



## **Supplementary Information**

## **Renseignements supplémentaires**

### **Written submission from Ontario Power Generation**

### **Mémoire d' Ontario Power Generation**

In the Matter of

À l'égard d'

**Ontario Power Generation**

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**Ontario Power Generation**

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**Ontario Power Generation – Licence amendment application for the Darlington Nuclear Generating Station regarding the commercial production of Cobalt-60**

**Ontario Power Generation – Demande concernant la modification de son permis pour la centrale nucléaire de Darlington en vue de produire commercialement du Cobalt-60**

Public Hearing – Hearing in writing based on written submissions

Audience publique – Audience fondée sur des mémoires

**Spring 2024**

**Printemps 2024**

**OPG Proprietary**

June 30, 2023

CD# NK38-CORR-00531-24619 P

Mr. D. Saumure  
Commission Registrar  
Canadian Nuclear Safety Commission  
P.O. Box 1046  
280 Slater Street  
Ottawa, Ontario, K1P 5S9

Dear Mr. Saumure:

**Darlington NGS – Supplemental Submission to Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope**

The purpose of this letter is to provide the Cobalt-60 (Co-60) Production Modifications Project schedule details in a supplemental submission to the application to amend the Darlington Nuclear Generating Station (NGS) Power Reactor Operating Licence (PROL) 13.03/2025 in order to produce the radioisotope Co-60 in the reactor core, as committed in Reference 1.

In Reference 1, Ontario Power Generation Inc. (OPG) submitted an application requesting the Canadian Nuclear Safety Commission, referred to as “the Commission”, amend the Darlington PROL 13.03/2025 to add a new licensed activity to possess, transfer, produce, package, manage and store the Co-60 radioisotope. The project schedule details for the application are provided in Attachment 1 of this supplemental submission.

OPG remains committed to safe operation of the Darlington NGS units, and re-affirms that the Co-60 system can be implemented as presented in the robust safety case (Reference 1). Assessments completed conclude that the proposed activities to support production of Co-60 will not compromise continued safe reactor operation, environmental protection and public safety. OPG will continue to meet Canada’s international obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons*.

Mr. Saumure

**OPG Proprietary**

CD# NK38-CORR-00531-24619 P

This submission completes Regulatory Commitment REGC AR 28259299.

Should you have any questions, please contact Mr. Craig Axler, Manager, Darlington Regulatory Affairs, at (289) 314-7769.

Sincerely,



Richard Geofroy  
Senior Vice President  
Darlington Nuclear  
Ontario Power Generation Inc.

Attach.

cc: CNSC Site Supervisor: Darlington  
[forms-formulaires@cnsccsn.gc.ca](mailto:forms-formulaires@cnsccsn.gc.ca)  
A. Viktorov – OTTAWA  
A. Mathai – OTTAWA

References: 1. OPG letter, R. Geofroy to D. Saumure, "Darlington NGS – Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope", April 28, 2023, CD# NK38-CORR-00531-23462.

## **ATTACHMENT 1**

OPG letter, Richard Geofroy to D. Saumure, "Darlington NGS – Supplemental Submission to Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope"

