Advancing Nuclear:

From concept to successful deployment – The Canadian success story

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ANA Australia 2024

AtkinsRéalis

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WHO WE ARE

We're AtkinsRéalis, a world-leading engineering services and nuclear organization. **We design and deliver major projects on the built and natural environments** all around the world, and we do so by connecting people, data and technology.

Started in 1911 by Quebec engineer Arthur Surveyer, we rode the first wave of the electrification revolution.

Formerly, SNC- Lavalin, our company has been steadily evolving for years while working with clients on some of the world's most complex projects.

As we've evolved, we've strengthened our offering through several acquisitions, including **Atkins and Faithful+Gould**, and a focus on group-wide collaboration to help deliver better outcomes for clients, communities and the environment.

WE HAVE A STRONG PURPOSE, WHICH IS TO:

Engineer a better future for our planet and its people

The Case for NEW NUCLEAR

Net Zero carbon by 2050 is the global deadline we cannot afford to miss. We aim to meet this goal and help the world do the same.

Engineering Net Zero – AtkinsRéalis (atkinsrealis.com)

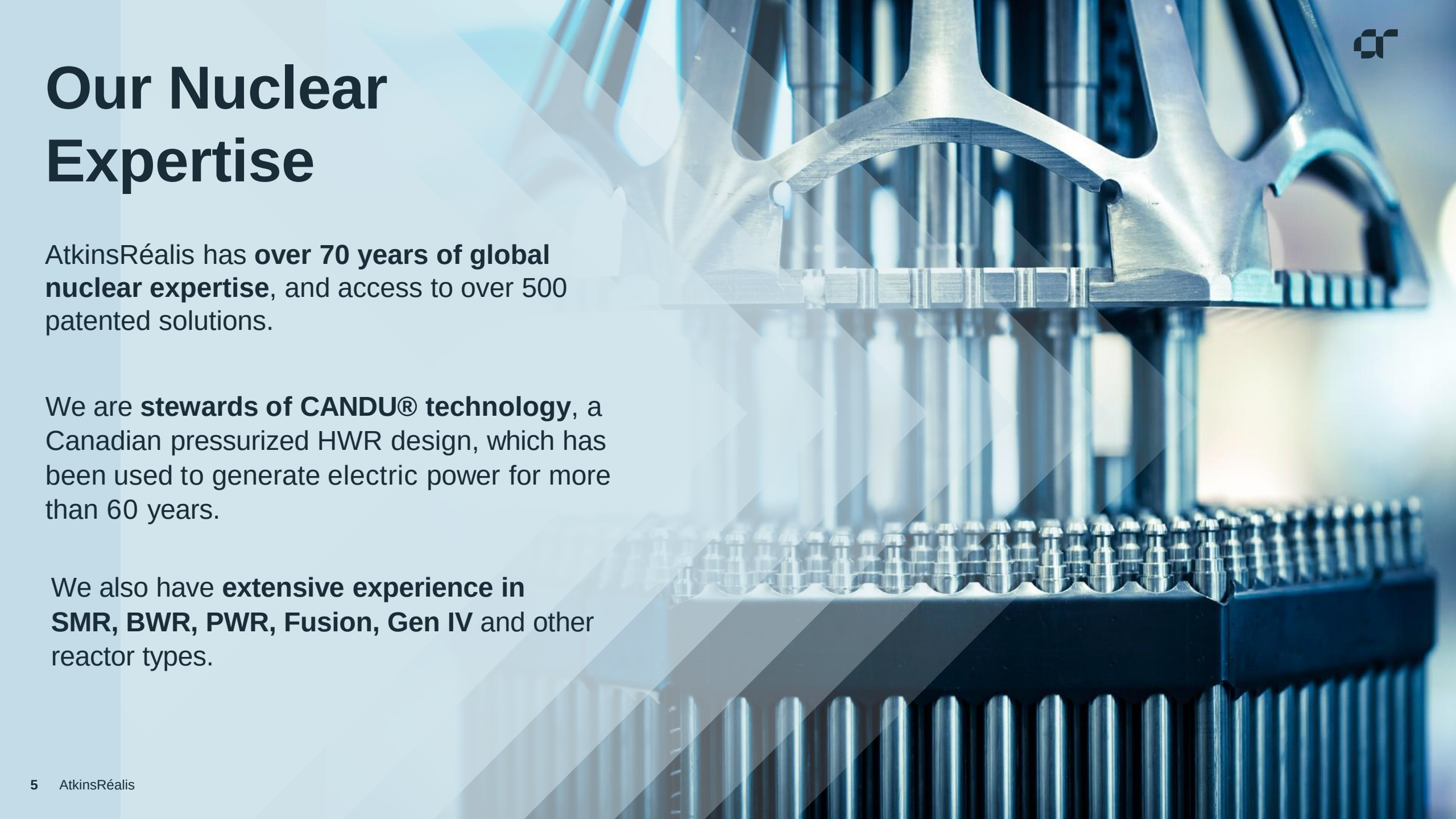
AtkinsRéalis

Our Nuclear Expertise

AtkinsRéalis has **over 70 years of global nuclear expertise**, and access to over 500 patented solutions.

We are **stewards of CANDU® technology**, a Canadian pressurized HWR design, which has been used to generate electric power for more than 60 years.

We also have **extensive experience in SMR, BWR, PWR, Fusion, Gen IV** and other reactor types.



