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Darlington Refurbishment Program Annual Report

2024 REPORT

AS PER DECISION AND ORDER IN EB-2020-0290

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December 18, 2024

DARLINGTON REFURBISHMENT PROGRAM

INTRODUCTION

This report provides the status of the Darlington Refurbishment Program, hereafter referred to as the "Program."

Unless otherwise noted, this report includes a summary and a review of the Program performance through September 30, 2024.

This is an annual report to be provided by Ontario Power Generation (OPG) to the Ontario Energy Board (OEB) pursuant to the OEB's decision and order in EB-2020-0290.[1]

EXECUTIVE SUMMARY

The Program is a multi-year, multi-phase, mega-project that will enable the Darlington Nuclear Generating Station (Darlington) to continue safe and reliable operation until 2055. The Program includes the replacement of life-limiting critical components, the completion of upgrades to meet applicable regulatory requirements, and the rehabilitation of components at Darlington's four units.

The Release Quality Estimate (RQE) for the four-unit refurbishment is $12.8 Billion. Under the RQE, the refurbishment of the first unit (Unit 2) was to start in October of 2016 and be returned-to-service in the first quarter of 2020, with the last unit (Unit 4) scheduled to be completed in 2026. The RQE formed the basis of OPG's May 2016 pre-filed evidence in EB-2016-0152. After the development of the RQE, OPG continued detailed planning and preparations and further refined its Unit and Program estimates through the Unit 2 Execution Estimate (U2EE) in August 2016, Unit 3 Execution Estimate (U3EE) in August 2020, Unit 1 Execution Estimate (U1EE) in November 2021 and Unit 4 Execution Estimate (U4EE) in March 2023. All of these maintain the Program estimate, exclusive of external events such as COVID-19, within the original $12.8 Billion RQE budget and continue to forecast completion of the four-unit refurbishment in 2026. The U3EE formed the basis of OPG's December 2020 pre-filed evidence in EB-2020-0290.[1] OPG measures its performance over the refurbishment of each Unit against each Unit's execution estimate.

The cost forecast for the overall Darlington Refurbishment Program remains on plan at $12.8 Billion, excluding the impact of COVID-19. Based on the COVID-19 impacts to date, OPG is forecasting costs of $127 Million. OPG is continuing to assess and monitor further potential impacts associated with the current extraordinary inflationary environment on the project.

Unit 2 was successfully returned to service on June 4, 2020. Completion of the Unit 2 refurbishment on budget and with a small schedule variance of just over three months, represented a significant achievement in mega-project execution for OPG. Unit 3 was successfully reconnected to the grid on July 17, 2023, which represented another significant milestone for the Program. Both Unit 2 and Unit 3 are operating at 100 percent full power.

[1] EB-2020-0290, Decision and Order, dated November 15, 2021, Schedule A (OEB Approved Settlement Proposal), Appendix A, p. 1.

The U1EE was approved by OPG's Board of Directors in November 2021 in advance of the start of the refurbishment outage on Unit 1, and incorporated additional lessons learned, and strategic improvements based on the Unit 2 and Unit 3 refurbishments. Per the final U1EE, the budget and High Confidence Schedule to complete Unit 1 are $1,984 Million and 38 months, respectively.

As of September 30, 2024, Unit 1 refurbishment activities were progressing on schedule and in the fourth and final major segment, Power Up & Lead-Out, which involves restoration of the Vault, receiving approval from the CNSC to proceed with increasing reactor power above 35% of full power and returning the unit to commercial service. Unit 1 was successfully reconnected to the grid on November 27, 2024, with good quality and safety, within the approved budget, and 142 days ahead of public commitment schedule. Overall, the return to service of Unit 1 represents another significant milestone for the Program with performance improvements exceeding the planned unit over unit efficiencies. Unit 1 is operating at 100 percent full power.

Unit 4 is the last of four units undergoing refurbishment. The final U4EE was approved by OPG's Board of Directors in March 2023. Per the final U4EE, the budget and High Confidence Schedule to complete Unit 4 are $2,128 Million and 37 months, respectively.

Unit 4 execution commenced on July 19, 2023, shortly after the return to service of Unit 3. Based on Independent Electricity System Operator (IESO) grid stability constraints, the approval for the outage was delayed 17 days. The Unit is currently progressing through the Reassembly and Installation Segment, which involves the installation and reassembly of reactor components, including calandria tubes, fuel channels, and new feeder tubes. Unit 4 is on track to be returned to service by the third quarter of 2026.