CD# NK38-CORR-00531-24619 P

### **Supplemental Submission with Cobalt-60 Production Modifications Project Schedule Details**

**Prepared By: R. Kovinthan**

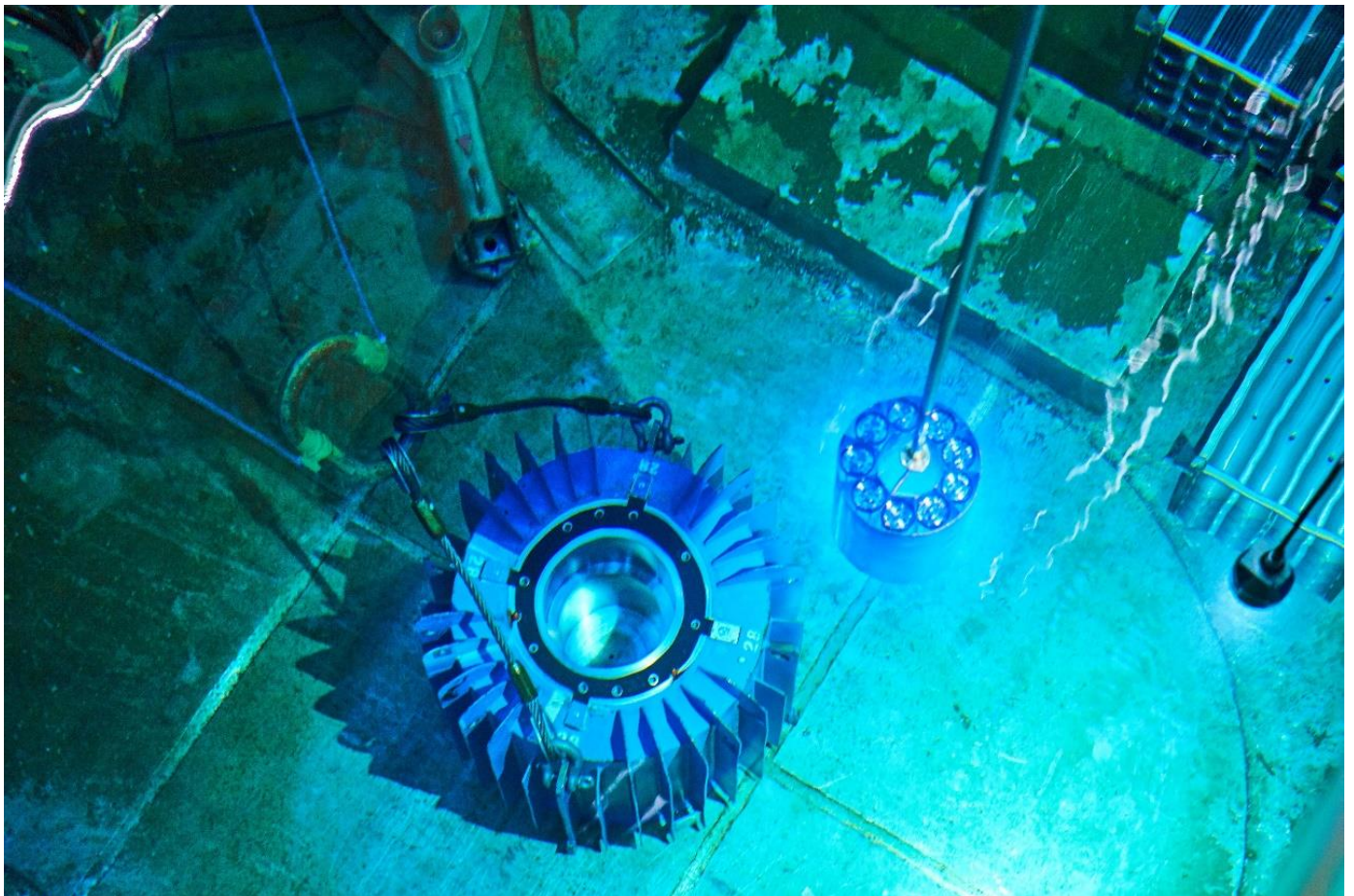
**Checked By: P. Le Dreff**

ATTACHMENT 1



Where a brighter tomorrow begins.

**Supplemental Submission – Project Schedule**  
**to Application for Darlington Nuclear Generating Station**  
**Power Reactor Operating Licence 13.03/2025 Amendment**  
**for Production of the Cobalt-60 Radioisotope**



**Project Intent and Installation Schedule for all Units**

Ontario Power Generation Inc. (OPG) plans to utilize all four of Darlington Nuclear Generating Station’s (NGS’s) reactors for the irradiation of Cobalt-59 (Co-59) rods to produce Cobalt-60 (Co-60). The Co-60 Production Modifications Project construction window is currently planned between 2022 and 2027, and all unit modification installation is during refurbishment, planned outages with potential for some online work in U2. The currently planned installation sequence and subsequent harvest schedule is as follows, with Unit 1 targeted to be the first unit to have Co-59 rods installed during the Unit 1 refurbishment outage (DNRU1):