Canada's Nuclear Pedigree

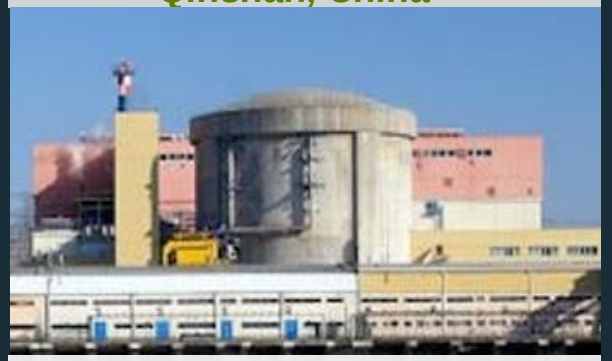
- 31 CANDU reactors built globally.
- 10 of the largest Canadian CANDUs are going through mid-life refurbishment now that will extend the fleet to 2065.
- International CANDUs have the highest capacity factors of ANY reactor design in operation!!
- **We have an enviable history of *On-time/budget* delivery.**
- Canada is building the first western SMR with the first of four BWRX- 300 SMRs at Darlington. To be on-line by 2029.
- *We are developing our **next CANDU – 1,000MWe***
- Bruce Power and OPG are planning new large-scale reactors
- Our industry and Regulator (CNSC) are supporting dozens of countries with business plans and designs.

Canada's New Build Delivery Record

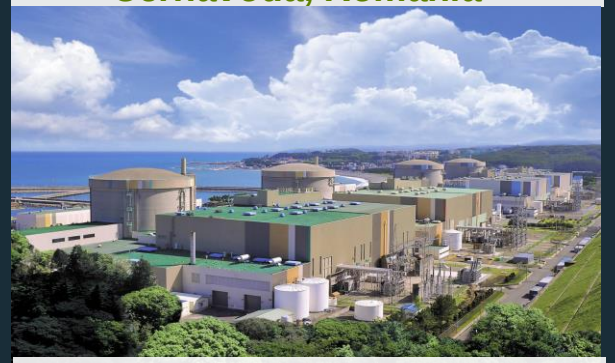
In-Service	Plant	Status
1996	Cernavoda Unit 1, Romania	On budget, on schedule
1997	Wolsong Unit 2, South Korea	On budget, on schedule
1998	Wolsong Unit 3, South Korea	On budget, on schedule
1999	Wolsong Unit 4, South Korea	On budget, on schedule
2002	Qinshan Phase III Unit 1, China	Under budget, 6 weeks ahead of schedule
2003	Qinshan Phase III Unit 2, China	Under budget, 4 months ahead of schedule
2007	Cernavoda Unit 2, Romania	On budget, on schedule

Context **Olkiluoto 3** (2x890 MW) originally expected online in 2009; connected to grid March 2022.
Original ETC = €3 billion; Final cost > €8.5 billion
Vogtle (1,114 MW): seven years late (connected to grid 2023), $17B over budget.
Final cost $35B billion

