Going in the Wrong Direction

Ontario's Plan to Ramp-Up Gas Power

April 15, 2024

ONTARIO CLEAN AIR ALLIANCE

Acknowledgments

Ontario Clean Air Alliance Research gratefully acknowledges the generous financial support that it has received for this report from:

Echo Foundation

Green Sanderson Family Foundation

Ivey Foundation

M.H. Brigham Foundation

Merryweather Fund

Noor Cultural Centre

Taylor Irwin Family Foundation at the Toronto Foundation

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Overview

According to the Independent Electricity System Operator's (IESO) *2024 Annual Planning Outlook* (March 2024) forecast, the greenhouse gas (GHG) pollution from Ontario's gas plants in 2030 will be 570-580% greater than levels reached in 2017.

In addition, the IESO is asking the Government of Canada to amend its proposed Clean Electricity Regulations to allow the GHG pollution of Ontario's gas plants in 2035 to be 5.2 times greater than the 2017 level. The IESO is also asking the federal government to permit Ontario's gas plants to continue operating until 2050.

Thirty-five (35) Ontario municipalities, representing almost 60% of Ontario's population, have passed resolutions requesting the Government of Ontario phase-out gas power by 2030 or as soon as possible.[1] Unfortunately, the Government of Ontario is continuing to ignore the municipalities' request.

The good news is that Ontario can phase-out gas power by 2035 by tripling its wind and solar power and by investing in energy efficiency and storage.

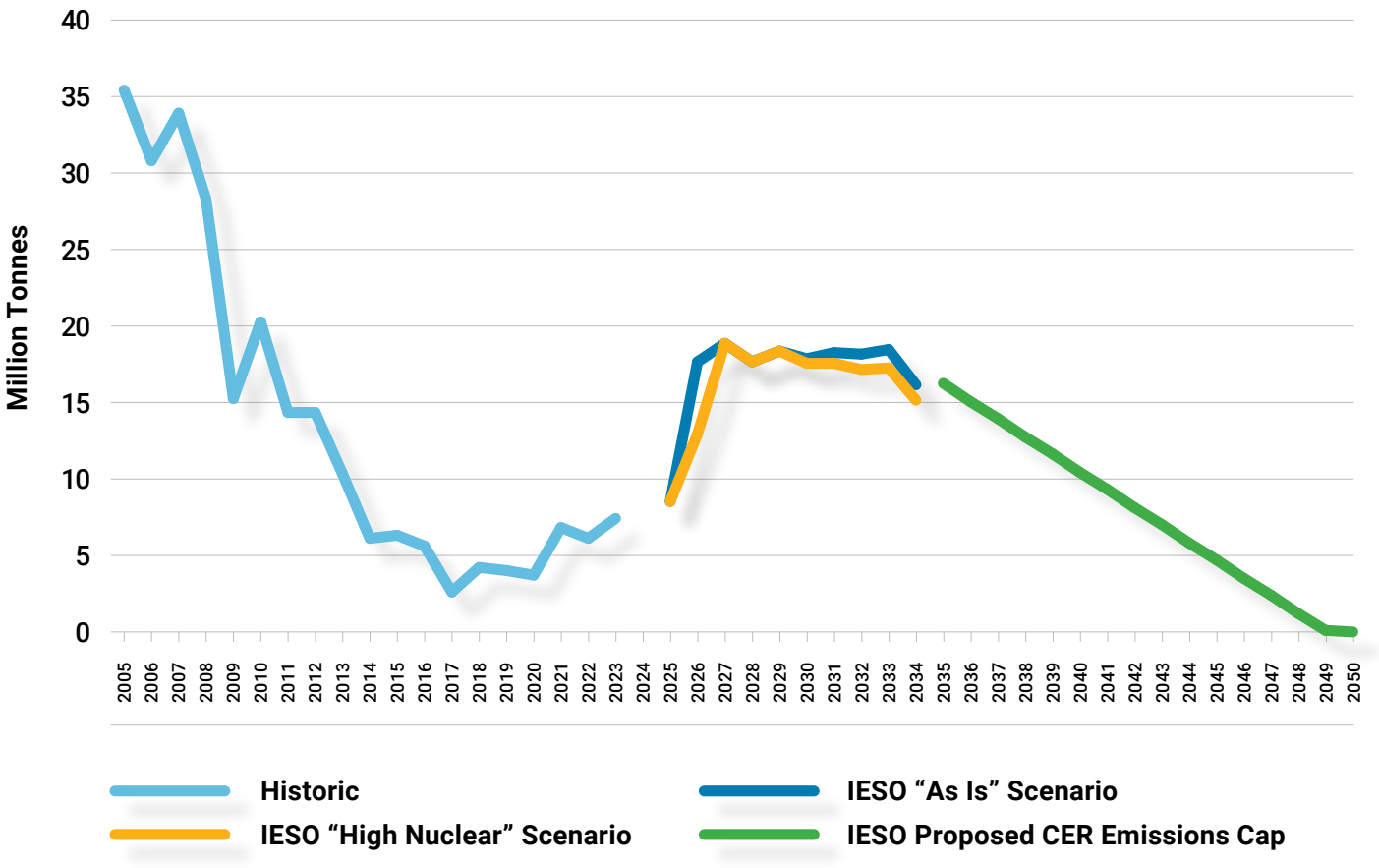
Thirty-five Ontario municipalities, representing almost 60% of Ontario's population, have passed resolutions requesting the Government of Ontario

