

CANADIAN NUCLEAR ASSOCIATION

NUCLEAR – A STRATEGIC ASSET FOR ONTARIO

October 7 , 2015

CNA: Who We Are

1 Represent the Canadian nuclear industry

2 Promote nuclear technologies for peaceful purposes

3 Industry Profile:

- **\$6.6 billion of activity**
- **60,000 jobs (direct & indirect)**
- **Heavily concentrated in Ontario**

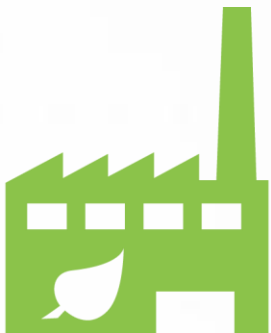
Nuclear Industry: A Strategic Asset



Contributes to Ontario's economic, environmental and social goals



Provides 60% of grid-delivered electricity



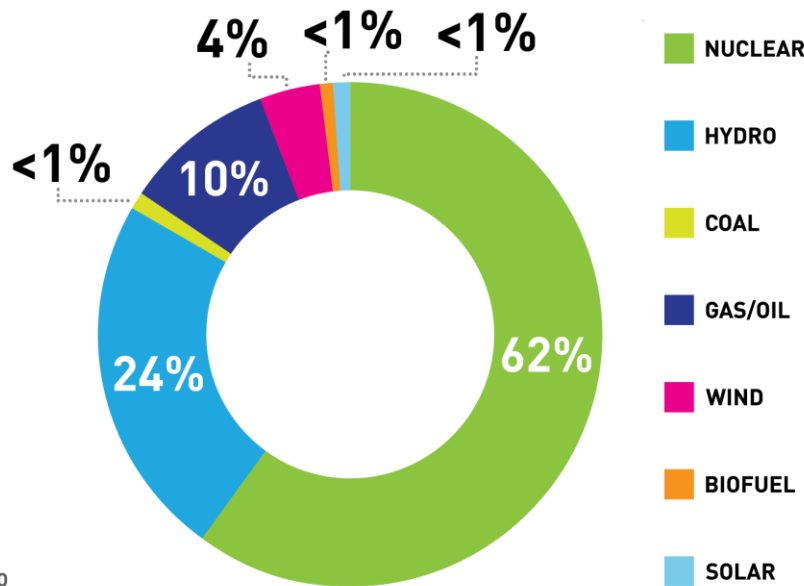
Generates zero GHGs



Opportunity for growth in international nuclear marketplace

Made-in-Ontario Supply

ELECTRICITY GENERATION IN ONTARIO IN 2014



Source: IESO

“Nuclear generation will continue to be the backbone of Ontario’s supply.”
- Ontario’s Long Term Energy Plan

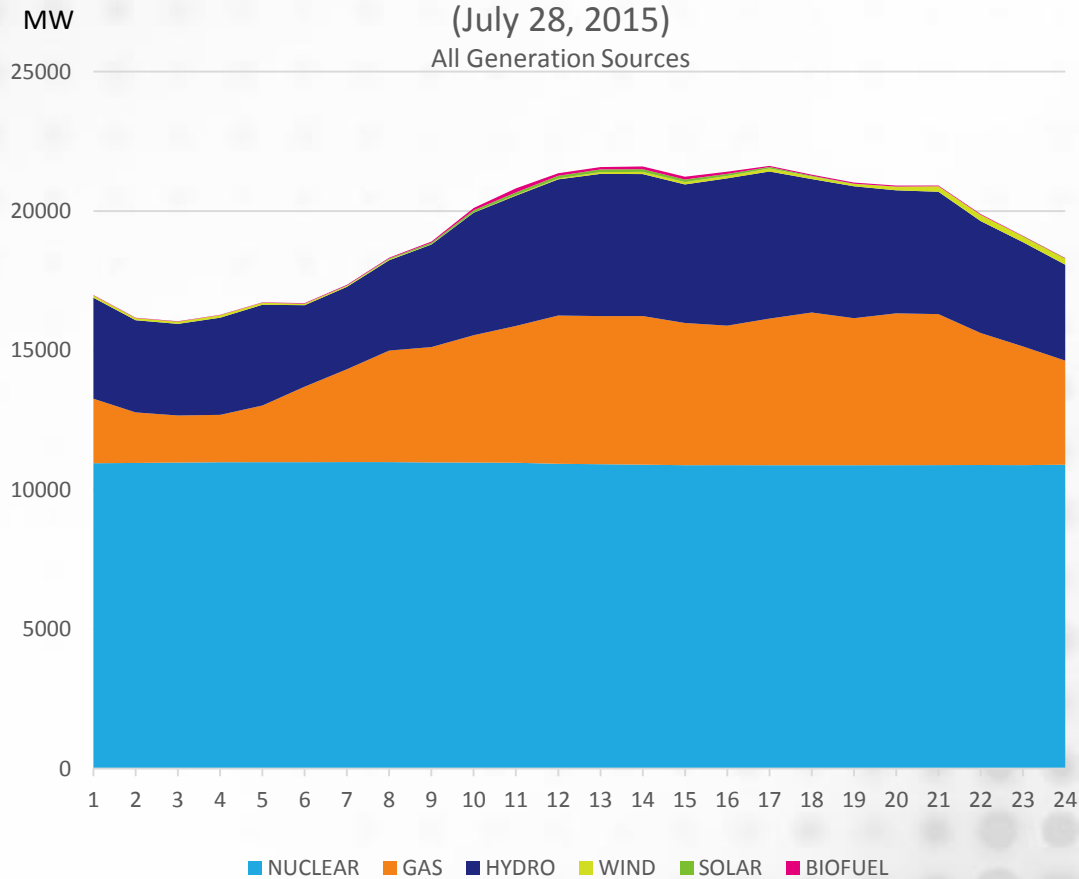
- Nuclear energy provided 62% of grid power in 2014.
- 18 operating units in Ontario (based on CANDU technology) at Pickering, Bruce and Darlington sites
- Stable, reliable output enabled Ontario’s coal shutdown.
- Cost of nuclear to IESO: 6.6¢/kWh
 - Only hydro less expensive: 5.6 ¢
 - Gas: 12.7 ¢
 - Wind: 12.5 ¢
 - Solar: 47.3 ¢