Qinshan, China



Cernavoda, Romania



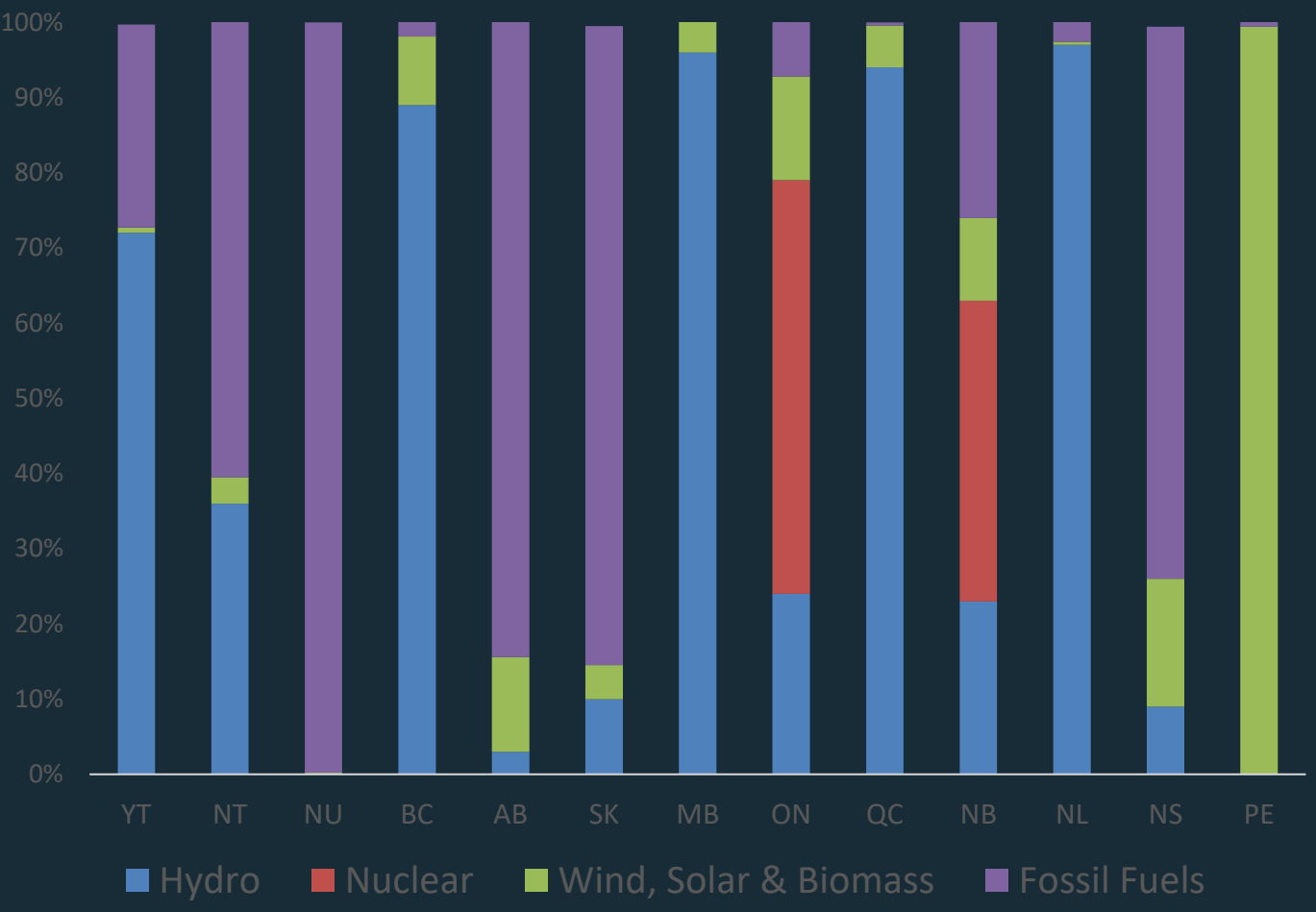
Wolsong, Korea

ENERGY GENERATION Landscape
Canada & Ontario

NUCLEAR & THE CANADIAN ECONOMY

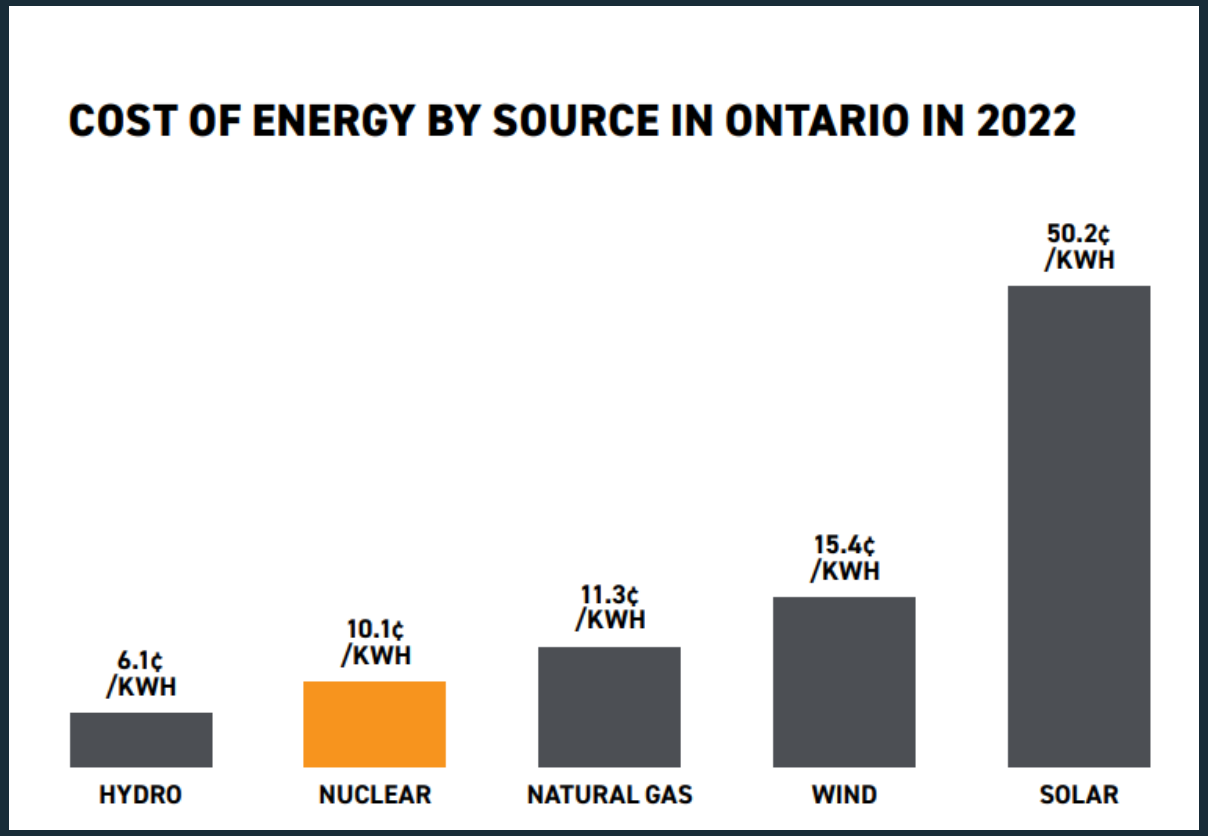
- The nuclear industry directly and indirectly supports a total of **76,000** Canadian jobs, with a total impact on the Canadian GDP of $**17 billion** per year.
- Nearly **275** Canadian companies supply products or services to the nuclear industry
- Sources of employment include Power Generation, Uranium mining and the **Medical Isotope industry**.

SOURCES OF ELECTRICITY



- Nuclear Power Provides Approximately **60%** of Ontario's electricity.
- Coal was completely phased out in Ontario in **2014.**
- **Fifty-three to zero:** the number of smog days in Ontario in 2005 compared with the number in 2014.

COST OF POWER IN ONTARIO



- **More than half** the cost of nuclear is attributed to facility construction. Once built, nuclear has very low fuel and maintenance costs.
- Supplier costs for solar and wind significantly exceed market pricing, and presently only make up about **10% of the energy mix.**
- Government subsidies assist low-income, small-business and residential customers.