phase-out gas power by 2030 or ASAP

Historic and Potential Future GHG Pollution of Ontario's Electric Power Plants

Historic

Figure 1 | Ontario's Historic and Potential Future GHG Pollution from its Electric Power Plants*



* See Appendix A for references

Thanks to the phase-out of Ontario's five dirty coal plants, Ontario's electricity related GHG pollution fell by 93% between 2005 and 2017, dropping from 35.3 to 2.6 million tonnes.

But in 2018 the GHG pollution from Ontario's power plants started to rise again. As a result, the GHG pollution of Ontario's gas plants in 2023 was triple the 2017 level.

IESO's 2025 to 2034 Forecasts

The IESO is forecasting the GHG pollution of Ontario's gas plants between 2025 and 2034 under two scenarios: a) "As Is"; and b) "High Nuclear".

The "As Is" scenario includes existing and committed generation and efficiency resources until their contract or commitment periods end. It also includes new nuclear reactors at Darlington, new and expanded gas plants, and new energy storage facilities. It does not include any new wind or solar power.

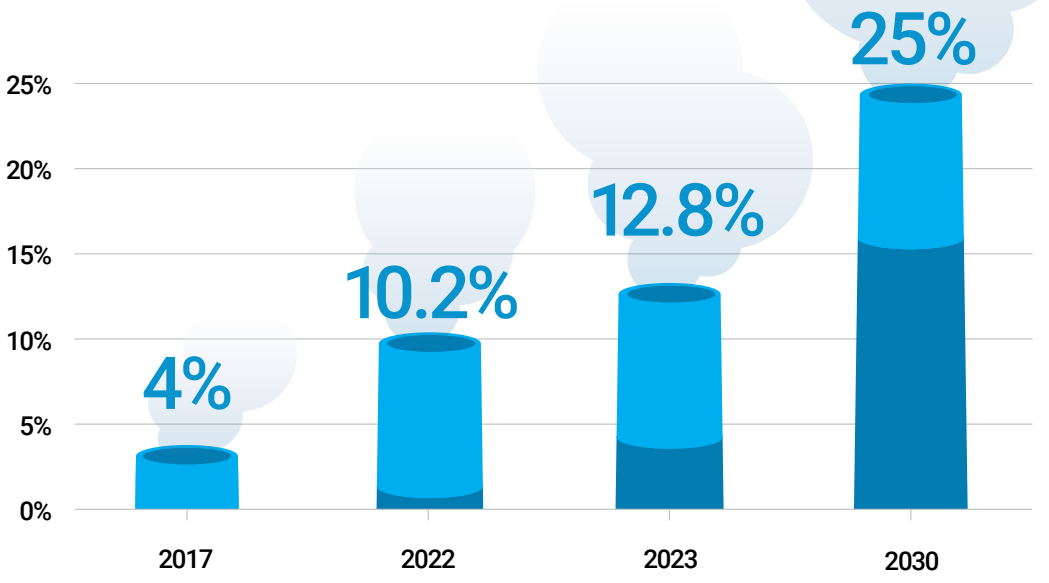
In addition to the "As Is" scenario's resources, the "High Nuclear" scenario also includes the continued operation of the Pickering B Nuclear station and its refurbishment plus the addition of new reactors at the Bruce Nuclear Station.[2]

