Role of Nuclear Energy in Powering Ontario's Future

Presentation to Durham Nuclear Health Committee

September 2025

Overview – Building on Ontario's Nuclear Advantage

- Nuclear energy is at the core of Ontario's ambitious plan to provide an abundant supply of reliable and affordable electricity for generations to come.

- Thanks to nuclear power, Ontario has one of the cleanest electricity systems in the world with about 85% of our electricity supply coming from non-emitting sources in 2024. Nuclear energy currently provides about 50% of the province's needs.

- Ontario is home to a mature nuclear industry, starting with the first "made-in-Ontario" CANDU (Canada Deuterium Uranium) power reactor going into service in 1962.

  – 16 of 17 Canada's operating CANDU reactors are in Ontario (i.e., Bruce, Darlington, and Pickering) and the remaining one is in New Brunswick.

  – Ontario's nuclear industry is comprised of more than 200 companies and is a source of innovation and specialized employment, supporting around 80,000 jobs in Ontario. The nuclear industry adds over $22 billion per year to Canada's GDP.

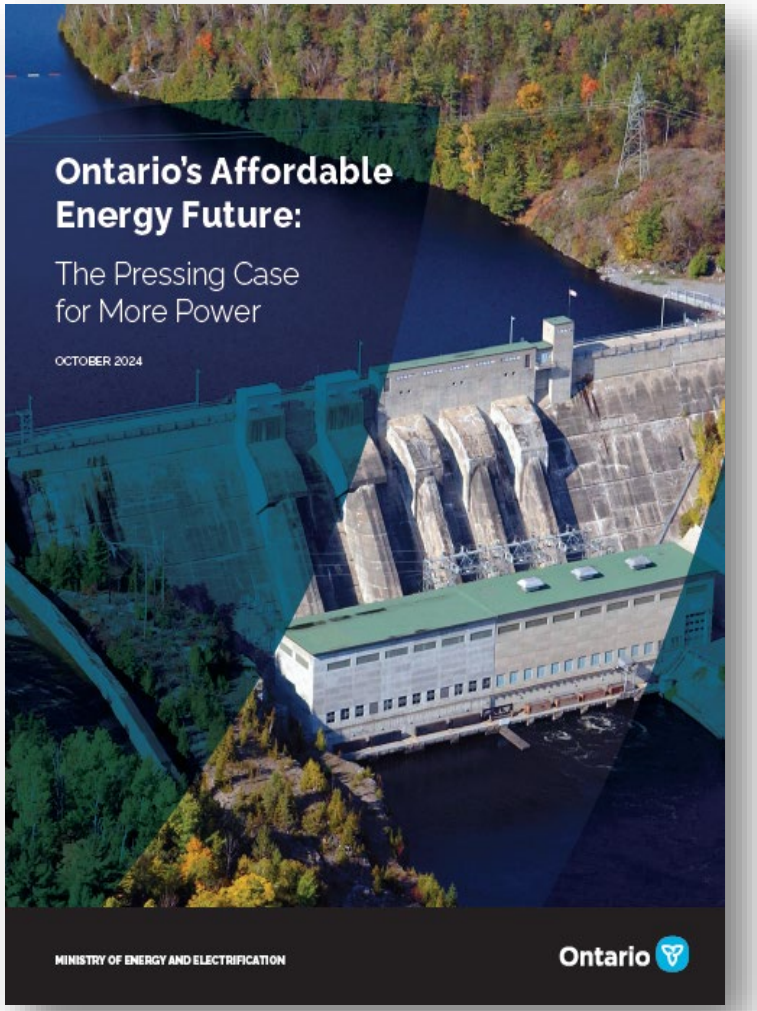
- Nuclear is part of Canada's national science and innovation sector, involving over 30 universities and several major research centres, many of them located in Ontario (e.g., McMaster University, Ontario Tech University).

- The nuclear industry in Ontario is advancing innovation in nuclear and non-nuclear applications such as medical isotopes that are used for diagnosing and treating life-threatening diseases and sterilization of medical equipment around the world.