THE NEXT EVOLUTION OF THE CANDU:

The Monark

CANDU: A PROVEN TECHNOLOGY

WORLD RECORD PERFORMANCE

- ✓ 7 consecutive New Builds completed on time and on budget (Wolsong Units 1-4, Cernavoda Units 1-2, Qinshan Units 1-2)
- ✓ World's largest operating nuclear station (Bruce Power, 6400 MW)
- ✓ World record for consecutive days of continuous operation (1106 days, Darlington Unit 1, 2020)
- ✓ World record for highest average capacity factor over lifetime of plant (Cernavoda Unit 2, 92%)

900+YEARS

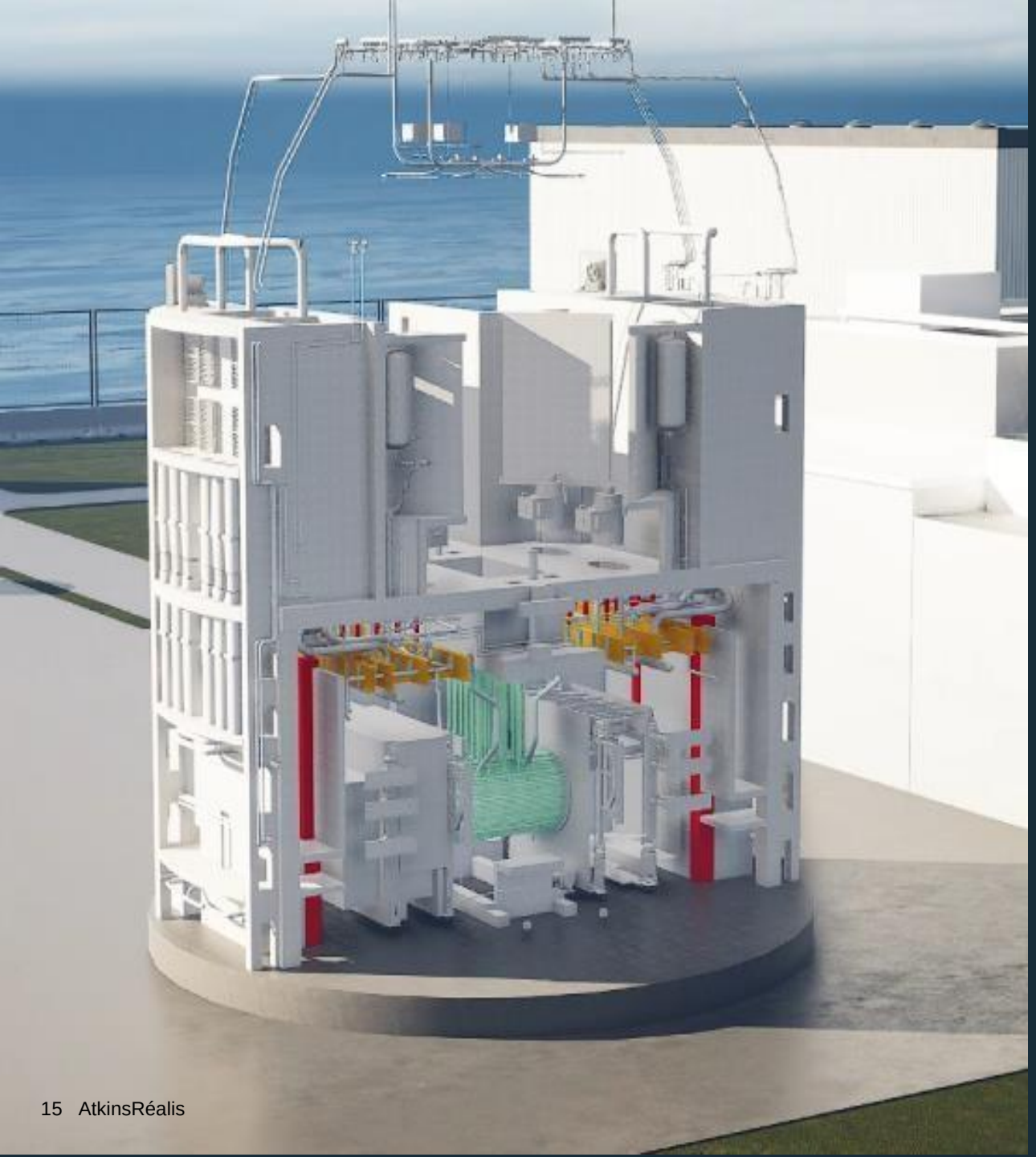
Operating Experience on 4 Continents

Meet the CANDU MONARK

1000MW Power output
Combined with Proven Natural Uranium Reactor Core

- The CANDU MONARK integrates the best features of other top performing CANDU-style reactors to create a “best-in-class” 1000 MW *reactor.*

- ✓ ***Natural Uranium Fuel***
- ✓ Co-production of life-saving medical isotopes
- ✓ Online Refueling
- ✓ ***Passive Safety***
- ✓ Completely modular design
- ✓ Operations and Maintenance-Based Design
- ✓ Mature Canadian supply chain
- ✓ ***Record of On-time On-budget deployments***



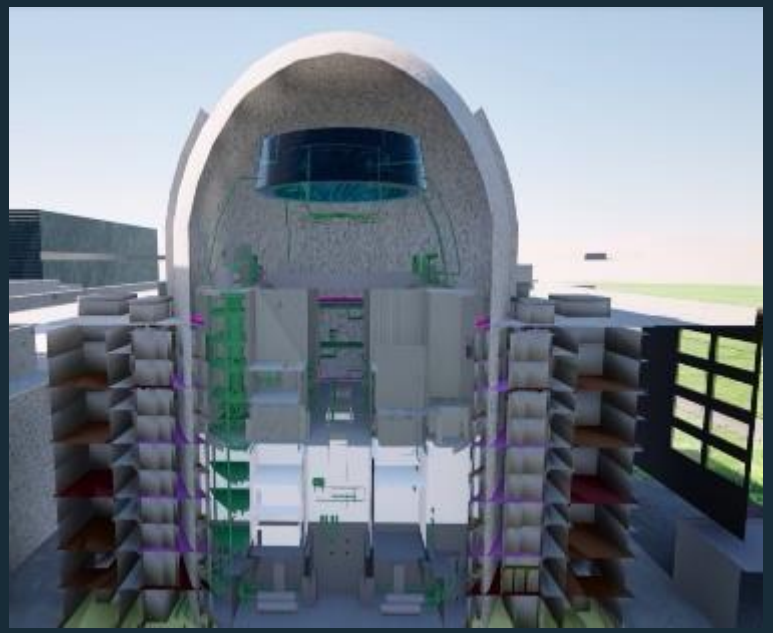
LOW LEVELIZED COST OF ELECTRICITY

- ✓ Low capital construction cost with compact layout and use of standard components
- ✓ Higher megawatt output due to increased fuel bundle & channel power (reactor power)
- ✓ Designed for 70-year life at highest capacity factors in the world
- ✓ Lowest cost of fuel due to use of natural, unenriched uranium
- ✓ Design has been optimized to reduce cost of annual operations and maintenance – and to allow these activities to be performed while the plant is online

