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Darlington Refurbishment Program Annual Report

2022 REPORT

AS PER DECISION AND ORDER IN EB-2020-0290

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December 16, 2022

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, 2022.

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 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 and Unit 1 Execution Estimate (U1EE) in November 2021. All of these maintained the Program estimate, exclusive of COVID-19 impacts, within the original $12.8 Billion RQE budget and continue to forecast completion of the Unit 4 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 Program continues to track to the $12.8 billion budget, excluding the impacts of "black swan" events such as the COVID-19 pandemic. Based on COVID-19 impacts experienced to date, OPG forecasts costs of approximately $175 Million. OPG continues to assess and seek ways to manage the impact of the COVID-19 pandemic on the project's total cost. In addition, OPG is continuing to assess and monitor 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 refurbishment is currently in its third major segment, Reassembly, which involves the installation and reassembly of reactor components, including new feeder tubes and Fuel Channel Assemblies. Following the successful completion of the fuel channel installation in July 2022, Lower Feeder Installation series commenced and is targeted for completion in the fourth quarter of 2022. Unit 3 is currently expected to be returned to service by late 2023, ahead of the committed return to service date of the first quarter of 2024.

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

The final 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 3 refurbishments. Per the final U1EE, the budget and High Confidence Schedule to complete Unit 1 are $1,984 Million and 38 months, respectively.

On February 15th, 2022, OPG commenced defueling of the Unit 1 reactor, marking the start of Unit 1 refurbishment execution. Unit 1 refurbishment is currently in its second major segment, Disassembly, with activities progressing on schedule, following the completion of the Feeder Cabinet Removal in September 2022. The removal of fuel channel assemblies is expected to commence in the fourth quarter of 2022 with the removal of end fittings. As demonstrated by the performance to date, lessons learned, and strategic improvements have contributed to unit over unit efficiencies. Unit 1 is scheduled to be returned to service in the second quarter of 2025.

Preparation for the refurbishment of Unit 4 is progressing on plan. The execution estimate for Unit 4 is planned to be completed March 2023. Field execution work plans and material procurement continues to progress well and remain on schedule.

DARLINGTON REFURBISHMENT PROGRAM STATUS

OVERVIEW

Key Program highlights include:

- **SAFETY:** Safety performance continues to be significantly better than the average construction industry performance in Ontario. The Program is approaching 39 million hours worked with only one Lost Time Injury[2] since the start of the Program, which occurred in May 2019.
- **QUALITY:** The quality management program is used to identify issues during refurbishment execution by focused surveillance of vendor-performed work. There have been no Significant Quality Events (SQEs) recorded on Unit 3 or Unit 1 to date. Relative to Unit 2, there has been significant improvement in Unit 3 Feeder program welding activities.
- **SCHEDULE:** Unit 3 refurbishment activities are currently progressing ahead of schedule. On July 18, 2022, the project completed the Fuel Channel Installation Series, and successfully transitioned into the Lower Feeder Installation Series, and is progressing on track. Unit 3 is expected to be returned to service ahead of the committed return to service date of the first quarter of 2024. Unit 1 refurbishment activities are progressing on plan and on September 8, 2022, the project completed the Retube Tooling Platform series and transitioned into Feeder Cabinet Removal window, which was successfully completed September 20, 2022. Unit 1 Critical Path is now progressing through the Feeder Removal series. Unit 1 is forecast to be returned to service on schedule by Q2 2025.
- **COST:** Total Program expenditures to date are $9.0 Billion with the current remaining estimate to complete the Program at $3.8 Billion (excluding COVID-19). Excluding COVID-19 impacts, life-to-date expenditures are $1,937 Million for Unit 3, $643 Million for Unit 1, and $232 Million for Unit 4.

PROGRESS

The refurbishment of Unit 3 is 84% complete. Following is a status summary, as of September 30, 2022, of the major work completed since the 2021 DRP Annual Report filed December 31, 2021:

- Calandria Tube (CT) Installation series completed March 14, 2022.
- Upper and Middle Feeder Installation completed April 12, 2022.
- Fuel Channel Installation completed July 18, 2022.
- Successful completion of the first Unit 3 Restart Control Hold Point 1 (RCHP 1) on July 28, 2022.
- Turbine Generator (TG) Static Commissioning completed September 23, 2022.
- Seven Integrated Implementation Plan (IIP) tasks for Unit 3 refurbishment have been completed with 22 remaining. Remaining IIP tasks are tracking to the current plan approved by the Canadian Nuclear Safety Commission (CNSC). The Safety Improvement Opportunity update is now included as a Unit 3 IIP task.

