Does Ontario Need New Nuclear to Keep its Lights On in 2050?

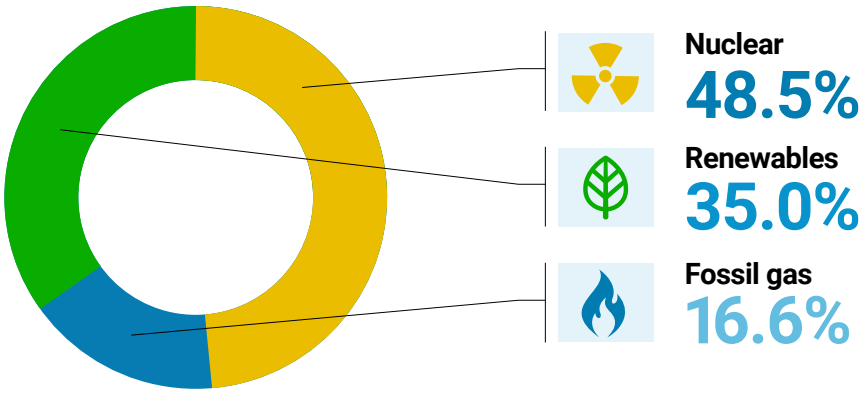
Ontario's Electricity Supply in 2024

Ontario's total electricity generation in 2024 was 165 billion kilowatt-hours (kWh).[1]

As **Figure 1** shows, the Bruce, Darlington and Pickering Nuclear Stations produced 48.5% of Ontario's electricity in 2024. Renewables (water, wind, solar and bioenergy) supplied 35.0% and fossil gas 16.6%.

Figure 1

Ontario's Electricity Supply Mix in 2024[2]



Ontario's Electricity Demand and Supply in 2050

Demand

Ontario's Independent Electricity System Operator (IESO) forecasts that Ontario's total demand for electricity in 2050 will be between 207 and 297 billion kWh.[3]

Supply

- The Pickering Nuclear Station will be shut down in September 2026.[4]
- According to the IESO, the Bruce and Darlington Nuclear Station will still be operating in 2050. We estimate that they will produce 57.9 billion kWh per year in 2050.[5]
- According to the IESO, our existing waterpower facilities will provide us with 39.6 billion kWh in 2050.[6]
- The IESO forecasts that virtually all of our existing solar, wind and bioenergy facilities will have come to the end of their economic lives by 2050. However, it has become common to repower solar and wind facilities by installing new turbines, panels and other components. This can result in these facilities producing significantly more power thanks to ongoing technological improvements.

Need for New Supply

Therefore, assuming the Pickering Nuclear Station is not refurbished, no new nuclear stations come into service, and our gas plants are phased out, we will need up to 199.5 billion kWh of new renewable energy to keep our lights on in 2050 [297 billion kWh – (57.9 billion kWh + 39.6 billion kWh)].

Meeting Ontario's Projected Electricity Demands in 2050

Solar Power

Solar farms with a total footprint equal to one-half of 1% of Ontario's total land area could produce 199.5 billion kWh per year.[7]

In addition, rooftop and parking lot solar could also produce large quantities of electricity without requiring the conversion of land from other uses. For example, more than 50% of Toronto's electricity needs could be met by local rooftop and large parking lot solar.[8]

Great Lake Offshore Wind Power

Great Lakes offshore wind power could produce 151 billion kWh per year[9] with a total lakebed footprint of 0.69 square kilometres.[10] The total area of the Canadian sections of the Great Lakes is 87,560 square km.

Onshore Wind Power

Onshore wind power with a total footprint equal to one square km could produce 199.5 billion kWh per year.[11] Ontario's total land area is 1,076,395 square km.

Conclusion

Ontario does not need new nuclear to keep its lights on. The good news is that we can meet all of our incremental needs for reliable 24/7 electricity by investing in an integrated combination of onshore and offshore wind power, land-based solar farms, rooftop and large parking lot solar energy and energy storage (e.g., batteries, hydro reservoirs, compressed air and thermal storage).[12]

References

1 Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2024 Data*, https://www.oeb.ca/sites/default/files/2024-supply-mix-data-update.pdf

2 Ontario Energy Board, *Ontario's System-Wide Electricity Supply Mix: 2024 Data*, https://www.oeb.ca/sites/default/files/2024-supply-mix-data-update.pdf

3 IESO, *Annual Planning Outlook: Ontario's electricity system needs: 2027-2050*, (March 2026), page 24, https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook

4 *Annual Planning Outlook: Ontario's electricity system needs: 2027-2050*, page 30.

5 The Bruce and Darlington Nuclear Stations have net peak outputs of 6,507 and 3,512 MW respectively. According to the IESO, Bruce Units #1 (818 MW) and #2 (791 MW) are expected to reach the end of their operating lives in 2043. We are assuming that their annual capacity utilization rates in 2050 will be equivalent to the Darlington's cumulative average annual capacity utilization rate as of December 31, 2023, namely, 78.6%. *Annual Planning Outlook: Ontario's electricity system needs: 2027-2050*, page 30, https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook. https://pris.iaea.org/PRIS/CountryStatistics/ReactorDetails.aspx?current=43

6 IESO, *2026 Annual Planning Outlook: Data Tables*, (March 2026), Figure 21: Energy Adequacy (TWh) – Reference Scenario, https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook

7 Solar PV systems in Ontario can generate 37.375 million kWh per square km per year. Therefore 5,338 square km of solar PV will produce 199.5 billion kWh per year. Ontario's total land area is 1,076,395 square km. See Allie Pell, Ontario Clean Air Alliance Research, *Ontario's Potential Solar Electricity Generation Fact Sheet,* (May 22, 2026). https://euzvzapheqq.exactdn.com/wp-content/uploads/2026/05/Ontario-Solar-Generation-fact-sheet-may-21-v_02.pdf

8 McDiarmid Climate Consulting, *Transforming Toronto with Solar,* (November 2024), page 5, https://www.cleanairalliance.org/wp-content/uploads/2024/11/Toronto-Solar-Report-nov-2024-nov-21-v_01.pdf

9 Ontario Clean Air Alliance Research Inc., *Great Lakes Wind Power: Now is the Time,* (April 2023), page 5, https://www.cleanairalliance.org/wp-content/uploads/2023/04/Great-Lakes-Wind-Report-apr-17-v_01.pdf

10 Assuming 6,900 five-megawatt turbines, with a lakebed footprint of 100 square metres per turbine.

11 Onshore wind turbines with a total capacity of 50,835 MW and an average capacity utilization rate of 44.8% will produce 199,500,000 MWh per year or 199.5 billion kWh per year. If each turbine has a capacity of five-megawatts and a footprint of 100 square metres, the total footprint of the 10,167 wind turbines will be 1,016,700 square metres. The IESO's average capacity utilization rate forecast for new Ontario onshore wind turbines in 2030 is 44.8%. See, IESO, Pathways to Decarbonization, (December 2022), Appendix A, https://www.ieso.ca/en/Learn/The-Evolving-Grid/Pathways-to-Decarbonization.

12 Ontario Clean Air Alliance Research, *Briefing Note: New IESO Report on Wind & Solar Energy Combined with Battery Energy Storage vs SMRs,* (Revised January 26, 2026). https://euzvzapheqq.exactdn.com/wp-content/uploads/2026/01/Revised-January-26-2026-OCAA-Research-Briefing-Note-August-2025-IESO-report-renewables-vs-nuclear-.pdf