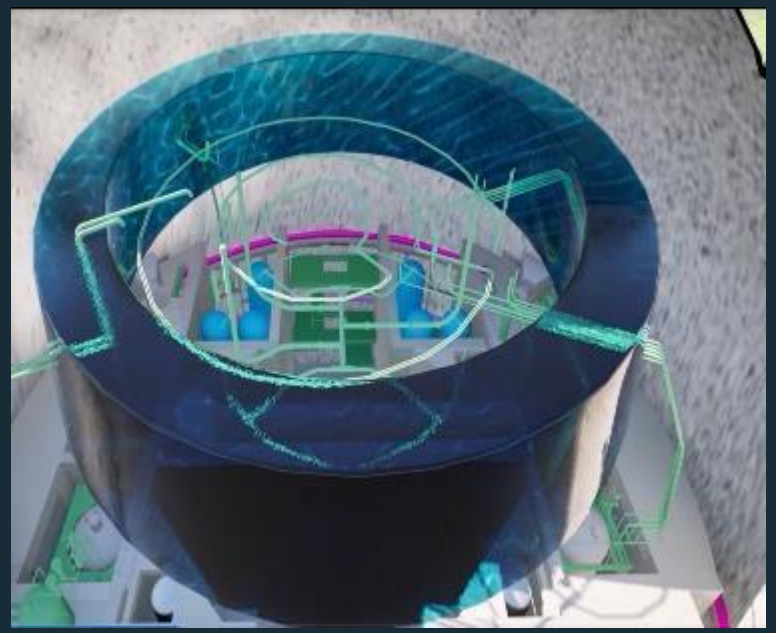
BEST IN CLASS PASSIVE SAFETY

CANDU Monark includes multiple redundant safety features, making it the most robust model to date

Multiple redundant passive safety systems – CANDU was the first to introduce an elevated water tank to provide gravity-fed cooling in accident scenarios



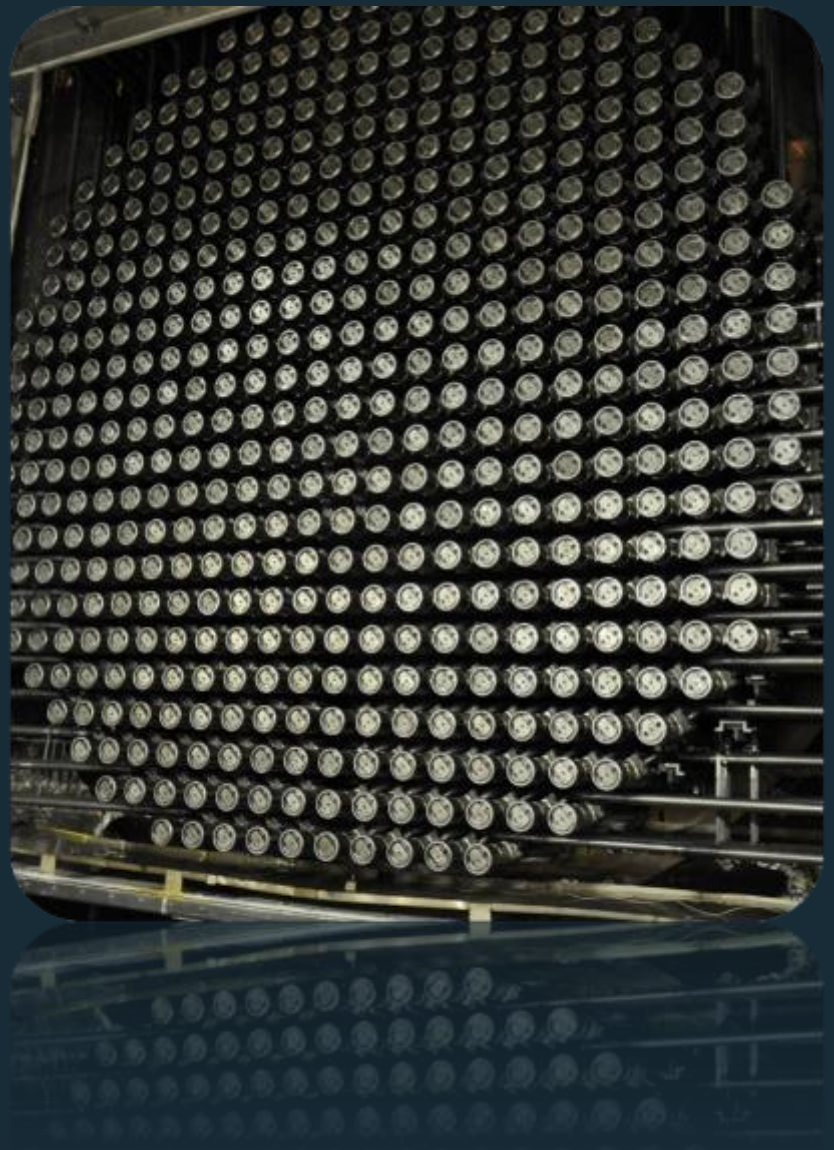
Elevated Reserve Water Tank passively cools the core without operator intervention for 72+ hours achieving what is often called ‘Walk-Away-Safe’ design