According to the IESO, under these scenarios the GHG pollution of Ontario's gas plants in 2030 will be 570% ("High Nuclear") to 580% ("As Is") higher than the 2017 level. In 2034, gas plant GHG pollution will be 480% ("High Nuclear") to 520% ("As Is") higher than their 2017 level.

As Figure 2 reveals, according to the IESO, in 2030 fossil gas will be responsible for 25% of Ontario's electricity supply.

In 2030 fossil gas will be responsible for 25% of Ontario's electricity supply

Figure 2 | Percentage of Ontario's Electricity Provided by Polluting Gas*



* Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2017 Data*; Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2022 Data*; IESO, *"2023 Year in Review"*; and IESO, *2024 Annual Planning Outlook*, Data Tables, Figures 26 & 27.

IESO's Proposed Clean Electricity Regulations Emissions Cap: 2035 to 2050

In its March 15, 2024 submission to Environment and Climate Change Canada, the IESO recommended that Canada's Clean Electricity Regulations (CER) should cap the GHG emissions of Ontario's fossil power plants at 16.2 million tonnes in 2035, and that in each subsequent year the cap should be reduced by 1,153,110 tonnes until it reaches zero in 2050.[3] The IESO is also recommending that the power plants' emissions during emergencies should be exempt from its proposed emission cap.[4]

The IESO's proposed CER emissions cap would allow the GHG pollution of Ontario's gas plants in 2035 to be 5.2 times greater than their 2017 level (before any emergency use is factored in).

The IESO's proposed cap would also allow Ontario's gas plants to continue to operate for another 25 years despite the fact that they were responsible for only 12.8% of Ontario's electricity supply in 2023.[5] In this context, it is important to remember that in 2002, when the Ernie Eves Government committed Ontario to a coal phase-out by 2015, coal-fired electricity generation was responsible for 24% of Ontario's electricity supply. Nevertheless, Ontario achieved a complete coal phase-out on April 8, 2014. That is, in less than 12 years.

The IESO's proposed emissions cap would allow the GHG pollution of Ontario's gas plants in 2035 to be 5.2x greater than their 2017 level

Phasing-Out Gas Power by 2035

Table 1 shows the *2024 Annual Planning Outlook's* year 2035 forecast of Ontario's gas-fired electricity generation, and our electricity supply shortfall due to increasing electricity demand and expiring supply contracts under its "High Nuclear" and "As Is" scenarios.

Table 1 | Forecast Gas-Fired Generation and Electricity Supply Shortfall in 2035*

	High Nuclear Scenario (TWh)	As Is Scenario (TWh)
Gas-Fired Generation	23.1	23.5
Electricity Supply Shortfall	30.0	47.5
Required Resources to Phase-Out Gas Power & Eliminate Electricity Supply Shortfall	53.1	71.0

**2024 Annual Planning*, Data Tables, Figures 26, 27 & 28

So according to the IESO, to phase-out gas power in 2035 and keep our lights on, we must obtain 53.1 to 71.0 terawatt-hours (TWh) of new electricity supply and/or savings due to energy efficiency investments.