DARLINGTON REFURBISHMENT PROGRAM STATUS

OVERVIEW

Key Program highlights include:

- **SAFETY:** Safety performance continues to be better than the average construction industry performance in Ontario. The Program is approaching 56 million hours worked with only one Lost Time Injury[2] (in May 2019) since the start of the Program. Programmatically, OPG has implemented the Fail-Safe methodology that attempts to build capacity by adding defenses in a layered approach with the mindset to reduce risk and chance of injury to the worker.

- **QUALITY:** The quality management program is used to identify issues during refurbishment execution by focused surveillance of vendor-performed work. Quality of work to date has surpassed nuclear standards, and in most cases is industry leading. There was one Significant Quality Event (SQE) for Unit 1 in September 2024 and none for Unit 4 to date.

- **SCHEDULE:** Unit 1 was returned to service on November 27, 2024. As of September 30, 2024, Unit 1 refurbishment activities were progressing on plan, and Critical Path was progressing through Low Power Testing, Heat-up & Fuel Bundle Analysis. Unit 4 execution began on July 19, 2023, and was progressing on plan through Tube Sheet bore Cleaning as of September 30th, 2024. Unit 4 is expected to return to service by the third quarter of 2026.

- **COST:** OPG is continuing to track to the $12.8 Billion budget excluding impact of COVID-19. Total Program expenditures to date are $11.1 Billion. Excluding COVID-19 impacts, life-to-date expenditures as of September 30, 2024 are $1,711 Million for Unit 1 and $941 Million for Unit 4.

PROGRESS

Unit 1 was successfully reconnected to the grid on November 27, 2024. As of September 30, 2024, the refurbishment of Unit 1 was 99% complete. Some of the major accomplishments are as follows:

- RCHP 1 Moderator Fill on December 23, 2023.
- RCHP 2 Fuel Load on April 28, 2024.
- RCHP 4 Primary Heat Transport System Fill on May 31, 2024.
- RCHP 3 Bulkhead Removal on August 10, 2024.
- RCHP 5 GSS Removal on September 13, 2024.

As of September 30, 2024, the refurbishment of Unit 4 is 51% complete; some of the major accomplishments are as follows:

- Segment 1 Lead In on October 21, 2023.
- Segment 2 Removal with completion of Pressure Tube and Calandria Tube removal on September 4, 2024.

[2] A Lost Time Injury is a work injury that results in lost days (minimum of one) beyond the date of injury as a direct result of a safety incident.

ANNUAL INTEGRATED IMPLEMENTATION PLAN (IIP) COMMITMENT

- All Unit 1 IIPs are complete and closed.
- Overall, 91% (566 of 622) of IIP commitments have been completed to date. There are 71 overall tasks due in 2024 with 3 IIP tasks remaining and 68 IIP tasks are closed/complete. The IIP commitments for 2024 are on track to be achieved.

SAFETY

Safety is a top priority for OPG. OPG has one of the lowest injury rates in the Canadian electricity sector [3]. In order to maintain this safety performance, OPG continues to set challenging targets for its day-to-day operations. At the end of the third quarter of 2024, the Program reported a Total Recordable Injury Frequency (TRIF) of 0.19 against its internal target of 0.40, reflecting six medically treated injuries from Q1 to Q3 2024. OPG sets very challenging targets for all aspects of its operations and the Program. This expectation has resulted in a program safety performance that is significantly better than the overall construction industry average as illustrated in Table 1.

The Program is approaching over 56 million hours worked with one Lost Time Injury, which occurred in May 2019. There have been no Lost Time Injuries since then.

OPG employs a variety of leading indicators to ensure that issues are addressed before incidents occur. OPG proactively tracks all events/issues and has adopted the Safety Classification and Learning (SCL) model. The SCL model is focused on learning from events to prevent recurrence and keep workers safe, which aligns with OPG's Fail-Safe strategy. OPG carefully logs and reviews each of these incidents and implements corrective actions to reduce the likelihood of future incidents. In addition, the Safe Work Planning Assessment (SWPA) has been implemented to assess the quality of direct controls implemented to address high-energy hazards within safe work plans.

