

Ontario Power Generation



Boris Vulcanovic

Senior Director Projects | Nuclear Refurbishment, Retube and Feeder Replacement

June 18, 2022 – Durham Nuclear Health Committee

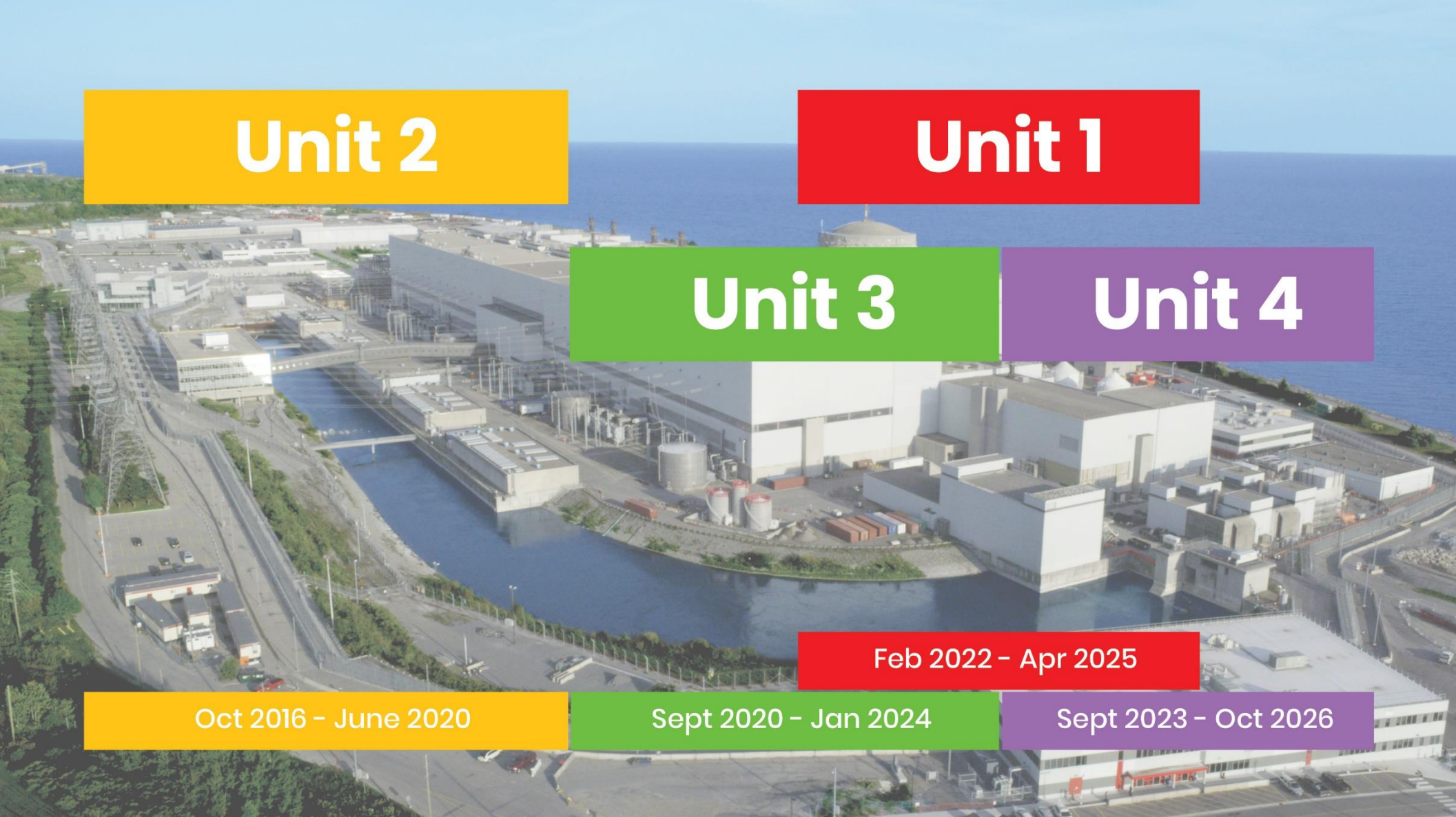
ONTARIO **POWER**
GENERATION

Darlington Refurbishment



- **Darlington Nuclear Station placed in-service in the early 1990's providing over 25 years of clean, reliable power to the people of Ontario.**
 - Four Units: 3524 MW net output
 - 20 per cent of Ontario's Electricity – power for 2 million homes (approx.).
- **Recognized internationally as one of the top performing nuclear stations in the world.**
- **Darlington's design requires a mid-life refurbishment to allow for 30 or more years of ongoing operations.**
 - 10 yrs planning, 10 yrs execution
 - \$12.8 Billion investment
 - 12,800 jobs; \$89.9 Billion boost to Ontario's GDP.