“Refurbished nuclear is the most cost-effective generation available to Ontario for meeting baseload requirements.”

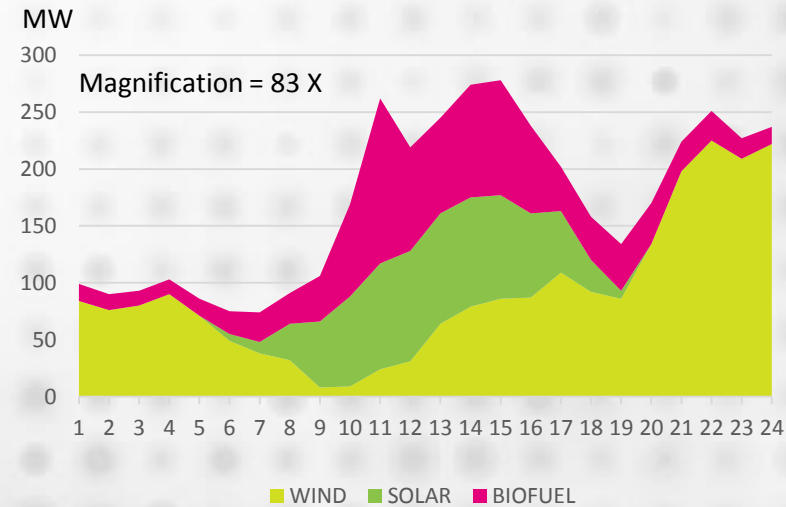
- Ontario’s Long Term Energy Plan

Generation – A Snapshot

Electricity Generation vs Time of Day
(July 28, 2015)
All Generation Sources



Electricity Generation vs Time of Day
(July 28, 2015)
Non-Hydroelectric Renewables Only



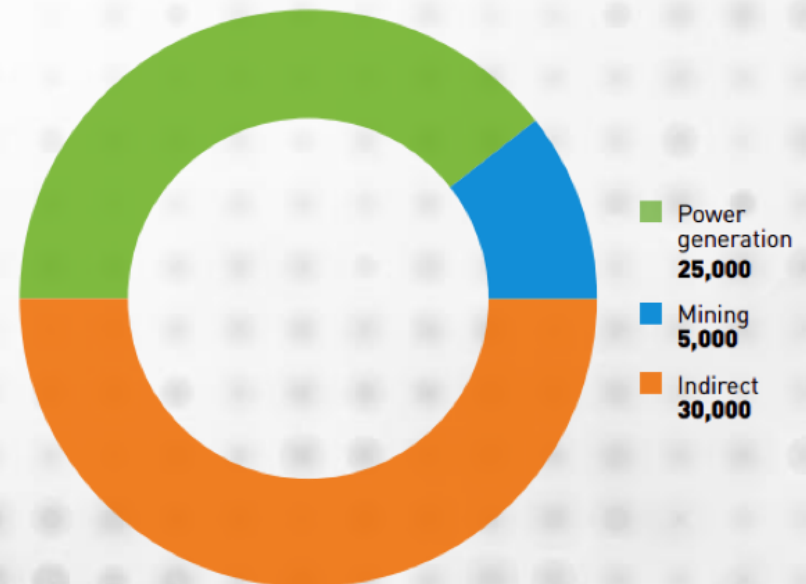
Economy

“Nuclear power is also part of Canada’s science and innovation advantage, involving more than 30 universities and six major research centres, many of them in Ontario. The nuclear industry generates \$2.5 billion in direct and secondary economic activity in Ontario every year.”