PERFORMANCE METRICS SUMMARY

Table 1 provides a summary of the Program's Safety Performance and includes OPG and Vendor workers.

[3] Compared to the Infrastructure Health and Safety Association injury rate.

Table 1 - Safety Performance Metrics												
			Historical Actuals								Actual	IHSA[3]
Category	Measure	OPG Target	2016	2017	2018	2019	2020	2021	2022	2023	2024 (Q3) YTD[2]	Ontario Construction Industry 2023[3]
Safety	TRIF (Total Recordable Injury Frequency)[1]	0.40	0.64	0.49	0.39	0.52	0.35	0.25	0.26	0.19	0.19	3.91
	Lost Time Injuries	0	0	0	0	1	0	0	0	0	0	N/A

Notes:
1. TRIF is the average number of fatalities, Lost Time Injuries, medical treatment injuries and restricted work injuries per 200,000 hours worked.
2. Year-to-Date (YTD).
3. 2023 IHSA rating is the most current safety rating for the Ontario Construction Industry (as of March 2024).

CAMPAIGNS, PROGRAMS, AND INITIATIVES

OPG's safety performance is underpinned by the practice of monitoring low level precursor issues and proactively taking action to reduce the likelihood of serious events occurring. The following are the key safety campaigns, programs, and initiatives that OPG and its vendor partners advanced in 2024:

- **A Fail-Safe Approach to Safety and Human Performance**

  This ongoing initiative emphasizes safe work planning, event learning, recognition for safety-related improvements and the presence of defenses. Fail-Safe involves a strategy team consisting of OPG and vendors who are engaging workers in practices which utilize safety tools and defenses. Fail-Safe aligns with OPG's strategic direction to proactively approach safety and human performance. For 2024, the focus has continued to have Fail-Safe concepts in Safe Work Plans (SWP) and Pre-Job Briefs (PJB) with the use of defenses/direct controls, and hazard recognition to build capacity. The generation of progressive metrics to capture the presence of Fail-Safe defenses is ongoing. Introduction of SCL model metrics is targeted to be implemented in Q1 2025.

- **DataCube – Construction Observations Report**

  DataCube was implemented in the second quarter of 2023 as a digital tool to capture observations, coaching and actions across all field staff in the Enterprise, including the Program, and continues to be utilized. The report transforms the way OPG does work by centralizing information on safety related metrics from the field, identifying trends in real time and making informed decisions to act on the trends in timely manner. The DataCube has been effective in connecting users by notifying relevant groups on the occurrence of key events and streamlining collaboration between OPG and vendor partners.

- **Power Solutions – Safety Culture**
  Power Solutions continues to support the Program, by empowering field staff with the ability to report issues or provide feedback on conditions anonymously to reconcile the concerns. Power Solutions is frequently used by vendor partners and staff to address issues in an expeditious manner and provide feedback to the leadership team on the culture in the field.

- **Confined Space App**

The Program continues to use the Confined Space application to reduce errors in confined space documentation, provide interlocks, and ensure unqualified workers are not assigned to confined space work. Work groups using the App have provided positive feedback by noting the App has made the confined space work process more efficient.

- **Units 314 Proactive Human Performance and Safety Plan**

  The refurbishment group continues to use this road map to drive aligned communications throughout the Refurbishment project in collaboration with the vendor partners.

- **Surveillances and Benchmarking**

  OPG's Health and Safety group conducts ongoing surveillances with vendor partner work groups on higher risk areas to ensure hazards are identified and actions are incorporated into planning to reduce the risk of injury.

  A self-assessment to review the effectiveness of corrective actions for consequential events is in progress. The goal of the self-assessment is to confirm effectiveness and transfer knowledge into the planned Pickering Refurbishment.

  Benchmarking with other work programs within OPG and with Bruce Power was also performed to implement best practices for current Program work activities. Best practices from Edison Electric Institute (EEI) are also being introduced into the work program, through SCL and Fail-Safe initiatives.

- **Trending, Prevention and Intervention (TPI) Program**

  The Program has adopted the TPI program to identify, detect and correct issues pertaining to the Industrial Safety functional area. TPI enables the site to take action by reviewing trends and putting in place the necessary actions.