The good news is that we can phase-out gas power and eliminate the shortfall by taking the following three actions: a) re-contracting expiring renewable electricity supply contracts; b) tripling our wind and solar capacity; and c) investing in energy efficiency.

Re-Contracting Expiring Renewable Contracts

In 2022, Ontario's non-hydro renewables (wind, solar, bioenergy) produced 21.25 TWh.[6] According to the *2024 Annual Planning Outlook*, as a result of expiring contracts this supply could fall to 6.20 TWh by 2035.[7] Therefore, by re-contracting with Ontario's non-hydro renewable power producers, the IESO could reduce our potential electricity supply shortfall in 2035 by 15.05 TWh (21.25 – 6.20).

Given the huge decline in costs for solar and wind over the past decade and the near zero operating costs of existing projects, the IESO will be able to renew its existing contracts at low prices.

Tripling Wind and Solar Capacity

In December 2023, the IESO had 5,553 megawatts (MW) of wind and 2,649 MW of solar capacity under contract.[8] If the IESO re-contracts all of its expiring wind and solar contracts, it will be able to triple our total wind and solar capacity by

The IESO will be able to renew its existing renewable energy contracts at low prices

contracting for an additional 11,106 MW of wind power and 5,298 MW of new solar power.

According to Clean Energy Canada, the annual capacity factors of new Ontario solar and wind power plants would be 20% and 40% respectively.[9] Therefore 11,106 MW of new wind power and 5,298 MW of new solar power would produce an additional 38.9 and 9.3 TWh per year respectively, totaling 48.2 TWh per year of new supply.

As the IESO itself notes, "New wind and solar projects are well-suited to the coming procurements as they can be developed in four to five years once a contract has been issued."[10]

Investing in Energy Efficiency

According to report prepared for the IESO by Guidehouse, energy efficiency programs could cost-effectively reduce Ontario's electricity needs in 2035 by 21 TWh at an average cost of 3.1 cents per kWh.[11]

Unfortunately, as the *2024 Annual Planning Outlook* notes, Ontario does not have a policy to pursue all of our cost-effective and achievable energy efficiency investment opportunities.[12] Specifically, the IESO is forecasting that its energy efficiency programs will only obtain 11.6 TWh of the cost-effective ("achievable") potential identified by Guidehouse.[13] As a consequence, more ambitious energy conservation programs could reduce Ontario's electricity supply shortfall in 2035 by an additional 9.4 TWh (21 – 11.6).

Summary of Resource Needs and Options

As Table 2 shows, Ontario can phase-out gas power by 2035 by re-contracting our expiring renewable power contracts, tripling our wind and solar capacity, and by investing in energy efficiency.

Table 2 | Summary of Resources Required and Available to Phase-Out Gas Power & Eliminate an Electricity Supply Shortfall in 2035

	High Nuclear Scenario (TWh)	As Is Scenario (TWh)
Required Resources to Phase-Out Gas Power & Eliminate an Electricity Supply Shortfall	53.1	71.0
Re-Contracting Expiring Renewable Contracts	-15.0	-15.0
Tripling Wind & Solar Capacity	-48.2	-48.2
Energy Efficiency	-9.4	-9.4
Surplus supply	+19.5	+1.6

Ontario can phase-out gas power by 2035 by re-contracting our expiring renewable power contracts, tripling our wind and solar capacity, and by investing in energy efficiency

New Nuclear Reactors at Darlington

The *2024 Annual Planning Outlook* assumes that three new GE-Hitachi boiling water reactors will be in service by 2035 as per a July 2023 Government of Ontario news release.[14]

This assumption is very problematic for the following reasons:

- The proposed new GE-Hitachi 300 MW boiling water reactors have not been built anywhere in the world;
- The proposed new reactors are still not fully designed[15];
- Ontario Power Generation (OPG) has still not received a construction licence from the Canadian Nuclear Safety Commission (CNSC) to build the proposed GE-Hitachi reactors and the CNSC has still not scheduled a hearing with respect to OPG's application for a construction licence[16];
- According to the IESO, the cost of electricity from new solar and wind facilities is 55-70% lower than its forecast of the cost of electricity from the GE-Hitachi reactors[17];
- According to the IESO, new nuclear reactors can take 10 to 15 years to build[18]; and
- Every new nuclear project in Ontario has been late and gone over budget.