- Ontario’s Long Term Energy Plan

- **60,000 jobs (direct & indirect):**
 - Concentrated in Ontario
 - Highly skilled and knowledge-based
- **Refurbishment of 10 CANDU reactors:**
 - \$25 billion paid to suppliers and direct labour over 15 years
- **Export of CANDU technology and services abroad:**
 - Generates thousand of person years of employment to the province
- **Central to Ontario’s innovation system:**
 - Links universities, research facilities, utilities, advanced manufacturing, health care

JOBS SUPPORTED BY NUCLEAR IN CANADA



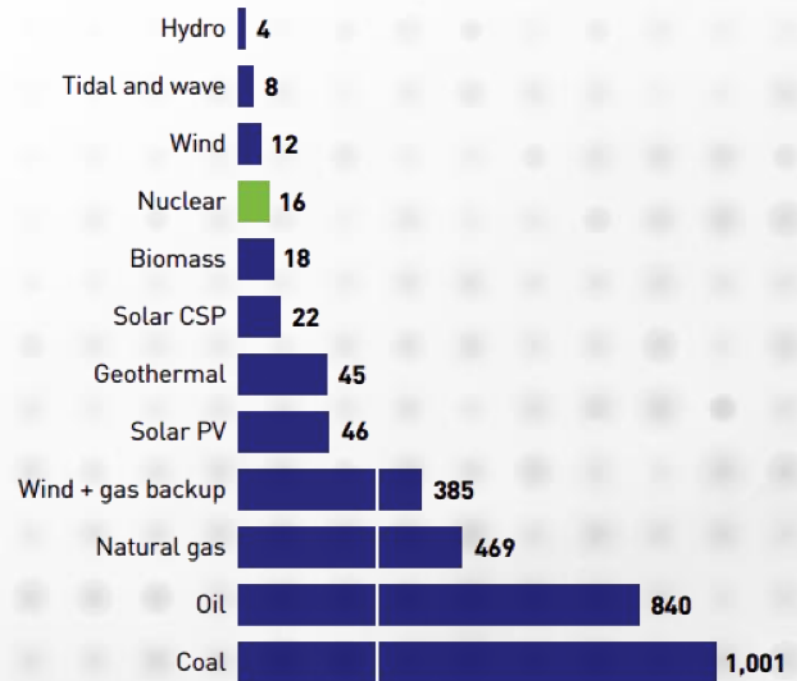
SOURCE: Canadian Manufacturers and Exporters

Environment

- **Key instrument for climate stabilization:**
 - Zero GHG emissions during operation
 - Lifecycle basis: compares favourably to hydro, wind and solar
 - Health benefit: No more smog days
- **Nuclear waste:**
 - Only energy industry able to account fully for all waste
 - Spent fuel safely stored
 - Future waste-management liabilities already fully funded by generators

“Nuclear generation produces no greenhouse gas emissions.”
- Ontario’s Long Term Energy Plan