RADIOLOGICAL SAFETY

OPG's Radiological Protection (RP) program continues to meet regulatory requirements and industry standards. All workers are in compliance within regulatory dose limits. This performance is a result of OPG's robust nuclear safety culture and OPG's "As Low as Reasonably Achievable" (ALARA) radiological safety principles. Lessons learned on Unit 2 and Unit 3 have been incorporated into training and enhanced radiological safety measures on Unit 1 and Unit 4. The Program's ALARA committee continues to monitor and challenge RP performance to ensure ALARA principles result in lower doses to workers.

There has been one (1) unplanned radiological exposure YTD which occurred in September 2024 related to an acute tritium uptake during a valve setup in Unit 1, the first to date within the Program. OPG's Radiation Protection team and the Responsible Health Physicist Assessment determined that the worker dose uptake meets the threshold to be reportable to the regulator but did not exceed OPG Exposure Control Limits or Regulatory Dose Limits for the year.

PERFORMANCE METRICS SUMMARY

Table 2 provides a summary of the Program's radiological safety performance and includes both OPG and vendor employees.

Table 2 - Radiological Safety Performance Metrics						
	2022 Year End		2023 Year End		2024 End of Q3	
	Actual	Target	Actual	Target	Actual	Target
Unit 1 CRE (person-rem)[1]	722	984	416	435	128	221
Unit 4 CRE (person-rem)[1]	N/A	N/A	114	120	833	1085
Unplanned Exposures	0	0	0	0	1	0

Note:

1. Collective Radiation Exposure (CRE). A lower number represents a lower amount of radiological exposure.

QUALITY

Refurbishment of a Darlington unit involves many thousands of removal and installation activities, which are required to be executed with a high degree of precision. Many of the installation activities involve precision fit-up tasks and highly technical welding operations that are critical. A certain amount of rework is to be expected on a program of this nature.

The quality management program is used to identify issues during refurbishment execution by focused oversight on vendor performed work. As of September 30, 2024, there has been one SQE declared for Unit 1 related to a measurement discrepancy on installed Fuel Channel End Fittings, and none for Unit 4.

Incorporation of lessons learned, and Kaizen/Six Sigma lean practices have improved industrial and radiological safety, tooling, schedule management, organizational alignment, Foreign Material Exclusion (FME) planning and oversight. The culture of continuous improvement for the Program has yielded significant benefits, as lessons learned have been effectively collected and integrated, thereby driving improved performance across Unit 1 and Unit 4. The success of OPG's Culture of Continuous Improvement can be attributed, in large part, to the Window Specific Lessons Learned Workshops. These have been instrumental in capturing and disseminating valuable insights and best practices.

SCHEDULE

OPG measures Program progress against two schedules:

1. A longer High Confidence Schedule
2. A shorter Working Schedule

The difference between these two schedules is that the High Confidence Schedule includes additional contingency amounts quantified based on detailed risk analysis. These contingency amounts are expected to be utilized over the course of the Program. The Working Schedule is used to calculate performance metrics, for example, the Schedule Performance Index (SPI), and manage day-to-day activities, allowing

for early escalation of issues[4]. The use of both a Working Schedule and High Confidence Schedule is an industry leading best practice for large and complex projects.

Based on the strong performance and completion of Unit 3 to date, OPG has advanced its High Confidence Schedule for Units 1 and 4 as part of the U1EE and U4EE forecasts. Given inherent schedule risks that remained from factors such as the ongoing execution of the units in an overlapped manner (Units 1 and 4), OPG has continued to maintain its previous public commitment durations for each unit.

PERFORMANCE METRICS SUMMARY

Table 3A provides a summary of the Unit 1 schedule performance relative to the U1EE Working Schedule and High Confidence Schedule.

Table 3A - Unit 1 Schedule Performance Metric

Measure	2023 Year End Actual	2024 Q3 Actual	Working Schedule Target
Days Ahead of / Behind High Confidence Schedule LTD[1]	23 Days Ahead	44 days Ahead	N/A
Critical Path Days Ahead of / Behind Working Schedule LTD[2]	29 Days Behind at Completion of Fuel Channel Install (W119)	30 Days Behind At Completion of ATC (Approach To Critical) (W092)	14-Oct-2024
SPI[3] (Schedule Performance Index)	1.00	1.00	1.00
Forecast Working Schedule Completion Date[2]	22-Oct-2024	25-Oct-2024	N/A

Notes:

1. Days Ahead/Behind is calculated as progress for all work currently completed relative to the Life to Date (LTD) allotment of Contingency Days available in the High Confidence Schedule.
2. Critical Path Days Ahead/Behind and Forecast Working Schedule Completion Date are calculated as progress for all work currently completed relative to the Working Schedule and do not consider projected gains or losses for future work.
3. SPI is calculated for construction, commissioning, and inspection work packages only against the Working Schedule and SPI calculation includes both critical path and the non-critical path works.