- Ontario is taking an "all of the above" approach to nuclear energy including refurbishing existing reactors and planning for small modular reactors (SMRs) and large-scale nuclear plants.

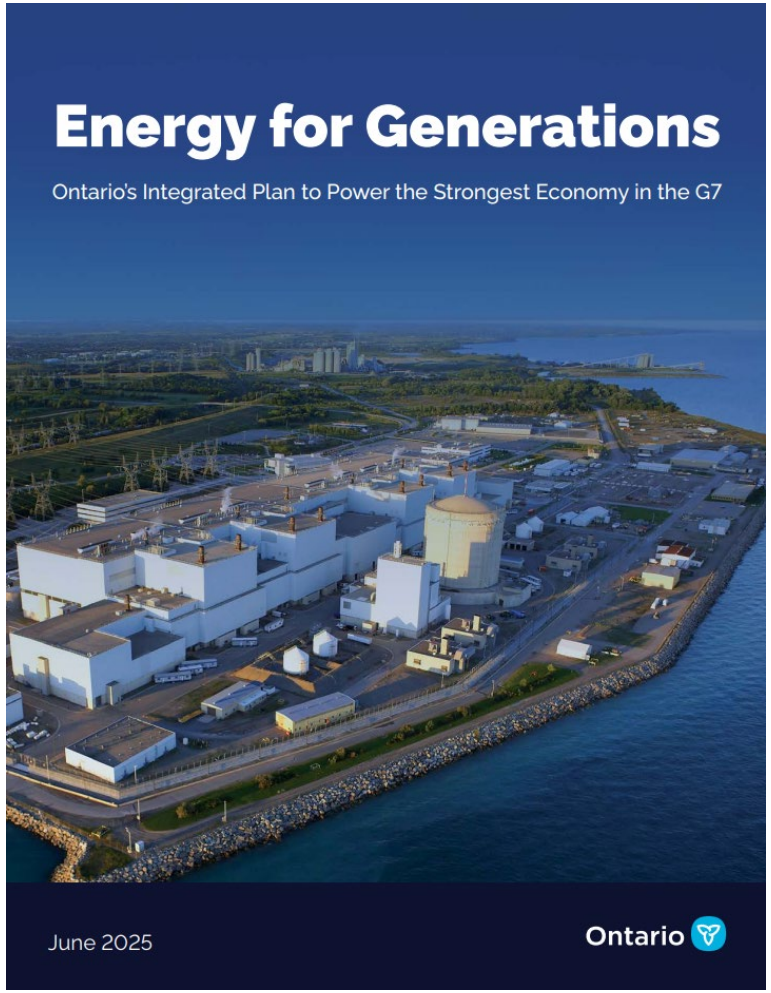
Powering Ontario's Growth: Nuclear Energy

- In 2023, the Ontario Government released the *Powering Ontario's Growth* plan, which outlines the actions the province is taking to meet the increasing demand for electricity driven by strong economic growth and electrification through the 2030s and 2040s.
  - Recent major industrial announcements, particularly around the electric vehicle supply chain and clean steel-making, are expected to significantly increase industrial electricity demand.
  - Residential demand is growing as the population increases and as more households transition to electric vehicles and electric heat pumps for heating.
  - Energy projects, especially nuclear and transmission, require **significant lead time** for planning and approvals. There is a need to **take action now** and also to **plan for long term growth.**
- The plan includes immediate actions to enhance the role of nuclear in Ontario's electricity system such as **additional SMRs, refurbishments** and **new large-scale nuclear**.
- In October 2024, the Ontario Government released its vision for Ontario's energy future, "*Ontario's Affordable Energy Future: The Pressing Case for More Power*" and legislative changes through the *Affordable Energy Act* that would include the following steps:
  - Establish Ontario's First Integrated Energy Plan: introduce a new framework that would coordinate planning for all energy resources to ensure energy remains affordable.
  - Prioritize Nuclear Power in Generation Build Out: for the first time in legislation, Ontario will prioritize the role of nuclear power generation to meet future increases in demand.