Refurbishment Outage Timeline



Refurbishment Scope and Vendors

Defuel, Fuel Handling, Special



BWXT
BWX Technologies, Inc.

Retube and Feeder Replacement



 **SNC·LAVALIN Nuclear** **AECOM**
Joint Venture

Turbine / Generator



  **SNC·LAVALIN Nuclear** **AECOM**
Joint Venture

Steam Generators




BWXT
BWX Technologies, Inc.


Balance of Plant



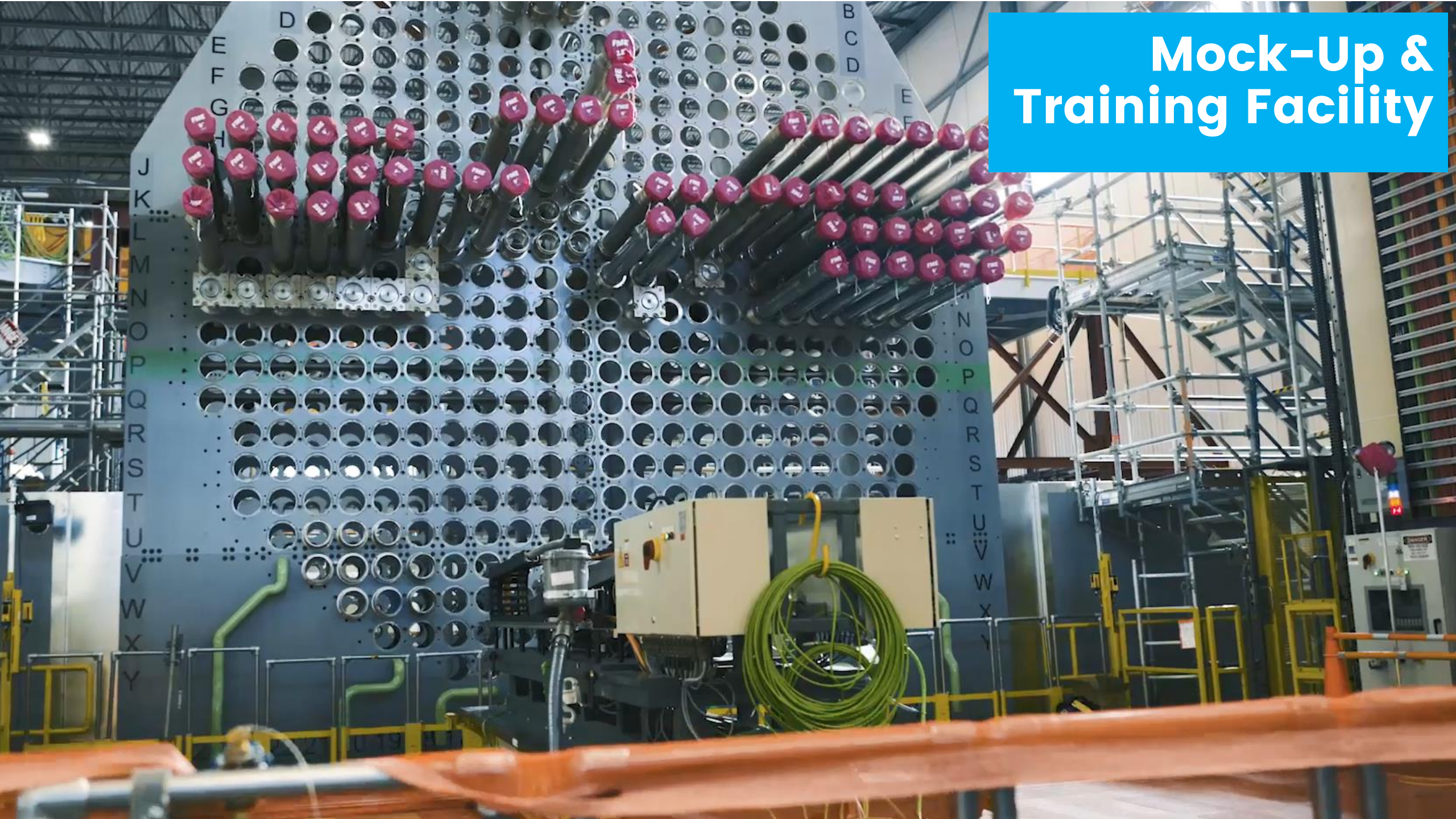


Cyclic Outage





Mock-Up & Training Facility



Unit 2 - Complete & Lessons Learned