Darlington NGS Unit	Planned Installation*	Initial Harvest
Unit 3 Phase A (refurbishment, DNRU3)	2022/2023	N/A - rods not installed
Unit 1 (refurbishment, DNRU1)	2023	2028
Unit 2 Phase A (unit outage & online)	2024	N/A - rods not installed
Unit 4 (refurbishment, DNRU4)	2024	2028
Unit 3 Phase B (unit outage)	2026	2029
Unit 2 Phase B (unit outage)	2027	2030

Phase A - primarily positioner modification

Phase B - remaining reactor modifications

\*These dates are based on the latest refurbishment and outage schedules and are subject to change based on future outage planning requirements.

An overview of the planned project installation schedule is provided in Appendix A of this attachment.

The proposed modifications at Darlington NGS for Co-60 production on all four units include: conversion of non-cobalt adjuster rods to inactive Co-59 adjuster rods, addition of equipment and tooling to facilitate installation of Co-59 adjuster rods, safe removal of the irradiated Co-60 rods during planned outages, and modifications for discharging, storing and processing<sup>1</sup> adjuster rods in the Wet Cask Handling Bay of the Irradiated Fuel Bay (IFB) in the West Fueling Facilities Auxiliary Area (WFFAA). The scope of the modifications is captured under six Master Engineering Changes under OPG’s Engineering Change Control (ECC) process, as outlined in Attachment 3 of Reference [1].

Attachment 3, section 3.1.2, of Reference [1], ‘*Licensing Impact Assessment in Support of the Cobalt-60 Production Modifications Project at the Darlington Nuclear Generating Station*’ verifies that the cobalt project installation and commissioning activities are in compliance with the Engineering Change Control Process. Approved workplans and relevant safety related documents will be utilized to ensure safety during all phases of execution.

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<sup>1</sup> Processing refers to the harvesting activities to prepare and package the Co-60 bundles in the Nordion supplied shipping packages for shipment to Nordion’s processing facility in Kanata, Ontario.

## **Darlington NGS Unit 1**

Installation of Co-60 modifications in Darlington NGS Unit 1 is planned to commence in 2023 during DNRU1 and includes all infrastructure and reactor modifications.

Installation of the Co-60 harvesting infrastructure is targeted to commence in Q3 2023 and be completed in Q2 2024. The harvesting infrastructure includes the positioner rail beams, interferences relocation modifications, Reactivity Mechanism Deck (RMD) handrails and swing gates installation, access platform installation, and positioner mechanical assembly. The integrated commissioning of the harvesting infrastructure, including the positioner, its movement over the RMD, and interaction with the adjuster port sites, flask and pedestal engineered equipment will be completed in the DNRU1 outage.

The current project plan for installation of Co-59 adjuster rods in Darlington Unit 1 is during DNRU1. OPG submitted an amendment application on April 28, 2023 to request a licence amendment of the Darlington NGS Power Reactor Operating Licence (PROL) to add a new licensed activity to possess, transfer, produce, package, manage and store the Co-60 radioisotope (Reference [1]). OPG acknowledges the Commission decision on Darlington NGS PROL amendment is not expected prior to the planned installation of Co-59 adjuster rods in Unit 1.

To maintain Co-59 adjuster rod installation within the DNRU1 schedule, maintain the potential for an initial Co-60 harvest in 2028, and progress DNRU1 critical path activities, Co-59 rod installation will be completed in Q3 2023. The implementation strategy includes having sixteen (16) Co-59 adjuster rods installed while Darlington NGS Unit 1 is in the Over Poisoned Guaranteed Shutdown State (OPGSS) during DNRU1.

The DNRU1 schedule requires either Co-59 or stainless-steel (SS) adjuster rods installed to proceed with Guaranteed Shutdown State (GSS) removal to allow for Unit 1 to return to service. Should the Darlington NGS PROL not be successfully amended within sufficient time prior to planned GSS removal, a backout plan will be invoked to remove the Co-59 adjuster rods, then install SS adjuster rods, and reperform moderator leak checks following the installation of SS adjuster rods to avoid the production of Co-60 and maintain compliance with the Darlington NGS PROL.

