO modelled a gas-free supply mix to replace the 11,000 MW of natural gas generation capacity currently connected to the province's electricity grid. The supply mix, which the IESO stated would not ensure the reliability of the system, relies heavily on supply options that may not be viable by 2030. For example, the IESO's model assumes 6,000 MW of storage capacity though they acknowledge no storage technology has been tested at the scale required. The IESO also assumes an additional 3,330 MW of power imports from Quebec year-round,

1 http://www.ieso.ca/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook

even though Quebec currently relies on importing power from Ontario during the winter[2]. Even with this supply model, the IESO determined that phasing out natural gas from the province's energy supply mix by 2030 would lead to blackouts as grid reliability would be compromised.[3]

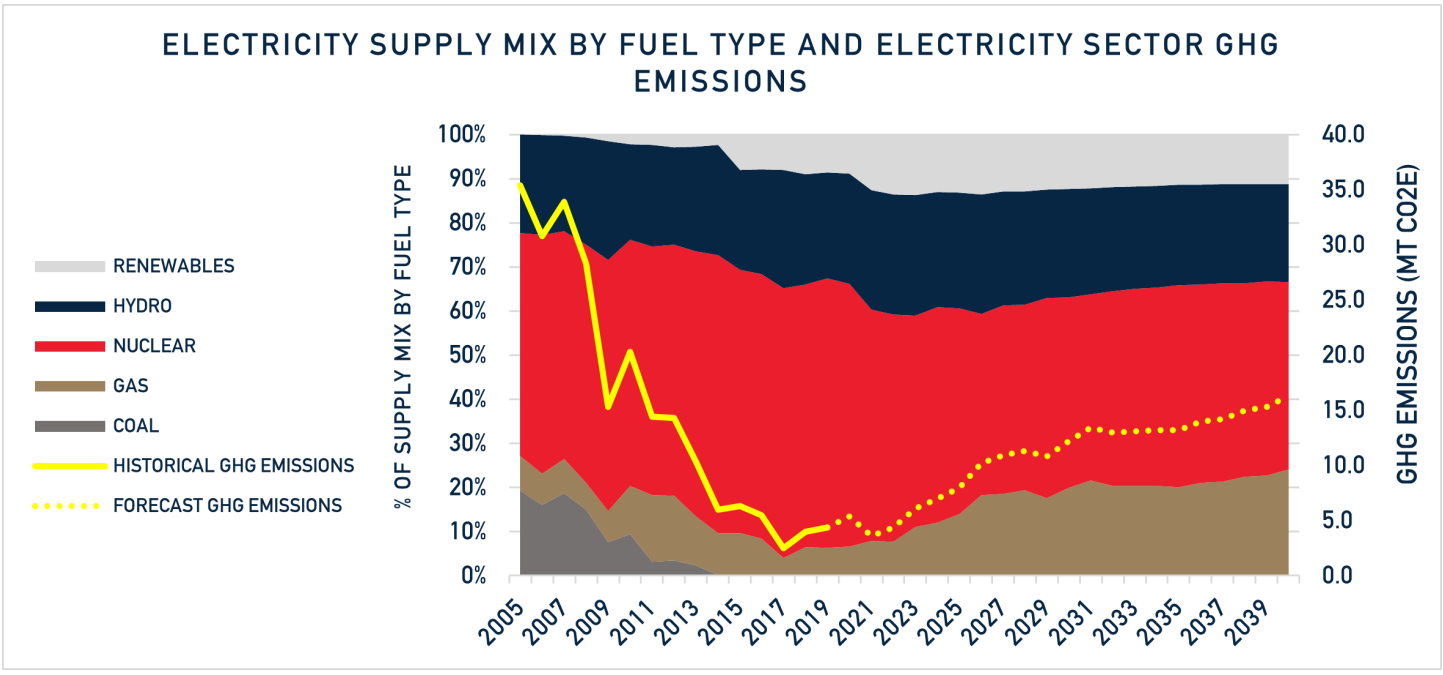
The reality is natural gas, in its current capacity, plays an important role in Ontario's energy supply mix. However, there is reason to be alarmed by the province's planned use of natural gas generation. According to the latest IESO annual planning outlook, the province's electricity supply mix is going to shift dramatically towards reliance on natural gas over the next 20 years. The IESO forecasts that by 2040, 24 percent of the province's electricity generation will be from natural gas generation – four times the current levels.