The refurbishment of Unit 1 is 25% complete. Following is a status summary, as of September 30, 2022, of the major work completed since the 2021 DRP Annual Report filed December 31, 2021:

- Defueling completed April 23, 2022.
- Installation of Accessibility Platform Trolley and End Fitting Seal Caps completed on May 4, 2022.
- Installation of Containment Bulkheads completed June 9, 2022.
- Containment pressure test and final vault commissioning completed June 22, 2022.

[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.

- Bulk Interference Removal series completed July 13, 2022.
- Removal of 1 Fuel Machine Bridge and Installation of the Refurbishment Tool Platform completed September 8, 2022.
- Feeder Cabinet Removal completed September 20, 2022.
- Nine IIP tasks for Unit 1 refurbishment have been completed with 25 remaining. Remaining IIP tasks are tracking to the current plan approved by the CNSC.

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 Q3 2022, the Program reported a Total Recordable Injury Frequency (TRIF) of 0.26 against its internal target of 0.40, reflecting seven medically treated injuries from Q1 to Q3 2022. 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 39 million hours worked with only one Lost Time Injury, which occurred in May 2019 with no Lost Time Injuries since then.

OPG employs a variety of leading indicators to ensure that issues are addressed before incidents occur. OPG's practice of proactively tracking events/safety incidents where no injuries occur, but where there is potential for harm, is one example of a leading indicator. OPG carefully logs and reviews each of these incidents and implements corrective actions to reduce the likelihood of future incidents.

PERFORMANCE METRICS SUMMARY

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

Safety Performance Metrics										
			Historical Acutals						Actual	IHSA
Category	Measure	OPG Target	2016	2017	2018	2019	2020	2021	2022 (Q3) YTD	Ontario Construction Industury 2021
Safety	TRIF (Total Recordable Injury Frequency)	0.40	0.64	0.49	0.39	0.52	0.35	0.25	0.26	4.58
	Lost Time Injuries	0	0	0	0	1	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. IHSA rating is the most current safety rating for the Ontario Construction Industry (current as of 2021 year-end).

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 from occurring. The following are the key safety campaigns, programs, and initiatives that OPG and its vendor partners launched in 2022:

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

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

This initiative builds on the existing plan which includes greater emphasis on 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. It identifies defenses in place to ensure events occur safely with no adverse consequences to people, the plant or equipment. This initiative involves developing the Fail-Safe communication and implementation plan, training and fostering worker engagement. Recent accomplishments include engaging vendors to support Fail-Safe workshops for work planning by implementing strong defenses prior to execution of work, and creation of a fleet Fail-Safe guide & plan to track accomplishments and set goals.

- **Remote Monitoring**

  OPG and CanAtom worked to develop a solution to mitigate the risk of heat stress for workers. Monitoring conditions for heat stress and calculating work rest regimens had been done with the Wet Bulb Global Temperature device in the field, which required the personnel performing the testing to be exposed to the conditions. OPG is implementing the new X-Labs WIFI Gateway wireless transceiver to transmit sensor data to the cloud for remote monitoring. This enables immediate access to current conditions and reduces wait time by providing real time metrics.

- **Implementation of Worklete**

  OPG is piloting the Worklete project to address body mechanic hazards. Worklete uses a micro-learning approach to teach employees safe body mechanic principles. It helps build muscle memory and safe habits that can be applied to any task, whether at or outside of work.

- **My reasons for working safely lanyard card initiative**

  OPG has implemented a personalized initiative for working safely. All employees, including vendors, identify their personal reason for working safely (e.g., for family, pet, themselves, etc.) using a photo attached to their lanyard. This reminds employees why they need to work safely on an individual and co-worker level.

- **Confined Space App Implementation**

  OPG developed and implemented the Confined Space App to reduce errors in confined space documentation, provide interlocks, and to ensue unqualified workers are not assigned to confined space work. The App has been found effective in reducing documentation errors and non-compliances.