The *2024 Annual Planning Outlook* forecasts that the three new reactors will produce 7.3 TWh per year. By increasing Ontario's wind and solar capacity by 3.3 times, instead of a simple tripling, we can increase our wind and solar energy by an additional 7.3 TWh and eliminate the need for the new GE-Hitachi reactors.[19]

Every new nuclear project in Ontario has been

late and gone over budget

Energy Storage

Variable wind and solar energy production can be converted into a reliable 24/7 supply of power by combining it with energy storage.

Stationary Batteries

The Government of Ontario is in the process of procuring 2,500 MW of storage from stationary storage options (e.g., large batteries) located in Ontario.[20] However, there are also other storage options that Ontario should pursue.

Hydro Quebec's Reservoirs

According to a MIT report, the lowest cost storage option for Ontario's electricity system are Quebec's hydro-electric reservoirs.[21] For example, when our wind power production is above average, our surplus wind energy can be exported to Quebec to keep the lights on in Montreal and Hydro Quebec can store more water in its reservoirs. Conversely, when our wind power production is below average, Hydro Quebec can use the extra water in its reservoirs to produce electricity for export back to Ontario. In short, by integrating our wind and solar generation with Hydro Quebec's reservoirs, we can convert variable wind and solar energy into firm 24/7 sources of electricity supply for Ontario.

The total storage capacity of Hydro Quebec's reservoirs (228 TWh[22]) is 1.6 times greater than Ontario's total electricity consumption in 2023 (137 TWh).

The IESO has identified how we can increase our access to Hydro Quebec's reservoirs by 7,500 MW by upgrading our transmission links with Quebec at Chats Falls (2,000 MW), Ottawa (2,000 MW), Beauharnois (2,000 MW) and Cornwall (1,500 MW).[23] All of these upgrades can use existing Hydro One transmission corridors.

Coordination of electricity trading between Ontario and Quebec can help both provinces to meet peaks in demand, increase system reliability and lower costs. While Ontario's demand for electricity peaks during hot summer days when our air-conditioners are running full out, Quebec's demand peaks in the winter.

EV Batteries

Our electric vehicles' (EVs) batteries are also a good storage option for wind and solar energy.[24] When combined with bi-directional chargers, our EVs can store surplus wind and solar energy when generation is high and return the power back to the grid when it is needed. In 2030, the total capacity of our EVs' batteries will be more than double the capacity of our gas plants.[25]