The growing reliance on natural gas will be accelerated by if Pickering Nuclear Generating Station is decommissioned, which will reduce the province's baseload energy capacity by 3,100 megawatts, about 14 percent of the province's total electricity generation. In the absence of a long-term plan to replace the lost baseload power with a new nuclear generating station, Ontario will continue to increase its reliance on carbon-emitting natural gas to meet the province's long-term energy needs.

This represents a fundamental shift in purpose for natural gas generation in the province, from providing a reliable, dispatchable backstop source of load following power during periods of high demand, to providing the always available baseload power currently provided by GHG emission-free sources. This will have a significant impact on the province's GHG emissions, and its ability to meet climate targets.

GHG EMISSION PROJECTIONS

Ontarians paid a significant price to remove coal from the electricity grid, but it was a necessary cost to eliminate one of the province's largest sources of carbon emissions and air pollution. Investments in renewable power, while costly, provided the province with an intermittent source of emission-free power, but ultimately it was an increased reliance on nuclear generation that ensured the province's grid had adequate, carbon-free,



2 For more reasons why year-round imports from Quebec at this scale are not viable, see The Society's working paper "Can Ontario Meet Its Baseload Power Needs with Quebec Imports".

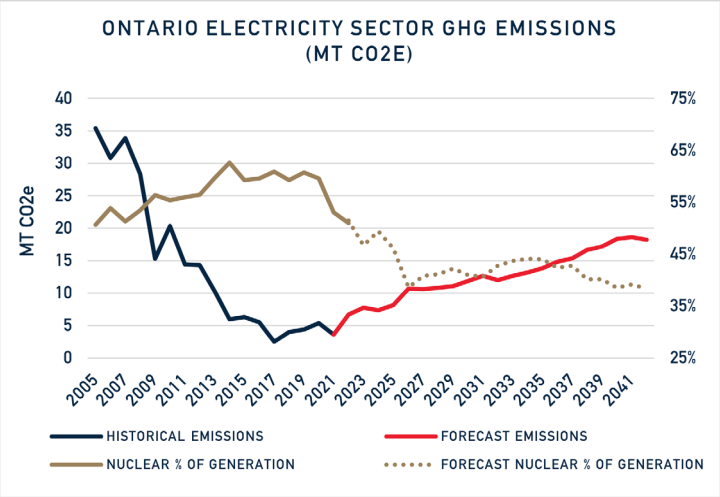
3 https://www.ieso.ca/en/Learn/Ontario-Supply-Mix/Natural-Gas-Phase-Out-Study

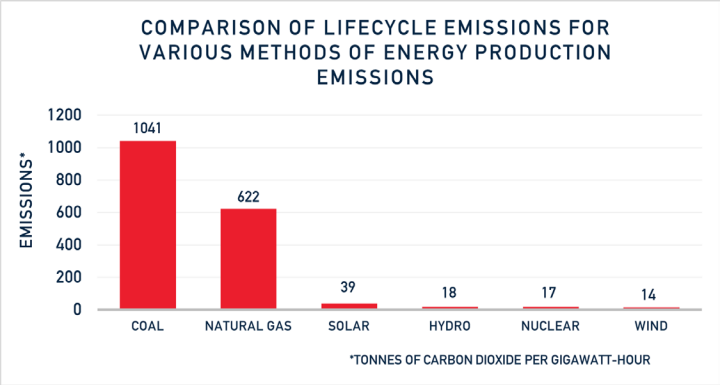
baseload power – driving electricity sector emissions down. In fact, the province's electricity sector's emissions reached historic lows when nuclear's share of the energy supply mix reached its peak.

However, Ontario is at risk of undoing some of the progress made in combatting climate change by creating a low-emissions electricity grid. By 2040 the province's electricity grid could exceed 2011-12 levels of GHG emissions, when the Nanticoke coal plant was still in operation. This is a direct result of a forecasted increase in reliance on natural gas, and a decrease in nuclear power generation.