- **Response to COVID-19**

  OPG has remained vigilant with its safety protocols and protective measures to mitigate COVID-19 transmissions in accordance with Provincial guidelines.

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

  This initiative builds on the existing plan and will have a multi-disciplinary team consisting of OPG and vendor subject matter experts assembling to analyze the human performance, safety and quality events and lessons learned from Units 2, 3 & 1. This initiative includes mapping these events and developing actions to reduce the likelihood of similar events on Unit 4 and the work remaining on Unit 3 and Unit 1.

- **Self-Assessments and Surveillances**

  In addition to lessons learned, OPG's Health and Safety group conducts several self-assessments and surveillance on higher risk areas to ensure improvements are incorporated into planning to reduce the risk of injury. Examples of self-assessments and surveillance performed in 2022 include:

  - Working at Heights and Falling Objects Self-Assessment
  - Material Handling and Safe Driving Practices Self-Assessment
  - Confined Space Self-Assessment and Follow up Confined Space Self-Assessment
  - Industrial Hygiene Self-Assessment

RADIOLOGICAL SAFETY

OPG's Radiological Protection (RP) program continues to meet regulatory requirements and industry standards. No worker has received a dose above regulatory limits or OPG's more stringent internal targets. 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 have been incorporated into training and enhanced radiological safety measures on Unit 3 and Unit 1. The Program's ALARA committee continues to monitor and challenge RP performance to ensure ALARA principles result in lower doses to workers.

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

	2020 Year End		2021 Year End		2022 End of Q3	
	Actual	**Target**	**Actual**	**Target**	**Actual**	**Target**
Unit 3 CRE (person-rem)[1]	129	334	1028	1379	294	543
Unit 1 CRE (person-rem)[1]	N/A	N/A	N/A	N/A	379	560
Unplanned Exposures	0	0	0	0	0	0

Note:
1. 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 surveillance of vendor performed work. The quality of work on Unit 3 and 1 has been good to date. Relative to Unit 2, there has been significant improvement in the quality of welding activities on the U3 Feeder program.

Incorporation of Unit 2 and 3 lessons learned, and Kaizen/Six Sigma lean practices have improved industrial and radiological safety, tooling, critical task training, organizational alignment, and One Team culture. Critical path savings have resulted from two trolley defuel, Pressure Tube/Calandria Tube removal tool redesign, bulkhead shielding removal, and general overall proficiency due to training improvements.

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 of Unit 3 to date, OPG has advanced its High Confidence Schedule for Units 3, 1 and 4 as part of the U1EE forecast. Given inherent schedule risks remain from factors such as the ongoing execution of the units in an overlapped manner (Units 3 and 1), OPG continues to maintain its previous public commitment durations for each unit.

PERFORMANCE METRICS SUMMARY

Table 3A provides a summary of the Unit 3 schedule performance relative to the U3EE Working Schedule and High Confidence Schedule.

Table 3A - Unit 3 Schedule Performance Metrics				
Measure	**2020 Year End Actual**	**2021 Year End Actual**	**2022 Q3 Actual**	**Working Schedule Target**
Days Ahead of / Behind High Confidence Schedule LTD[1]	9 Days Ahead	76 Days Ahead	107 Days Ahead	N/A
Critical Path Days Ahead of / Behind Working Schedule LTD[2]	9 Days Ahead	44 Days Ahead	60 Days Ahead	4 - Sept - 2023
SPI[3] (Schedule Performance Index)	0.95	1.00	1.01	1.00
Forecast Working Schedule Completion Date[2]	4 - Sept - 2023	4 - Sept - 2023	4 - Sept - 2023	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.

[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 1 schedule performance relative to the U1EE Working Schedule and High Confidence Schedule.