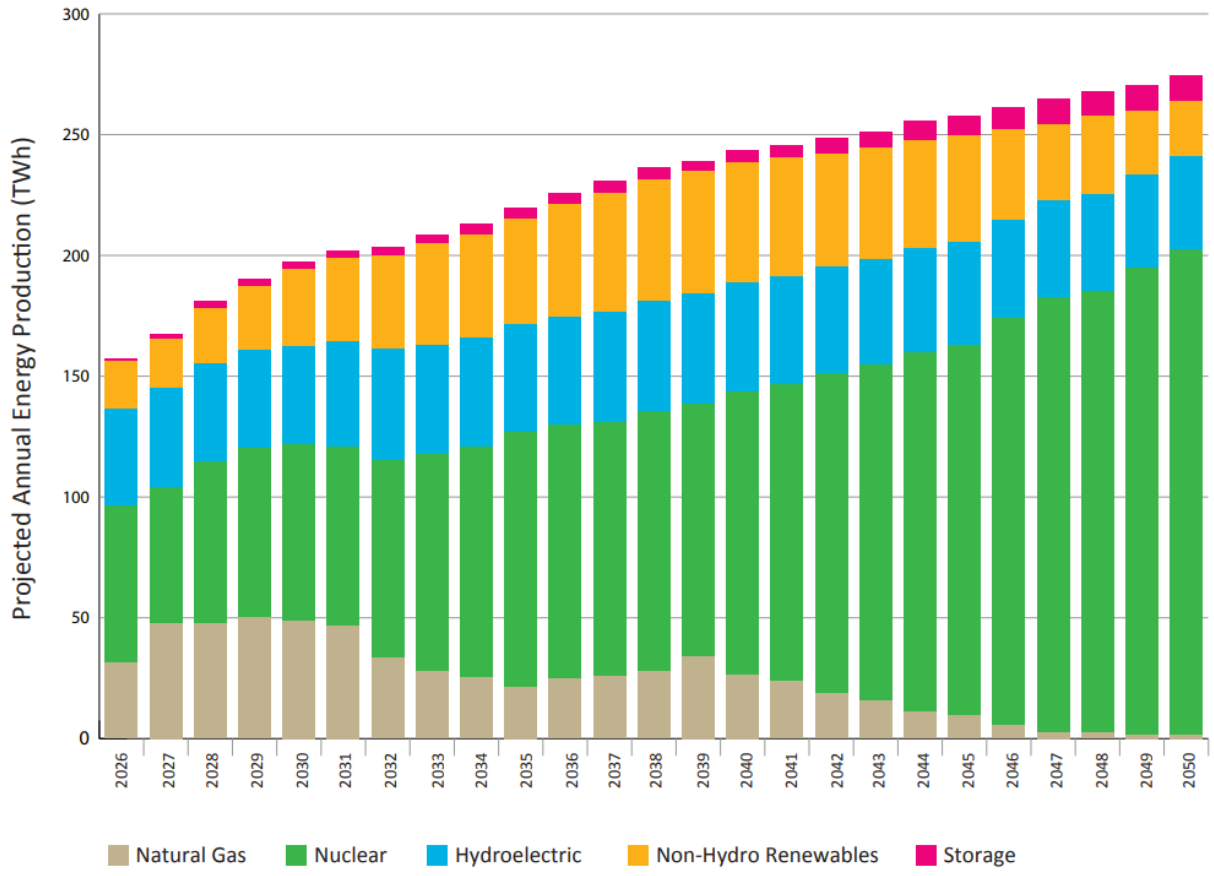
Ontario's Integrated Energy Plan

- In June 2025, the Ontario Government released its first-ever integrated energy plan, "*Energy for Generations*" which advances a range of actions that leverage every energy resource and position the province for long-term success including:
  - **Meeting Growing Electricity Demand** – Investing in energy efficiency, generation, storage and distribution, including competitive procurements and the largest nuclear buildout on the continent, while reaching more than 99% zero-emissions electricity by 2050.
  - **Positioning Ontario as a Global Clean Energy Superpower** – Growing exports of Ontario-made electricity, nuclear technology, medical isotopes and engineering expertise to global markets, while supporting east-west grid connections across Canada.
- Nuclear power will continue to serve as the **backbone of the province's electricity system** providing round-the-clock baseload power, with the following initiatives underway to meet the increasing demand for electricity through the 2030s and 2040s:
  - Refurbishments at Darlington and Bruce are progressing on time and on budget, securing about 10,000 MW of capacity;
  - Next steps toward potentially refurbishing Pickering "B" units for over 2,000 MW;
  - Construction of the first of four SMRs as well as planning and preparation for the three remaining SMRs at Darlington, for a total of 1,200 MW; and
  - Pre-development work for up to 4,800 MW of new nuclear generation at the Bruce site and up to 10,000 MW of new nuclear generation at the Wesleyville site.



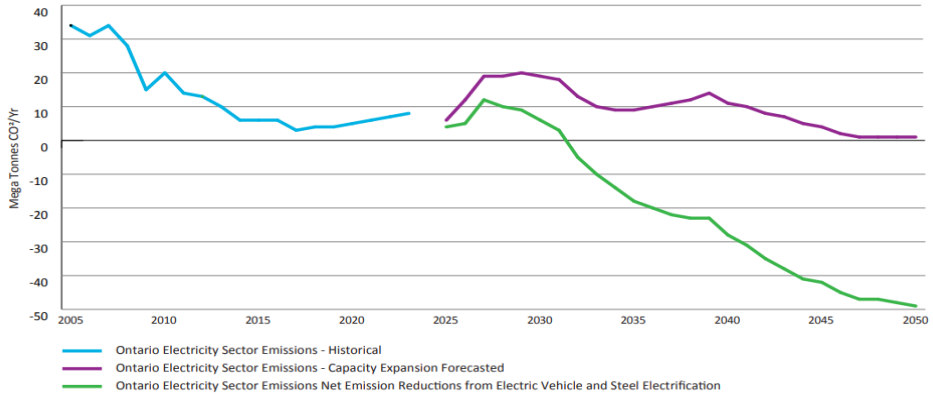
Ontario's Integrated Energy Plan – Key Charts

Figure 18: Projected Future Electricity Supply Mix



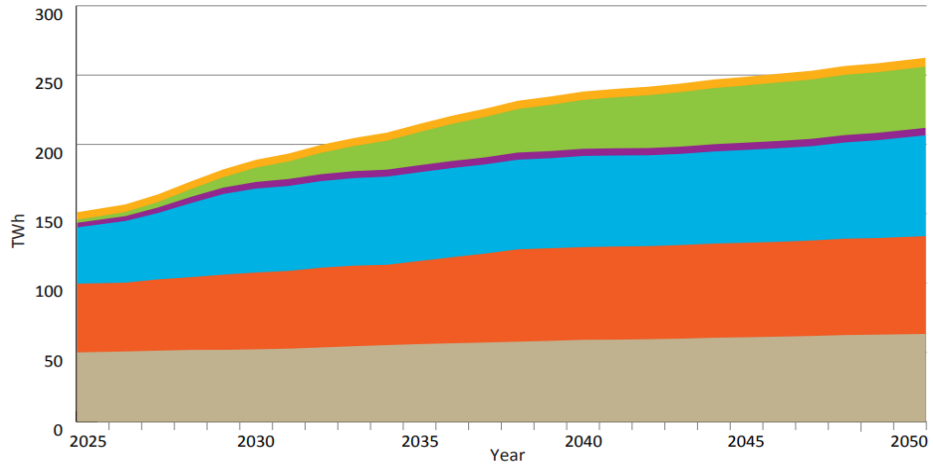
This chart shows an IESO projection from the 2025 APO of how the sources of electricity produced in Ontario could evolve over the planning period to meet demand in a cost-effective manner.