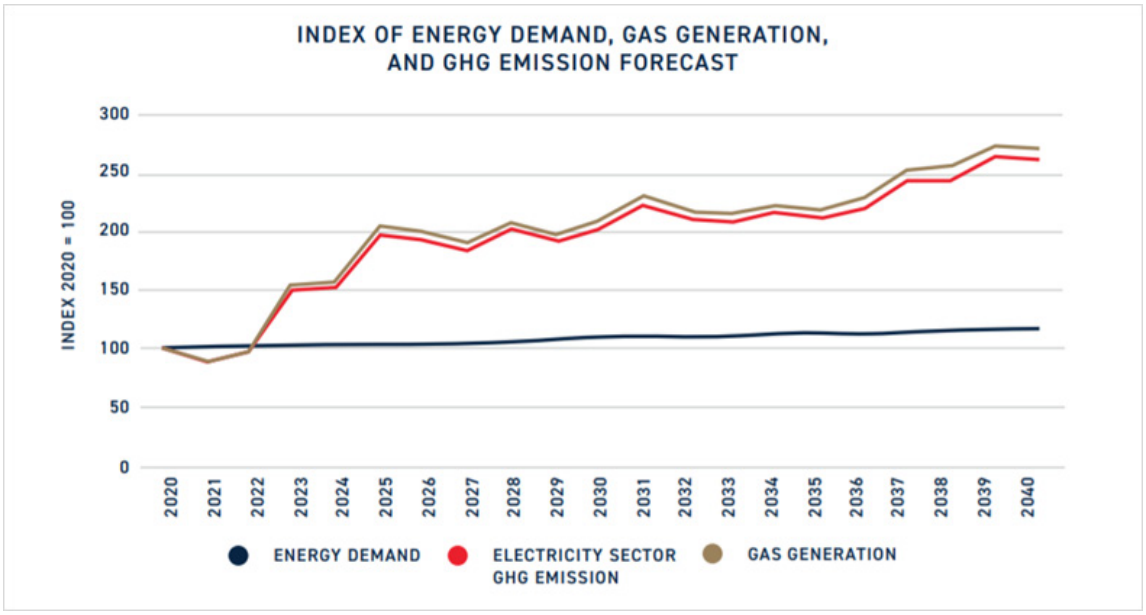
While natural gas generation is less carbon intensive than coal-fired generation, it is still a fossil fuel, and is dozens of times more carbon intensive than other baseload power options currently on the province's grid, like nuclear and hydroelectricity.

Relying on such a carbon intensive fuel is a necessary evil in its current capacity as a quickly dispatchable source of energy during periods of rapid changes in demand. At Ontario's current level of natural gas generation, electricity sector emissions account for only 2 percent of the province's total emissions – down from 17 percent just 15 years ago, and 21 percent compared to 30 years ago.





However, there is a forecasted rise in natural gas generation that is attributable to a shift from a peaking power backstop to a source of baseload power as nuclear power. Specifically, the 3,100 MW of baseload power generated from the PNGS that may come off the grid by 2026. This shift from peak to baseload power is almost directly responsible



for the forecasted increase in GHG emissions from the province's electricity grid, which will triple by 2040.

It should be noted that these forecasts are based on the IESO's assumptions of a modest increase in electricity demand over the next two decades. However, significant shifts towards the electrification of transportation or home heating would be accompanied by a two to three times increase in electricity demand. It is imperative that the province does not undermine the climate impact of electrification by increasing Ontario's reliance on fossil fuel generation.

A PATHWAY TO DECARBONIZATION

In 2021, Ontario's Minister of Energy issued a directive to the IESO to evaluate a moratorium on new natural gas generation in Ontario and to develop a pathway to zero emissions in the electricity sector.

In their Pathways to Decarbonization report, the IESO considered the necessary shifts in the province's electricity sector required to reach net-zero electricity sector carbon emissions by 2050. Among the assumptions within this report was significant, policy-driven electrification in the transportation, building, and industrial sectors.

In the report, the IESO assumes aggressive electrification by 2050 would more than double annual energy demand from current levels. In the net-zero emissions scenario they propose, the use of natural gas generation will be completely phased out by 2050, leaving only carbon-free forms of generation available to meet the rise in demand.

The IESO predicts that even with a 3000% increase in wind power, and more than 1000% increase in solar, the province still needs to double the existing nuclear capacity by 2050 – an increase that will have to come from a mix of small modular nuclear reactors (SMRs) and new, full-sized nuclear reactors.

Considering the long lead-time for nuclear construction, and the expected increase in electricity demand in the coming decades, IESO recommended a series of "no regret" actions that should be taken immediately. These actions include beginning to plan and gain regulatory approval for new nuclear infrastructure.

CONCLUSION

New sources of power generation cannot be built overnight. With the long lead-times associated with the construction of new electricity generation, the province needs to act now to ensure the baseload power lost with the full or partial decommissioning of the Pickering Nuclear Generating Station is replaced with a new source of carbon emission-free baseload power, of which nuclear power is the only viable option. In the absence of new nuclear baseload generation, natural gas will fill the baseload void – and Ontario will lose a decade of progress in combatting electricity sector carbon emissions. ■

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