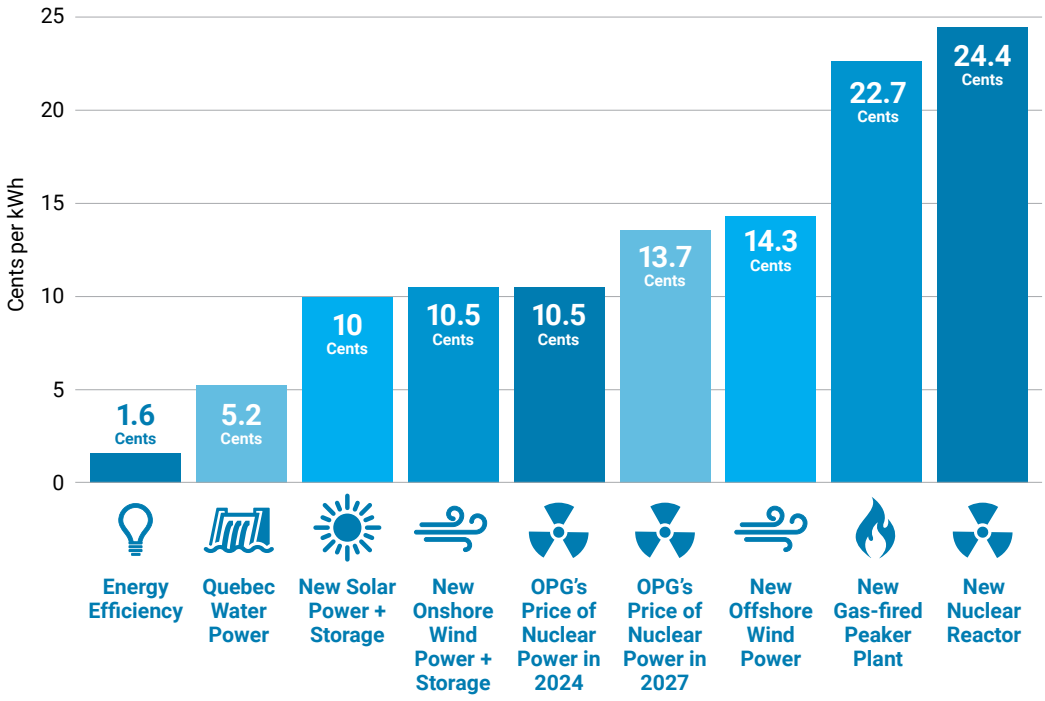
Variable wind and solar energy production requires
energy storage

Conclusion

At the December 2023 Climate Summit in Dubai, 198 governments, including the Government of Canada, pledged to triple the world's renewable electricity capacity by 2030 and double the global annual average rate of energy efficiency improvements to protect our climate.[26]

As Figure 3 reveals, energy efficiency and renewables can keep our lights on at less than half the cost of new gas-fired peaker plants and new nuclear reactors.

Figure 3 | Ontario's Electricity Options: A Cost Comparison[27]



Ontario should phase-out gas power by 2035 by re-contracting its expiring renewable energy contracts, increasing its wind and solar capacity by 3.3 times; and by investing in all of its cost-effective energy efficiency opportunities.

The Dubai Climate Summit called for the world to

triple renewables and double energy efficiency

Appendix A

Historic and Potential Future GHG Pollution from Ontario's Electric Power Plants (Million Tonnes)

Year	Historic[28]	IESO "High Nuclear" Scenario[29]	IESO "As is" Scenario[30]	IESO Proposed CER Emissions Cap[31]
2005	35.3			
2006	30.7			
2007	33.8			
2008	28.2			
2009	15.2			
2010	20.2			
2011	14.3			
2012	14.3			
2013	10.3			
2014	6.1			
2015	6.3			
2016	5.6			
2017	2.6			
2018	4.2			
2019	4.0			
2020	3.7			
2021	6.8			
2022	6.1			
2023	7.4			
2024				
2025		8.5	8.5	
2026		12.9	17.4	
2027		18.8	18.8	

Year	Historic[28]	IESO "High Nuclear" Scenario[29]	IESO "As is" Scenario[30]	IESO Proposed CER Emissions Cap[31]
2028		17.6	17.6	
2029		18.3	18.3	
2030		17.5	17.8	
2031		17.5	18.2	
2032		17.1	18.1	
2033		17.2	18.4	
2034		15.1	16.1	
2035				16.2
2036				15.0
2037				13.9
2038				12.7
2039				11.6
2040				10.4
2041				9.3
2042				8.1
2043				7.0
2044				5.8
2045				4.7
2046				3.5
2047				2.3
2048				1.2
2049				0.04
2050				0

Sources

1 https://www.cleanairalliance.org/ontario-municipalities-that-have-endorsed-gas-power-phase-out/

2 IESO, *2024 Annual Planning Outlook*, (March 2024), page 33.

3 According to the IESO's submission, Ontario's 2035 cap should equal Ontario's electricity production in 2035 multiplied by 80 tonnes per GWh. The IESO is forecasting that Ontario's total electricity demand in 2035 will be 202,300 GWh. IESO, *Independent Electricity System Operator (IESO) Submission on ECCC's Clean Electricity Regulations (CER)*, (March 15, 2024), page 7; and *2024 Annual Planning Outlook*, Data Tables, Figures 26 & 27.