Level 4 Defense-In-Depth Features including the Severe Accident Recovery and Heat Removal System (SARHRS) allow for the plant to continue safe cooling perpetually even under the most extreme accident conditions

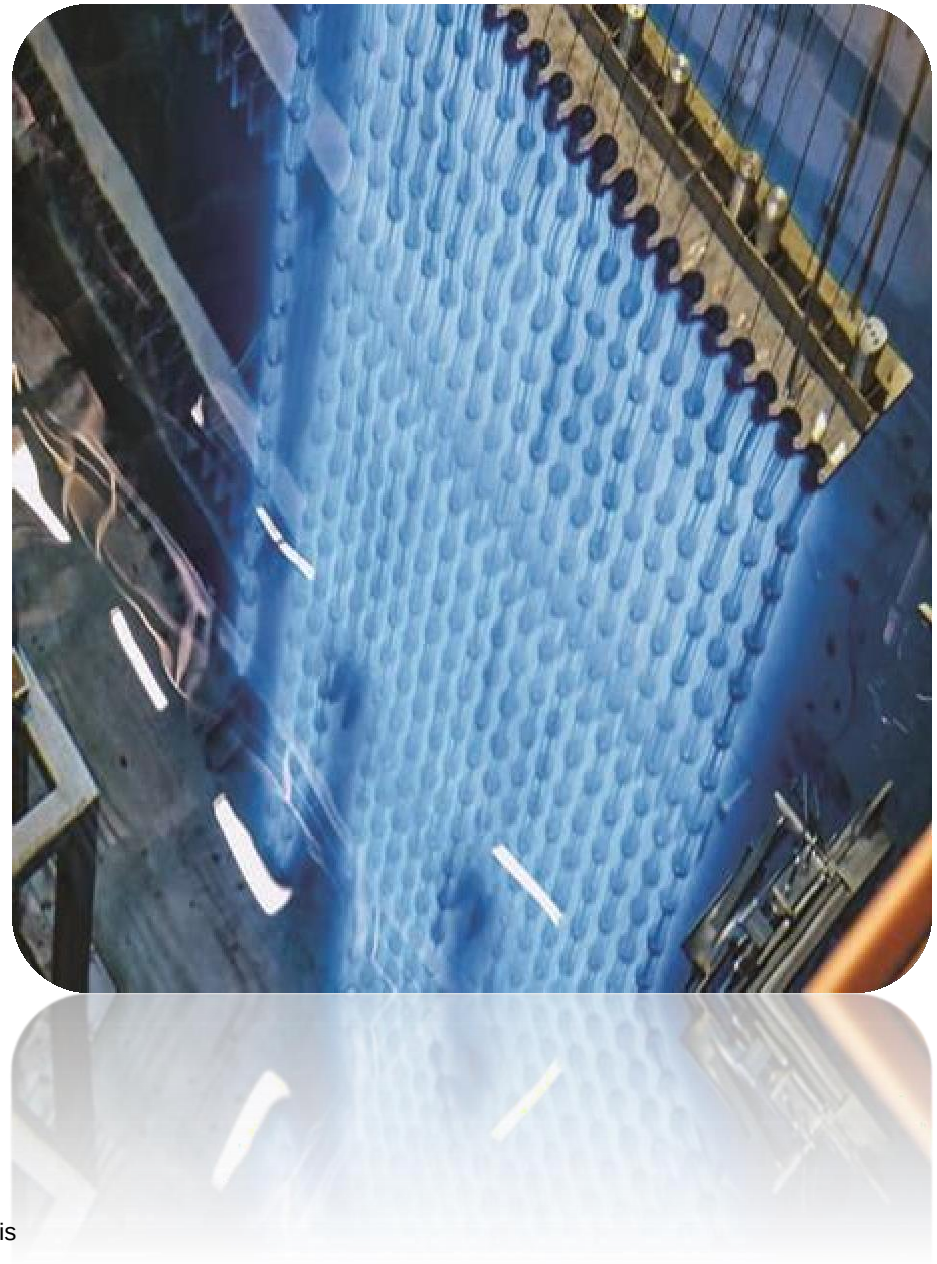
ENERGY INDEPENDENCE & LOW-COST FUEL

- ✓ CANDU MONARK is fueled with 100% Natural (unenriched) uranium
- ✓ CANDU MONARK's fuel is significantly lower cost than enriched uranium fuel for other reactors
- ✓ All countries who currently run CANDU reactors manufacture their own fuel domestically
- ✓ Natural Uranium Fuel, Individual Pressure tube design = Energy Security
- ✓ Fuel Efficiency: The CANDU MONARK features the Highest Utilization of Uranium among ALL large power reactors (~15% more)



ROBUST GENERATION III + DESIGN

- ✓ CANDU MONARK is designed for higher seismic loads than previous models
- ✓ Designed to withstand external threats including aircraft impact and extreme weather events due to climate change
- ✓ Designed for climate impact including higher ambient and water temperatures
- ✓ Latest in passive safety design and defense-in-depth features



MEDICAL ISOTOPE PRODUCTION

- ✓ CANDU MONARK is the ONLY power reactor able to co-produce life-saving medical isotopes
- ✓ Ontario's CANDU reactors currently produce 50% of the world's supply of Cobalt-60 which is used to sterilize 40% of the world's single-use medical devices
- ✓ MONARK's Online isotope harvesting system allows for extraction during power operations without any adverse impact on plant performance
- ✓ Medical isotopes are used for medical equipment sterilization, cancer diagnosis and life-saving cancer treatments

ECONOMIC IMPACT
of deploying 4 reactors

- ✓ **$90.4 billion** (2023 dollars) boost to Canadian GDP
- ✓ Every dollar spent GDP increases by **$0.97**. Including profit from the sale of electricity increases this multiplier to **$2.00**
- ✓ **33,500** full-time equivalent jobs over the 9 years of construction, and **3,500** over 70+ years of operation
- ✓ **$29.1 billion** in additional tax revenue

WHY CANDU

- **Natural Uranium** – security of supply. No enrichment needed.
- **Localization**: any country can build a domestic supply chain for a CANDU (80-90% of the supply of services and components can be sourced locally).
- CANDUs can also easily and efficiently produce a wide range of **medical and industrial-use isotopes** in LARGE quantities.
- **Ease of operation**: Ontario has successfully maintained (and grown) our fleet for 50+ years and this permitted us to become the first jurisdiction in North America to shutter coal power. Other countries have the same need.