Table 3B - Unit 1 Schedule Performance Metrics		
Measure	**2022 Q3 Actual**	**Working Schedule Target**
Days Ahead of / Behind High Confidence Schedule LTD[1]	24 Days Ahead	N/A
Critical Path Days Ahead of / Behind Working Schedule LTD[2]	1 Day Ahead	14 - Oct - 2024
SPI[3] (Schedule Performance Index)	0.87	1.00
Forecast Working Schedule Completion Date[2]	14 - Oct - 2024	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 $9.0 Billion with the current remaining estimate to complete the Program at $3.8 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, and the U1EE in November 2021. Detailed planning associated with the final U3EE and U1EE confirmed that the overall Program and associated contingencies were within the $12.8 Billion set at RQE, exclusive of COVID-19. OPG is currently completing the U4EE, which is on track for March 2023. Planning and pre-requisite activities for the refurbishment of Unit 4 are progressing as planned. 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. The refurbishment of Unit 4 is scheduled to be completed by the end of 2026.

[5] A copy of U2EE is provided 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)

Table 4 provides a summary of the cost performance metrics for Unit 3 and Unit 1.

Table 4 – Cost Performance Metrics Unit 3 & Unit 1[1] (Millions)				
Unit	**CPI (Q3 2022)**	**LTD Q3 2022 Actual Cost**	**Current Estimate to Complete**	**Current Estimate at Completion**
Unit 3	0.98	$1,937	$595	$2,532
Unit 1	0.96	$643	$1,341	$1,984

Note:
1. Program expenditures include capital and OM&A costs consistent with OEB-approved amounts.

Table 5 provides a summary of the Total Program Actual Cost Incurred vs. Forecast Cumulative 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[2]**
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	
Q1 2023	10,050	
Q2 2023	10,327	
Q3 2023	10,576	
Q4 2023	10,836	
Q1 2024	11,101	
Q2 2024	11,380	
Q3 2024	11,617	
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 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 3 and 1, and implements further Lessons Learned and Strategic Initiatives to the planning and execution of Unit 4, 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.

Per the U1EE, the refurbishment of Unit 3 estimated total cost to complete is $2,532 Million, within the budget of $2,559 Million set per the final U3EE, and the estimated total costs to complete the refurbishments of Unit 1 and Unit 4 are $1,984 Million and $2,086 Million, respectively, excluding any COVID-19 impacts.

Life-to-date capital and OM&A expenditures, excluding COVID-19, as of Q3 2022 are $1,937 Million for Unit 3, $643 Million for Unit 1, and $232 million for Unit 4.

OPG will continue to monitor, track, and explore potential efficiencies during the execution of the refurbishment of remaining units in an effort to complete the Program within the $12.8 Billion budget inclusive of COVID-19 cost impacts. OPG is also continuing to assess and monitor potential impacts on the project associated with the current extraordinary inflationary environment as part of development of the U4EE.

ENGINEERING

The strategy for Design Engineering is to replicate the Engineering Changes (ECs) from Unit 2 and Unit 3 and modify the ECs for use on Units 1 and 4, as required, based on lessons learned.

Currently, engineering is 99% complete, and the remaining ECs are mainly associated with incorporating lessons learned from Unit 3 for the turbine generator (TG) and fire protection software modifications.

Major engineering accomplishments in the period include:

- First of a kind turbine generator (TG) static commissioning has been completed for Unit 3 including integrated system testing of all TG trip tests.
- Unit 1 engineering design changes are 100% complete for all refurbishment programs.

Lessons learned and strategic improvements from Unit 2 and Unit 3 (collected to date) have been incorporated into subsequent unit designs. Some of these improvements are highlighted below:

- Robust Construction Complete Declaration (CCD) and System Available for Service (SAFS) process that has been proven on Unit 2. Lessons learned have been incorporated to help with timing and integration of the CCD and SAFS processes into the schedule and CNSC hold point reviews.
- Foreign Material Exclusion (FME) Program – Building on Unit 2, the team developed improved FME, and FME inspection strategies for DNRU3 which resulted in a significant reduction in FME findings in Primary Heat Transport header and upper and middle feeders. This has reduced inspection time on critical path and helped to protect the integrity of the fuel, which will aid the team to reach the corporate goal of zero fuel defects.
- Engineering staff are highly integrated with CanAtom under One Team model for RFR.

PROCUREMENT

PROCUREMENT STATUS FOR UNIT 3

98% of materials for Unit 3 have been delivered to site as planned, with remaining material tracking to the planned need date.

PROCUREMENT STATUS FOR UNIT 1

91% of purchase orders were issued and 88% of materials for Unit 1 have been delivered to site, with remaining materials tracking to the planned need date.