The installation of either Co-59 or SS adjuster rods will conform to NK38-NR-PLAN-09701-10001, "*Darlington Refurbishment Return To Service Program Management Plan*", ECC process as outlined in section 1.6 of N-PROC-MP-0090, "*Engineering Change Process*", and Darlington's PROL 13.03/2025, Licence Condition 15.2. Construction Completion Declaration (CCD) and corresponding documentation confirming safe installation of either Co-59 or SS adjuster rods and successful moderator leak checks is required to produce the Completion Assurance Document (CAD) for Restart Control Hold Point 5 (RCHP5) during DNRU1.

To establish that installation of Co-59 rods does not pose any technical or safety risks beyond those already evaluated, Co-60 system safety assessments have been conducted in compliance with applicable requirements outlined as per Darlington's PROL 13.03/2025, Licence Condition 4.1, outlined in Attachment 3 of Reference [1]. The planned installation for U1 remains within the design and licensing basis as per the strategy provided in Reference [2].

## **Darlington NGS Unit 2**

Installation of Co-60 modifications in Darlington NGS Unit 2 is planned for the Darlington 2024 Unit 2 planned outage (D2421), online, and the Darlington 2027 Unit 2 planned outage (D2721). Detailed design is completed for D2421/online scope and is targeted to be completed in Q4 2023 for D2721 scope.

Installation of the Co-60 harvesting infrastructure at the RMD is targeted to commence in Q4 2023 and be completed by Q4 2026. The installation in Unit 2 during D2421 is planned to consist of the positioner rail beams, RMD handrails and swing gates installation, and access platform installation. There will also be interferences relocation modifications, including Moly-99 Target Delivery System (TDS) services, which have been identified during constructability walkdowns throughout the Unit 2 Co-60 detailed design stage. The positioner assembly installation is targeted after the unit is brought back online after the D2421 planned outage.

The Co-59 adjuster rod installation and integrated commissioning of the harvesting infrastructure is planned to occur during D2721.

The experience and lessons learned from installation in Unit 1 and Unit 4 will be incorporated into the installation planning for Unit 2 following the outage planning milestones for installation in D2721.

## **Darlington NGS Unit 3**

Installation of Co-60 modifications in Darlington NGS Unit 3 commenced during DNRU3 and are further planned for the Darlington 2026 Unit 3 planned outage (D2631).

Installation of Co-60 harvesting infrastructure in Unit 3 was completed during DNRU3, which included the positioner rail beams, interferences relocation modifications, RMD handrails and swing gates installation, access platform installation, and positioner mechanical assembly. Electrical wiring and terminations locally around the positioner have been completed as of Q2 2023.

Co-59 adjuster rod installation and integrated commissioning of the harvesting infrastructure is targeted during D2631. Some limited testing and commissioning of the positioner is planned to take place away from the RMD in 2024, post the Commission decision on Darlington NGS PROL amendment to include production of Co-60. This includes cradle alignment and flask loading.

Integrated commissioning of Co-59 adjuster rods is planned to be completed during D2631. This includes driving the positioner over the reactivity deck, lowering the flask, and checking interfaces with adjuster sites.

## **Darlington NGS Unit 4**

Installation of Co-60 modifications in Darlington NGS Unit 4 is planned to commence in 2024 during DNRU4 and includes all infrastructure and reactor modifications, including integrated commissioning of the harvesting infrastructure.

Completion of Unit 4 detailed design is targeted for Q3 2023, and incorporation of Units 3, 1 and 2 lessons learned and the completion of installation planning is forecasted for Q3 2024.



## **West Fueling Facility Auxiliary Area (WFFAA) and Irradiated Fuel Bay (IFB)**

To facilitate harvesting and packaging activities of Co-60 for shipment to Nordion's processing facility, cobalt equipment will be installed in the IFB located in the WFFAA. This is planned to occur in two installation windows. The scope of the first window includes relocation of the existing SS adjuster rod storage rack and new SS adjuster rod storage rack. Completion of detailed design is targeted for Q3 2023 and installation start is currently forecasted for Q4 2023, with planned completion in Q2 2024.