On June 4, 2020, Unit 2 was reconnected to Ontario's electricity grid, after a three-and-a-half year refurbishment.

- Over 4,000 lessons learned from the knowledge and experience gained on Unit 2 during planning and execution.
- Ongoing lessons learned built into plans for Units 3, 1 & 4.



Unit 3 Status Update

Unit 3 Refurbishment started September 3, 2020.

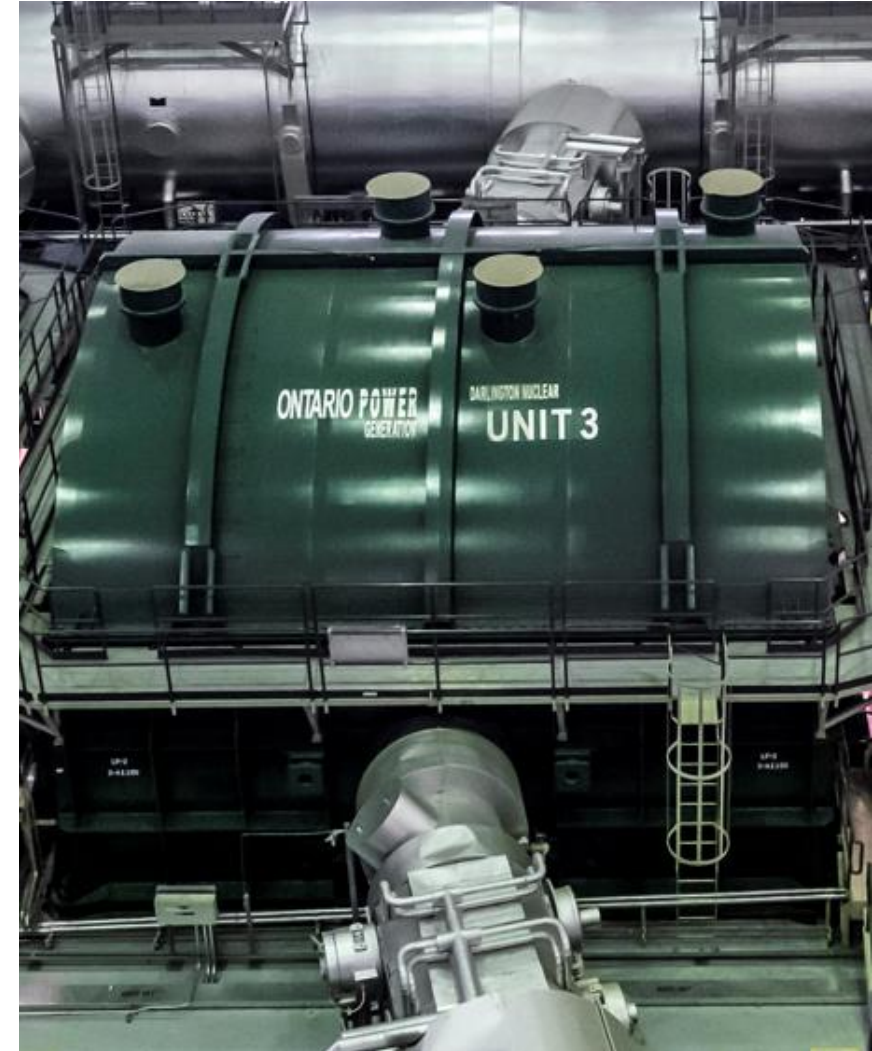
Work Series Completed: Defuel, isolate from operating units, RFR removal,