Managing the nuclear life cycle:

Successful CANDU refurbishments

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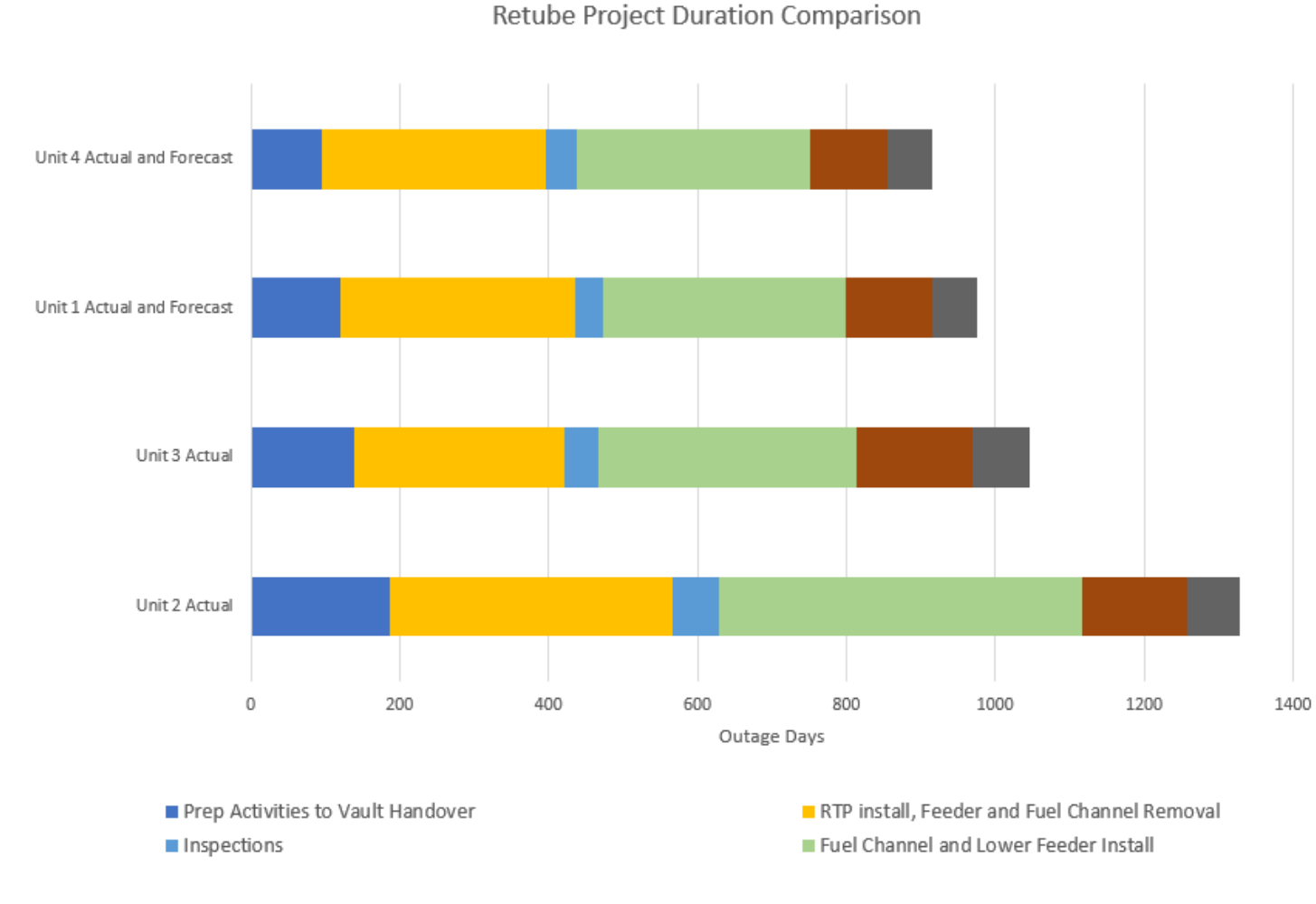
REFURBISHMENT PROJECTS IN ONTARIO

Project	Overview	Current Status	Impact
Darlington Nuclear Plant	OPG is refurbishing all four Candu reactors at Darlington, a $12.8 billion project started in 2012 to extend the plant's life by 30 years.	**- Unit 1:** Near completion, expected by Q4 2024. **- Unit 2:** Refurbished and returned to service in June 2020, setting a record with a 529-day continuous run. **- Unit 3:** Reconnected ahead of schedule, operating at full capacity, adding 3 TWh annually, and avoiding up to 1 megaton of GHG emissions. **- Unit 4:** Refurbishment began in July 2023, projected completion by 2026.	- Projected $89.9 billion in economic benefits (refurb + subsequent operation). - 14,200 jobs annually. - Boosts Ontario's GDP by CAD1.40 for every dollar spent.
Pickering Nuclear Plant	OPG received provincial support for refurbishing units 5-8 at Pickering, with a $2 billion initiation phase.	- **License:** Expires in August 2028, commercial operations for units 5-8 restricted to 2025, extension applied until end of 2026. - **Timeline:** Refurbishment expected to complete by mid-2030s.	- Adds $19.4 billion to GDP (refurb only). - 11,000 jobs annually during refurbishment. - Sustains over 6,000 jobs per year post-refurbishment.
Bruce Power Refurbishment	The Major Component Replacement (MCR) project is part of a Life Extension Program to refurbish six of eight reactors, enabling operation until 2064.	- **Unit 3:** Currently in progress and on track. - **Unit 6:** Reconnected to the grid in 2023. - **Units 4, 5, 7, and 8:** Sequential refurbishment starting in 2025, overall project to conclude by 2032.	- Estimated economic impact $8.1 to 11.6 billion - Supporting local businesses and providing thousands of skilled jobs. - Secures reliable and stable electricity, contributing approximately 30% of Ontario's power needs.