[4] This strategy provides an early indication of potential risks or issues and allows OPG to proactively manage Program performance.

Table 3B provides a summary of the Unit 4 schedule performance relative to the U4EE Working Schedule and High Confidence Schedule.

Table 3B – Unit 4 Schedule Performance Metrics			
Measure	**2023 Year End Actual**	**2024 Q3 Actual**	**Working Schedule Target**
Days Ahead of / Behind High Confidence Schedule LTD[1]	30 Days Ahead	16 Days Behind	N/A
Critical Path Days Ahead of / Behind Working Schedule LTD[2]	16 Days Ahead (At Completion of Remove Fueling Machine Bridges & Install Radioactive Particle Trackers W101)	44 Days Behind At Completion of Calandria Tube Removal (W117)	15-Feb-2026
SPI[3] (Schedule Performance Index)	1.03	0.98	1.00
Forecast Working Schedule Completion Date[2]	28-Dec-2025	07-Feb-2026	N/A

Notes:
1. Days Ahead/Behind is calculated as progress for all work currently completed relative to the LTD allotment of Contingency Days available in the High Confidence Schedule.
2. Critical Path Days Ahead/Behind and Forecast Working Schedule Completion Date are calculated as progress for all work currently completed relative to the Working Schedule and do not consider projected gains or losses for future work.
3. SPI is calculated for construction, commissioning, and inspection work packages only against the Working Schedule and SPI calculation includes both critical path and the non-critical path works.

COST

Total Program expenditures to date are $11.1 Billion, with the current remaining estimate to complete the Program at $1.7 Billion. The overall program estimate at completion remains at $12.8 Billion (excluding COVID-19 impacts).

After the approval of the RQE in 2015, OPG established the U2EE[5] in August 2016, the final U3EE[6] in August 2020, the U1EE in November 2021, and the U4EE in March 2023. Detailed planning associated with the final U1EE and U4EE confirmed that the overall Program and associated contingencies were within the $12.8 Billion set at RQE, exclusive of COVID-19 impact. The COVID-19 impact is forecasted to be $127 Million.

[5] A copy of U2EE is provide in EB-2016-0152 (Ex. L-4.3-1, Staff-055).
[6] A copy of U3EE is provided in EB-2020-0290 (Ex. D2-2-7, Attachment 1).

The planning, pre-requisite and execution work for Unit 1 and Unit 4 refurbishments has and will incorporate the benefits of experience with the first two units, Unit 2 and Unit 3, and additional strategic improvements.

OPG continues to assess and seek ways to manage the impact of the COVID-19 pandemic on the project's total cost, which is otherwise continuing to track to the $12.8 Billion budget.

OPG has been managing its response to extraordinary inflationary impacts at a corporate level where DRP exposure is continuing to be assessed and monitored. Mitigation actions continue to be implemented through supply chain and OPG continues to monitor inflation trends for further mitigation actions as required.

Table 4 provides a summary of the cost performance metrics for Unit 1 and Unit 4.

Table 4 – Cost Performance Metrics Unit 1 & Unit 4[1] (Millions)				
Unit	**CPI (Q3 2024)**	**LTD Q3 2024 Actual Cost**	**Current Estimate to Complete**	**Current Estimate at Completion**
Unit 1	1.00	$1,711	$273	$1,984
Unit 4	0.98	$941	$1,436	$2,377[2]

Notes:
1. Program expenditures include capital and OM&A costs consistent with OEB-approved amounts.
2. Includes program contingency of $249 Million following the close out of Unit 3.

Table 5 provides a summary of the Total Program Actual Cost Incurred vs. Forecast Cumulative Capital Costs for all Units (excluding the impacts of COVID-19).