4 *Independent Electricity System Operator (IESO) Submission on ECCC's Clean Electricity Regulations (CER)*, pages 4, 5, 9 and 10.

5 IESO, "2023 Year in Review".

6 Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2022 Data*.

7 *2024 Annual Planning Outlook,* Data Tables, Figures 26 & 27.

8 IESO, *A Progress Report on Contracted Electricity Supply,* (January 2024), page 9.

9 Clean Energy Canada, *A Renewables Powerhouse*, (February 2023), page 10.

10 *2024 Annual Planning Outlook,* page 87.

11 Guidehouse, *Forward to the 2022 Refresh of the 2019 Achievable Potential Study*, (September 8, 2022) page 3; and April 10, 2024 email from IESO Customer Relations to Jack Gibbons, Ontario Clean Air Alliance.

12 *2024 Annual Planning Outlook,* page 29.

13 *2024 Annual Planning Outlook,* Demand Forecast Module Data, Figure 24.

14 *2024 Annual Planning Outlook*, page 33; and Ontario, *News Release*, "Ontario Building More Small Modular Reactors to Power Province's Growth", (July 7, 2023).

15 Emma Graney, "Nuclear players push into heavy industry", *Globe and Mail,* (April 9, 2024).

16 https://www.cnsc-ccsn.gc.ca/eng/resources/status-of-new-nuclear-projects/darlington/project-timeline/

17 IESO, *2024 Annual Planning Outlook: Resource Costs and Trends,* (March 2024), page 5.

18 IESO, *Pathways to Decarbonization*, (December 2022), page 4.

19 According to the *2024 Annual Planning* Outlook, the new nuclear reactors will have an annual capacity utilization rate of 93%. Therefore three 300 MW reactors will produce 7.3 TWh per year. As we have noted above, 16,404 MW of new wind and solar capacity could produce 48.2 TWh per year. Therefore, an additional 2,484 MW of new wind and solar capacity would produce an additional 7.3 TWh. Under this scenario, Ontario's total wind and solar capacity in 2035 would be 27,090 MW (2,484 + 16,404 + 8,202) assuming our existing 8,202 MW of wind and solar generation is all re-contracted. 27,090 is 3.3 times greater than 8,202. IESO, *2024 Annual Planning Outlook: Resource Cost and Trends,* (March 2024), page 5.

20 https://news.ontario.ca/en/release/1003521/ontario-celebrates-indigenous-leadership-in-clean-energy-storage

21 Emil Dimanchev, Joshua Hodge and John Parsons, *Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower*, Massachusetts Institute of Technology Center for Energy and Environmental Policy Research, (February 2020).

22 Pierre-Olivier Pineau, Chair in Energy Management, HEC Montreal, *The State of Energy in Quebec and its Implications for Canada*, PowerPoint Presentation for the June 28, 2023 Sustainable Energy Initiative Webinar at York University.

23 IESO, *Ontario-Quebec Interconnection Capability: A Technical Review,* (May 2017) and IESO, *Review of Ontario Interties,* (October 14, 2014).

24 https://taf.ca/three-reasons-investors-should-take-a-closer-look-at-bidirectional-charging-technology/

25 Ontario Clean Air Alliance, *Vehicle to Building/Grid Integration,* (November 22, 2021), page 2.

26 https://www.iea.org/reports/renewables-2023/executive-summary

27 **Energy efficiency:** In 2022 the Independent Electricity System Operator's (IESO) average levelized unit energy cost (LUEC) of procuring a kWh of electricity savings was 1.6 cents. Email to Ontario Clean Air Alliance from Customer Relations, IESO, (December 7, 2023).