Figure 17: Ontario's Electricity Sector Emissions



As more homes, vehicles and industry take advantage of this clean electricity supply, instead of other fuels, emissions from the broader economy are expected to fall, even if electricity system emissions temporarily rise.

Figure 5: Projected Electricity Demand by Sector



Electricity demand growth is driven by increasing demand across almost all sectors of the economy including transportation, commercial, industrial and residential.

Nuclear Projects in Ontario – Refurbishments

Darlington Refurbishment: Refurbishment of 4 units at Darlington Nuclear Generating Station (3,500 MW)	
Status	• Following government approval, Ontario Power Generation (OPG) began refurbishment in 2016 and is scheduled to be complete by 2026. • On time and on budget.

Bruce Refurbishment: Refurbishment of 6 units at Bruce Nuclear Generating Station (6,550 MW)	
Status	• Following government approval of a refurbishment agreement between Bruce Power and Ontario's Independent Electricity System Operator, Bruce Power began refurbishment in January 2020 and is scheduled to be completed by 2033. • On time and on budget.

Pickering Refurbishment: Refurbishment of 4 units at Pickering Nuclear Generating Station (2,100 MW)	
Status	• Currently in the Project Definition Phase. By the end of 2025, OPG is expected to seek government approval to proceed with the execution of refurbishment following the development of a final project budget and schedule. • The refurbishments are expected to be complete by mid-2030s.

Nuclear Projects in Ontario – New Nuclear

Darlington New Nuclear Project: Construction of 4 SMR units at the Darlington nuclear site (1,200 MW)	
Status	• Following approval from the Canadian Nuclear Safety Commission and the Ontario government, OPG began construction of the first SMR unit in May 2025. OPG is currently proceeding with detailed planning and licensing for SMR units 2 to 4, pending future government and regulatory approvals. • The first unit is expected to be built by 2030 and the remaining three units by 2035.

Bruce "C" Project: Pre-development work for large-scale new nuclear at the Bruce nuclear site (up to 4,800 MW)	
Status	• Bruce Power has commenced public and Indigenous engagement and undertaking a federal Impact Assessment to review the environmental and associated impacts of the project. • Project is in early planning stages. Further Ontario government and federal regulatory approvals will be required before the project can proceed to construction.

Additional New Nuclear Siting Opportunities: Pre-development work for large nuclear at Wesleyville site (up to 10,000 MW)	
Status	• OPG is working with local communities to explore opportunities for new nuclear generation at the Wesleyville site and undertaking preliminary site assessments. • Project is in early planning stages. Further Ontario government and federal regulatory approvals will be required before the project can proceed to construction.

Next Steps

- **Ministry of Energy and Mines (MEM):** To provide policy oversight of OPG and Bruce Power's nuclear projects, including policies related to the recovery of nuclear costs from ratepayers, and to support future government decision-making to advance these projects.

- **Ministry of the Environment, Conservation and Parks (MECP):** Review applications for permits and authorizations related to non-nuclear environmental protection (e.g., water intake and discharge, non-hazardous waste disposal).

- **Other Ontario Government:** Review applications for permits and authorizations such as Ministry of Natural Resources (MNR) for drilling and use of the lakebed; and the Technical Standards and Safety Authority (TSSA) for pressure vessels. OPG and Bruce Power also work with the Ministry of Emergency Preparedness and Response (MEPR) to develop and implement off-site nuclear emergency response plans.

- **Impact Assessment Agency of Canada (IAAC):** Review applications for federal impact assessments, where applicable for new nuclear projects, to allow the federal nuclear licensing process to begin.

- **Canadian Nuclear Safety Commission (CNSC):** To provide lifecycle regulation of nuclear facilities including reviewing operating licences of existing OPG and Bruce Power nuclear stations and issuing new licences for site preparation, construction and operation of new nuclear stations.

- **Other Federal Government:** Review applications for permits and authorizations such as Fisheries and Oceans Canada (DFO) for impacts to lake fish; and Transport Canada for impacts to navigable waters.

Thank you.

Questions?