Table 5 – Total Program Actual vs. Forecast Cumulative Costs EB-2020-0290 (Millions)		
	Forecast Cumulative Costs[1]	**Actual Cost Incurred**
Q1 2021	7,746	7,637
Q2 2021	8,048	7,861
Q3 2021	8,324	8,076
Q4 2021	8,575	8,289
Q1 2022	8,849	8,518
Q2 2022	9,153	8,758
Q3 2022	9,438	9,003
Q4 2022	9,735	9,268
Q1 2023	10,050	9,510
Q2 2023	10,327	9,784
Q3 2023	10,576	10,014
Q4 2023	10,836	10,273
Q1 2024	11,101	10,523
Q2 2024	11,380	10,800
Q3 2024	11,617	11,083

Q4 2024	11,829	
Q1 2025	11,982	
Q2 2025	12,126	
Q3 2025	12,283	
Q4 2025	12,439	
Q1 2026	12,577	
Q2 2026	12,662	
Q3 2026	12,723	
Q4 2026	12,800	

Notes:

1. Total Program forecast cumulative costs (inclusive of capital and OM&A costs) are per the EB-2020-0290, Ex. L-D2-02-Environmental Defence-005, Chart 1 and exclude COVID-19 impacts. The expenditures are based on the U3EE, which did not separate between capital and OM&A costs. As stated in the interrogatory response, as OPG continues to execute Units 4 and 1, and implements further Lessons Learned and Strategic Initiatives to both units, the forecast quarterly expenditure profile may change. OPG will continue to report on this basis for ease of comparability.
2. Actuals are based on life-to-date total Program spend, inclusive of both capital and OM&A costs, and exclude COVID-19 impacts.

ENGINEERING

The strategy for Design Engineering was to replicate the Engineering Changes (ECs) from Unit 2 and Unit 3 for Units 1 and 4 and modify them based on lessons learned. Unit 1 and Unit 4 EC replication has been completed.

Major engineering accomplishments for the period include:

- Completed Unit 3 EC closeout.
- Completed Unit 1 Return to Service activities such as Moderator Fill, Fuel Load, Primary Heat Transport Fill and Containment Restoration.
- Completed Unit 1 Turbine Generator (TG) static commissioning and EC Available for Services (AFS) for major modifications such as Fuel Channels, Feeders, Feeder Instrumentation, Auxiliary Shutdown Cooling, Emergency Heat Sink and Liquid Relief Valve Replacements.
- Completed work to support the removal of the Unit 1 Guaranteed Shutdown State, and first criticality. Completed the Calandria Tube and Pressure Tube removal series which completed the major removal scope on Unit 4.

PROCUREMENT

PROCUREMENT STATUS FOR UNIT 1

All materials necessary for Unit 1 Return to Service have been procured. As of September 30, 2024, 100% of purchase orders were issued and 98% of materials for Unit 1 have been delivered to site, with remaining materials on track for the planned need date.

PROCUREMENT STATUS FOR UNIT 4

As of September 30, 2024, 98% of purchase orders were issued and 90% of materials for Unit 4 have been delivered to site, with remaining materials on track for the planned need date.

CONSTRUCTION

CONSTRUCTION PROGRESS SUMMARY

As of September 30, 2024, the execution of Unit 1 is 99% complete overall and non-critical path, or bulk work, activities are 95% complete. Unit 1 Construction activities were completed on August 30, 2024, and the Unit is in the final commissioning and start-up windows as of September 30, 2024. The following major accomplishments occurred within the period:

- Unit 1 Moderator Refill was completed on January 11, 2024.
- Unit 1 Fuel Load was completed on May 18, 2024.
- Primary Heat Transport Refill was completed on May 31, 2024.
- Unit 1 Vault Turnover back to Station was completed August 10, 2024.
- Unit 1 Bulkhead Removal was completed August 26, 2024.
- First criticality achieved on September 15, 2024.

As of September 30, 2024, the refurbishment of Unit 4 is 51% complete overall and non-critical path, or bulk work, activities are 59% complete. The following major accomplishments occurred within the period:

- Bulkhead Installation was completed on October 9, 2023, successfully isolating Unit 4 from the operating units.
- Removal of Fueling Machine Bridges and Installation of Re-Tube Tooling Platforms was completed on December 27, 2023.
- Removal of Bulk Interferences, Feeder Cabinets, Feeder Tubes, End Fittings, and Severing of Bellows and Pressure Tubes was completed on April 24, 2024.
- Successful completion of the Pressure Tube and Calandria Tube Removal window on September 4, 2024, which marked the completion of the removal phase for Unit 4.