The scope of the second installation window includes the Co-60 rod processing table and Co-60 rod discharge port. Completion of detailed design is targeted for Q1 2024 and installation start is currently forecasted for Q1 2025, with planned completion in Q3 2025.

### **References**

- [1]. OPG letter, R. Geofroy to D. Saumure, "Darlington NGS – Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope", April 28, 2023, CD# NK38-CORR-00531-23462.
- [2]. OPG letter, R. Geofroy to A. Mathai, "CONFIDENTIAL - Cobalt-60 Production Modifications Project Prior Written Notification of Installation of Cobalt-59 Adjuster Rods during DNRU1", May 30, 2023, CD# NK38-CORR-00531-24559.

APPENDIX A

Overview of the Planned Co-60 Production Modifications Project Installation Schedule

Milestone	Complete	2023			2024				2025				2026				2027				2028			
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Unit 3 Detailed Design	█																							
Unit 3 Positioner Installation (DNRU3)	█	█																						
Unit 3 Cobalt Rod Installation (D2631)														█										
Unit 3 Available for Service														█	█									
Unit 1 Detailed Design	█																							
Unit 1 Positioner Installation (DNRU1)			█	█	█	█	█																	
Unit 1 Cobalt Rods Installation (DNRU1)			█																					
Unit 1 Available for Service						█	█															█	█	
Unit 2 Detailed Design		█																						
Unit 2 Co-60 Harvesting Infrastructure (D2421/Online)				█	█	█	█							█	█	█	█							
Unit 2 Cobalt Rod Installation																		█	█					
Unit 2 Available for Service																						█	█	
Unit 4 Detailed Design		█	█																					
Unit 4 Positioner & Cobalt Rod Installation (DNRU4)									█	█	█	█												
Unit 4 Available for Service											█	█												
IFB Detailed Design (Window 1)		█	█																					
IFB Installation (Window 1)				█	█	█	█																	
IFB Available for Service (Window 1)						█	█																	
IFB Detailed Design (Window 2)		█	█	█	█																			
IFB Installation (Window 2)									█	█	█	█												
IFB Available for Service (Window 2)											█	█												
Project Complete																								█

**Summary of Regulatory Commitments, Regulatory Obligations and Regulatory Management Actions Made/Concurrence Requested**

**CD# NK38-CORR-00531-24619 P**

**Submission Title:**      **Darlington NGS - Supplemental Submission to Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope**

**Regulatory Commitments (REGC):**

<b>No.</b>	<b>Description</b>	<b>Date to be Completed</b>
	None	

**Regulatory Management Action (REGM):**

<b>No.</b>	<b>Description</b>	<b>Date to be Completed</b>
	None	

**Regulatory Obligation Action (REGO):**

<b>No.</b>	<b>Description</b>	<b>Date to be Completed</b>
	None	

**Concurrence Requested:**      None

## Impact Statement

*For Ontario Power Generation Distribution Only*

**CD# NK38-CORR-00531-24619 P**

**Title:** **Darlington NGS - Supplemental Submission to Application for Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 Amendment for Production of the Cobalt-60 Radioisotope**

**Action Item No.:** N/A

**SCI:** N/A

**Summary:** This letter provides the Cobalt-60 Production Modifications Project schedule details in a supplemental submission to the application to amend the Darlington Nuclear Generating Station Power Reactor Operating Licence 13.03/2025 in order to produce the radioisotope Co-60 in the reactor core. This submission completes Regulatory Commitment REGC AR 28259299.

### **Regulatory Commitments (REGC), Regulatory Obligation (REGO), and Regulatory Management Actions (REGM):**

<b>Commitment</b>	<b>Responsibility</b>	<b>Department</b>	<b>Date</b>
None			

### **Impact: MGMT**

<b>Description</b>	<b>Responsibility</b>	<b>Department</b>	<b>Date</b>
None			

**Submission Prepared by:** **A. Mount**