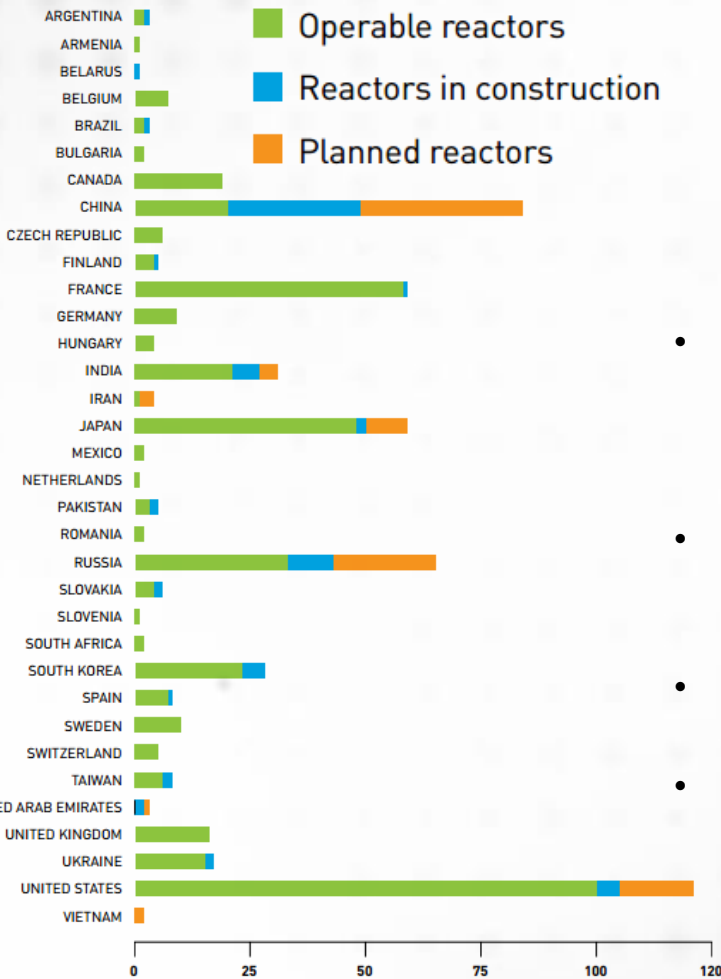
CO₂ EMISSIONS BY ENERGY SOURCE



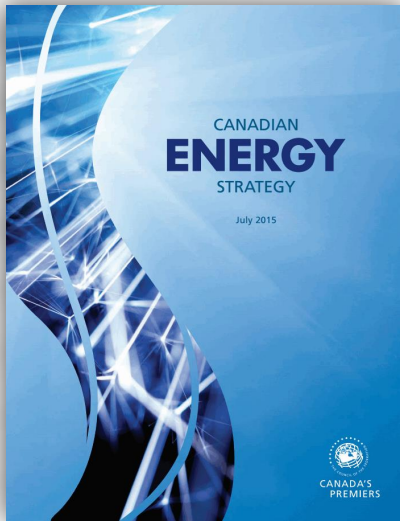
Lifecycle Greenhouse Gas Emissions (g CO₂ equivalent/kWh)

SOURCE: Intergovernmental Panel on Climate Change.

International Trade



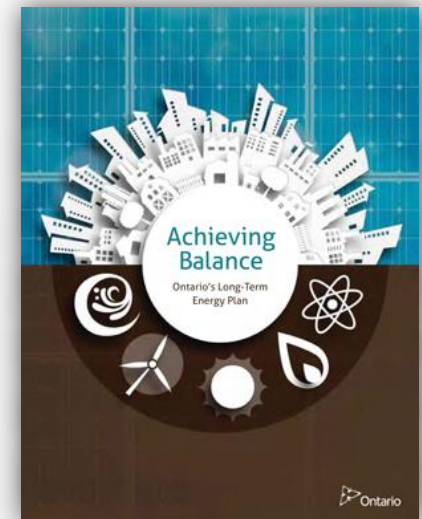
- **Global marketplace large and growing:**
 - 66 reactors under construction now (28 in China)
 - 137 reactors planned
 - Global electrical demand to rise 85% by 2040
 - Nuclear and gas main supply growth
 - 6 connections to the grid this year
 - 25 connections to the grid since Fukushima
- **New Build opportunities:**
 - Canada has successfully exported CANDU technology to four continents; well advanced in several new build opportunities
- **Refurbishment opportunities:**
 - Most of world's 435 operable reactors are 20-30 years old
- **Nuclear research increasingly a source of competitive advantage**
- **Major advantage: Fully integrated nuclear industry**
 - Saskatchewan: Mining
 - Ontario: Nuclear design and development, fuel fabrication, power generation, waste management & decommissioning



“The international energy market is very competitive, and in the race for new markets Canada’s global competitors are not standing still. It is important that we take timely action to explore and seize international export opportunities.”

- Canadian Energy Strategy

“The refurbishment of Ontario’s nuclear fleet represents a multi-billion dollar investment and continued support of the province’s nuclear supply chain and operations for decades to come. This will create a strong foundation where Ontario’s nuclear suppliers can market their products and services to a global nuclear industry that could reach over 500 reactors by 2030. By working with Ontario’s nuclear operators, Bruce Power and OPG, these suppliers will demonstrate their capability to deliver domestically and internationally, creating jobs and economic opportunities for the province.”



- Ontario’s Long-Term Energy Plan

Looking Forward

- Long-Term Energy Plan update in 2016 must retain nuclear energy as foundation for future
- Refurbishments: commit to all 10 reactors
- Recognize nuclear's contribution in reducing Ontario's greenhouse gas emissions and its key role in the province's actions to address climate change
- Champion opportunities for Ontario's nuclear industry in the province's international trade agenda





Thank You!

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