Quebec water power: average export price in 2023: Hydro Quebec, Press Release, "Hydro-Quebec delivers a strong performance in challenging times", (February 21, 2024).

Solar + Storage: According to Lazard, the cost of new utility-scale Solar PV + storage is 4.6 to 10.2 cents per kWh (US $) We have converted these costs to Canadian dollars by multiplying them by 1.35. Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 16.0*, (April 2023) page 2.

Sources | Continued

Onshore Wind + Storage: According to Lazard, the cost of new onshore wind + storage is 4.2 to 11.4 cents per kWh (US $). We have converted these costs to Canadian dollars by multiplying them by 1.35. Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 16.0*, (April 2023) page 2. In 2024 Hydro Quebec procured 1,550 MW of new wind power at an average cost of 7.8 cents per kWh. Hydro Quebec, Press Release, "Hydro-Quebec retains 8 bids totalling 1550 MW of wind power", (January 26, 2024).

OPG's Price of Nuclear Power in 2024: Ontario Energy Board Docket No. EB-2020-0290, Ontario Energy Board, *Payment Amounts Order Ontario Power Generation Inc*., (January 27, 2022), pages 5 & 8.

OPG's Price of Nuclear Power in 2027: Ontario Energy Board Docket No. EB-2020-0290, I1-01-Environmental Defence-028.

Offshore Wind: According to Lazard, the cost of new offshore wind is 7.2 to 14.0 cents per kWh (US $). We have converted these costs to Canadian dollars by multiplying them by 1.35. Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 16.0*, (April 2023) page 2.

Gas-Fired Peaker Plant: According to Lazard, the cost of a new gas-fired peaker plant is 11.5 to 22.1 cents per kWh (US $). We have converted these costs to Canadian dollars by multiplying them by 1.35. Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 16.0*, (April 2023) page 2.

New Nuclear Reactor: According to Lazard, the cost of a new nuclear reactor is 14.1 to 22.1 cents per kWh (US $) We have converted these costs to Canadian dollars by multiplying them by 1.35. Lazard, *Lazard's Levelized Cost of Energy Analysis – Version 16.0*, (April 2023) page 2.

28 See IESO, *2022 Annual Planning Outlook*, Data Tables, Figure 48 for emissions from 2005 to 2021 inclusive. We calculated 2022 emissions by multiplying Ontario's 2022 gas-fired electricity generation (15,760 GWh) by the IESO's estimate of the average emissions rate of Ontario's gas plants (390 tonnes per GWh). See Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2022 Data* and IESO, *2024 Annual Planning Outlook: Carbon Pricing,* (March 2024), page 2. We calculated 2023 emissions by multiplying Ontario's gas-fired electricity generation (19,100 GWh) by 390 tonnes per GWh. See IESO, *2023 Year in Review*.

29 We calculated the "High Nuclear" emissions by multiplying the IESO's "High Nuclear" annual gas-fired generation forecasts by the IESO's average emission factor for gas power (390 tonnes per GWh). *2024 Annual Planning Outlook*, Data Tables, Figure 27; and *2024 Annual Planning Outlook: Carbon Pricing*, page 2.

30 We calculated the "As Is: emissions by multiplying the IESO's "As Is" annual gas-fired generation forecast by the IESO's average emission factor for gas power (390 tonnes per GWh). *2024 Annual Planning Outlook,* Data Tables, Figure 26; and *2024 Annual Planning Outlook: Carbon Pricing*, page 2.

31 We calculated the 2035 emissions cap by multiplying the IESO's forecast of Ontario's total electricity demand in 2035 (202,300 GWh) by 80 tonnes per GWh. For each subsequent year we reduced the cap by 1,153,100 tonnes (202,300 GWh x 5.7 tonnes per GWh). *2024 Annual Planning Outlook,* Data Tables, Figures 26 and 27; and *Independent Electricity System Operator (IESO) Submission on ECCC's Clean Electricity Regulations (CER)*, (March 15, 2024), page 7.