DARLINGTON REFURBISHMENT PERFORMANCE



SMR Project Development at Ontario Power Generation

OVERVIEW

- Ontario Power Generation (OPG) is leading Canada's first commercial Small Modular Reactor (SMR) deployment at the Darlington New Nuclear Project (DNNP).

- Part of Canada's strategy to achieve net-zero emissions by 2050.

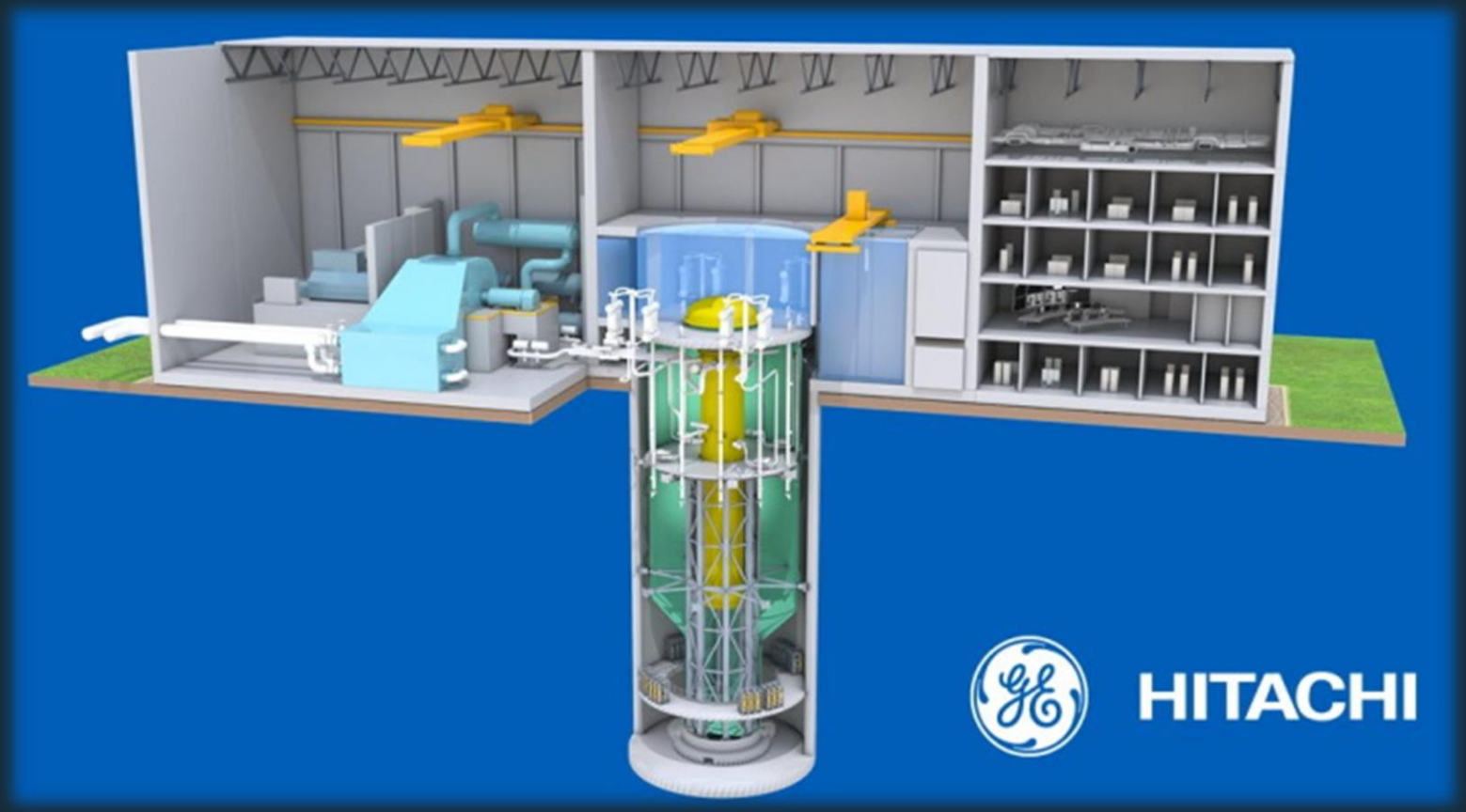
- SMR offers scalable, flexible, and low-carbon energy solutions, complementing traditional nuclear and renewable energy sources.

SMR TECHNOLOGY – an overview

Small Modular Reactor – GEN III+/ IV
Prefabrication, and modular construction design
Opportunity to **replace existing or decommissioned coal, gas, diesel plants** without grid upgrades
Cost range varies, only advertised (nothing proven yet) - **Grid-connected**
Factory-built Nth of a Kind cost reductions unproven.
Some products design to produce **industry useful high temperature steam**
Gen 3+ -> 265C
Gen 4 high temp -> up to 700C

BWRX-300 SMR

- 300MWe, BWR (Boiling Water Reactor)
- GEN III+
- Refueling cycle, 12-24 months
- Fully passive safety systems
- 60 Year design life
- Modular construction
- Lower upfront capital costs
- Shorter construction timelines to traditional nuclear reactors



thank you

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