PROCUREMENT STATUS FOR UNIT 4

71% of purchase orders were issued and 65% of materials for Unit 4 have been delivered to site, with remaining materials tracking to the planned need date.

CONSTRUCTION

CONSTRUCTION PROGRESS SUMMARY

As of September 30, 2022, the execution of Unit 3 is 84% complete and non-critical path activities are 91% complete. The following major accomplishments occurred within the period:

- Calandria Tube Installation series completed March 14, 2022.
- Upper and Middle Feeder Installation completed April 12, 2022.
- The Upper and Middle Feeder post-installation and demobilization completed May 20, 2022.
- Fuel Channel Installation completed July 18, 2022.
- Successful completion of RCHP 1 on July 28, 2022.
- Turbine Generator Static Commissioning completed September 23, 2022.
- Turbine Generator panning for Dynamic Commissioning is currently underway.

As of September 30, 2022, the execution of Unit 1 is 25% complete and non-critical path activities are 38% complete. The following major accomplishments occurred within the period:

- Unit 1 Defueling completed April 23, 2022.
- Installation of Accessibility Platform Trolley and End Fitting Seal Caps completed May 4, 2022.
- Installation of Containment Bulkheads completed June 9, 2022.
- Containment pressure test and final vault commissioning completed June 22, 2022.
- Bulk Interference Removal series successfully completed July 13, 2022.
- Removal of Fuel Machine Bridge and Installation of the Refurbishment Tool Platform completed September 8, 2022.
- Feeder Cabinet Removal completed September 20, 2022.
- Unit 1 is progressing through the Feeder Removal series.

LABOUR RELATIONS ISSUES SUMMARY

In May 2022, the Society of Professional Engineering and Associates engaged in a labour stoppage, which concluded in July 2022 with the ratification of a Collective Agreement. The effects of the strike were well managed and resulted in minimal impact to Program cost and schedule.

In July 2022, Technical Standards and Safety Authority staff engaged in a labour stoppage, which concluded in October 2022 with the ratification of a Collective Agreement. The effects of the strike were well managed resulting in no impacts to Program cost and schedule.

OPG is proactively taking steps to mitigate any risks of future labour relations issues.

ENVIRONMENTAL ISSUES SUMMARY

As of September 30, 2022, the Program continues to have excellent environmental performance with no reportable spills or infractions. Emissions are well below regulatory limits.

TESTING, START-UP, AND COMMISSIONING

RETURN-TO-SERVICE

OPG forecasts Unit 3 return-to-service to occur ahead of schedule, in late 2023.

PROGRAM RISKS AND RISK MANAGEMENT

OPG uses a robust risk management process where risks are identified, classified, quantified, and mitigated. Industry experience dictates that there will be uncertainties that cannot be avoided on a project 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 project cost estimation. These contingency amounts are expected to be used over the course of the Program.

The following major risks are being managed by OPG:

1. **Vendor Performance:** Ensuring contractors provide increased capability and a mature succession plan to complete the work successfully, safely and with quality. Additionally, vendors could become stretched as they respond to an increase in construction work. The Quality Management team is standardizing quality measures across the enterprise and creating the infrastructure to support tiered quality metrics and mitigations.
2. **Availability of Skilled Resources / Supervision of Future Units:** The Program has been challenged with skilled craft resource availability. OPG is continuing to monitor, optimize, increase, and develop a better supply of trades for projects. This includes continuing collaboration with key partners such as Bruce Power, Electric Power Systems Construction Association, Boilermakers, Sarnia Construction Association, OPG Indigenous Opportunities Network and Durham College to maximize the supply pool, align project resource demand and training programs.

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

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	**2018**	**2019**	**2020**	**2021**	**2022**
Planned at RQE	752	758	747	N/A	N/A
Planned at U3EE	N/A			880	944
Actual	867	850	722	690	712[1]

Notes:
1. Actual FTEs for 2022 are as of September YTD.

EFFORTS TO FILL OPEN POSITIONS

Talent acquisition initiatives are in place to fill open positions, primarily in Operations & Maintenance and Execution organizations, as required.

OPG has several Talent Management programs 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.

In 2022, to compliment this training program, a Project Management Community of Practice has been established where selected experienced project management coaches assist junior employees with implementing OPG's enterprise project management processes. 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.