LABOUR RELATIONS ISSUES SUMMARY

The Society of Energy Professionals and OPG entered into a new two-year collective agreement (January 1, 2024 – December 31, 2025).

The Power Workers' Union (PWU) and OPG entered into three-year agreement from April 1, 2024, to March 31, 2027.

Construction work in Ontario is performed through craft unions with established bargaining rights at OPG facilities. These bargaining rights are established either through the Electrical Power Systems Construction Association (EPSCA) or directly with OPG. The associated collective agreements are negotiated either directly between the parties or through the EPSCA, as applicable. All of these construction collective agreements expire on April 30, 2025. EPSCA is currently negotiating renewal agreements with the construction trade unions. On January 30, 2024, OPG and CUSW successfully reached agreement on the renewal of the collective agreement for the time period covering May 1, 2023, to April 30, 2025.

ENVIRONMENTAL ISSUES SUMMARY

From September 30, 2023, to September 30, 2024, there was one reportable spill, which occurred in April 2024. This spill occurred on Refurbishment Unit 4 and was due to a refrigerant leak caused by a degraded o-ring. The o-ring was promptly replaced before resuming working on the unit. Regulatory reporting was promptly completed for this spill.

There were no infractions in the Program during this period. Radiological and conventional emissions remain well below regulatory limits.

TESTING, START-UP, AND COMMISSIONING

Unit 1 Return-To-Service

Unit 1 began the return-to-service window on August 10, 2024. As of September 30, 2024, 92% of systems put into a modified or lay-up state were fully returned to service, and two of the four start-up Regulatory Hold Points were cleared.

Unit 4 Return-To-Service

Unit 4 is forecasted to begin return-to-service by the second quarter of 2026 and complete return-to-service by the third quarter of 2026.

PROGRAM RISKS AND RISK MANAGEMENT

OPG uses a robust risk management process that identifies, classifies, quantifies, and mitigates risks. Industry experience dictates that there will be uncertainties that cannot be avoided on a Program of this size. As such, OPG maintains a detailed inventory of risks and contingency amounts in accordance with the recommended practices of the Association for the Advancement of Cost Engineering, a leading authority in the area of cost estimation. These contingency amounts are expected to be used over the course of the Program.

The program risks are being managed by OPG include:

1. Any Turbine Generator issues during dynamic testing may delay Unit 1 and Unit 4 Return to Service.
2. Discovery work: Additional leak checks may be required during restoration activities, across multiple bundles, with a potential impact to Unit 1 and Unit 4 Return to Service.
3. Availability of Skilled Resources: The Program has experienced resource challenges with skilled trades resource availability. OPG monitors market demand conditions and has skilled trade forecasts to predict risks and develop mitigation plans for future resource challenges across the organization (resource optimization, industry sharing, and resource recruiting).

STAFFING

REFURBISHMENT RESOURCES

Table 6 provides a summary of the OPG Resources on the Program.

Table 6 – Full Time Equivalent (FTE) Resources by Year (Plan vs. Actual)						
Measure	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Planned at RQE	758	747	N/A			
Planned at U3EE	N/A		880	944	N/A	
Planned at U4EE	N/A				1026[1]	948
Actual	850	722	690	718	837	790[2]

Notes:

1. The variance of OPG resources against plan is primarily driven by the contracting strategy for certain maintenance activities.
2. Actual FTEs for 2024 are as of September Year to Date.

EFFORTS TO FILL OPEN POSITIONS

Talent acquisition initiatives are in place to fill open positions.

OPG has several Talent Management programs and initiatives in place to attract, retain, and develop qualified personnel across the company, including for the duration of the Program. Management continues to leverage industry best practices and utilize enterprise-wide talent and succession planning processes. This helps to ensure employees continue to develop and improve in their current role and/or are prepared to be successful in a future role for which they have been identified as a potential succession candidate, ensuring capability is sustained throughout the Program.

OPG's Enterprise Projects Management Organization is focused on implementing a standardized and scalable project delivery model throughout the enterprise. This organization has implemented a training program specifically designed to advance project management capability across the organization.

To further support employee development and succession planning programs, Career Path documents have been developed for several Enterprise Projects roles for project professionals and business units where their transferrable skillsets can be utilized.