Work Series Underway: Reassembly (Feeder Pipe install, Fuel Channel install)

Key Lesson Learned: First-of-a-kind evolution on Unit 3 (or refurbishment anywhere!) with the simultaneous Pressure Tube and Calandria Tube (CT-PT) removal. Safely and successfully completed

- Improved radiological and conventional safety for workers
- Savings of 30 days compared to separate PT and CT removal series on Unit 2
- Fewer material storage containers needed by volume reduction of CT-PT together

On track to complete March 2024



Units 1 Status Update

Breaker opened on Unit 1 (Feb. 15) marked the halfway point in the Darlington Refurbishment Project and for the first time ever at Darlington, the refurbishment of two different units at the same time.

Key lesson learned: Defuel of Unit 1 successfully implemented a first-of-a-kind evolution consisting of two-trolley systems alternating on the unit to improve efficiency

Critical Path continues to progress with pre-disassembly activities including crane maintenance, bulkhead installation and the containment pressure test.



Unit 4 Status Update

Work planning, design engineering efforts, procurement and execution of pre-requisite work continues to progress well.

Planning for Unit 4 is underway and scheduled to commence its Refurbishment execution in July, 2024.

Lessons learned and future opportunities from Units 2, 3 and 1 are being incorporated into Unit 4 planning.



OneTEAM

~ 2,000 trades required to support the remaining Refurbishment activities for Units 3, 1, & 4.



AECOM

SNC • LAVALIN



Radiation Protection and ALARA

As Low As Reasonably Achievable (ALARA) Principle: OPG ensures operations do not adversely impact human health and the environment.

Radiation Protection: involves performing radiological surveys to measure radiation levels and ensure all station staff are aware of the conditions or hazards in their work areas. The job also involves making sure all workers have the appropriate safety-related protective equipment when entering these work areas.

Safety is our overriding priority.



Safety Programs, Procedures and Lessons Learned

Radiation Protection:

- Unit 3 CT-PT Combined Removal
- New Dosimetry Tracking Tool – OPG & Bruce Power
- Tool Changes and Upgrades
- Powered Air Purifying Respirators (PAPRs)

Conventional Safety:

- Falling Object Prevention



Darlington Refurbishment



DARLINGTON NUCLEAR REFURBISHMENT PROJECT

30 MORE YEARS OF CLEAN ELECTRICITY
NUCLEAR ENERGY PLAYS A FUNDAMENTAL ROLE IN ONTARIO'S CLEAN-ENERGY EQUATION

THE REFURBISHED
DARLINGTON STATION
WILL REDUCE GREENHOUSE GAS
EMISSIONS BY AN ESTIMATED

297
MILLION TONNES

THAT'S THE EQUIVALENT
OF REMOVING

2 MILLION
Cars per
YEAR

FROM ONTARIO'S ROADS



1 IN 5

HOMES AND BUSINESSES
ARE POWERED BY DARLINGTON -
WITH VIRTUALLY
NO GREENHOUSE GASES



20%

OF ONTARIO'S POWER IS
SUPPLIED BY DARLINGTON -
ENOUGH TO SERVE A CITY OF
2 MILLION PEOPLE



60%

OF ONTARIO'S DAILY
ELECTRICITY NEEDS ARE
SUPPLIED BY THIS PROVINCE'S
NUCLEAR FLEET



8¢ kWh

30 YEARS OF POWER
BELOW AVERAGE COSTS

ONTARIOPOWER
GENERATION



Summary

Safety performance continues to exceed the construction industry in Ontario.

- Project execution continues to progress well.
- Overall program is tracking to budget.
- Additional opportunities are being identified and incorporated in the plan to achieve further gains.
- Darlington Refurbishment is one OPG's key climate change initiatives.
- The refurbishment of the four Darlington units remains on plan for completion by the end of 2026.



A worker in a white protective suit and orange hard hat is working inside a large, circular, industrial structure, likely a nuclear reactor core. The structure is filled with yellow components and blue cables. Scaffolding is visible in the foreground, and the worker is positioned in the middle ground, looking towards the right. The overall scene is brightly lit, and the structure's interior is complex and detailed.

Questions?

ONTARIO **POWER** GENERATION

