POINT LEPREAU NUCLEAR GENERATING STATION

Annual Compliance Report

ANNUAL COMPLIANCE REPORT ON RADIATION PROTECTION – 2024
ACR-03400-2024
Rev. 0

For Information

Document Approval

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Purpose

The purpose of this annual compliance report is to satisfy the requirements of *REGDOC-3.1.1, Reporting Requirements for Nuclear Power Plants*, *Section 3.5*, Annual report on radiation protection.

1.0 Summary

This section includes a summary of the information requested in Item 1 of *REGDOC-3.1.1, Section 3.5*.

1.1 Influences on Dose Data

Point Lepreau Nuclear Generating Station (PLNGS) was in operation at full reactor power from January 1 - April 6, 2024, when the station shut down for a planned maintenance outage which lasted ~253 days. The station was back at high power operation on December 15, 2024. There were no refurbishments or major projects carried out in 2024.

The main outage activities that met the criteria for High Hazard Radiation Work (HHRW) and had associated ALARA Plans were:

- Primary Heat Transport (PHT) Pump Mechanical Seal Replacements on Pumps, 1, 3 and 4
- Horizontal Flux Detector Replacement
- PHT Pump Rotating Element Replacement
- Traveling Flux Detector (TFD) Scans
- Replacement of East Feeder Cabinet Restriction Orifice (3312-RO-3)
- Fuel Channel Inspections (CIGAR)
- Fueling Machine Bridge Maintenance
- Steam Generator Primary Side Inspections (3311-BO1 and BO3)
- Steam Generator Secondary Side Water Lancing (3311-BO1, BO2, BO3, BO4)
- In-service and Periodic Inspections
- Delayed Neutron (DN) Tubing Inspection and Maintenance
- Moderator Purification Valve Replacements
- Inspections for Single Fuel Channel Replacement planned for Outage 2026.

The outage was planned to be completed in July 2024, however, an issue with the generator on the conventional side of the station was identified and the repairs were completed over the next several months. The outage scope that included radiological hazards was mostly complete by July, with the exception of TFD scans, which were planned to occur when the reactor power was at 35% full power. The scans were delayed by several months, but were completed in December 2024.

1.2 Initiatives and Activities to Improve Control of Worker Doses and Radiological Hazards

The following initiatives and activities to improve control of workers doses and radiological hazards were completed in 2024:

- **Mapping of External Dose Rates on the Reactor Faces:**
  During Outage 2024, NB Power took the opportunity to complete mapping of the external gamma dose rates across the East and West reactor faces in order to improve radiation work planning in these locations. The measurements were taken by mounting devices (capable of storing or transmitting dose rate data) on equipment being used to perform scans of the fuel channels. This permitted the entire reactor face to be measured without exposing workers.

- **Outage Source Term Characterization Measurements and Sampling:**
  NB Power procured the services of a vendor to complete outage source term characterization measurements via gamma spectrometry using specialized equipment. Smear samples were taken from open radioactive systems during Outage 2024 and sent for radiochemical analysis. These activities help validate that the protective measures used for worker dose control are appropriate and effective and assist with radiation work planning.

- **Implementation of New Work Method for Work on Fuel Channel Inspection Tooling:**
  Workers preparing to complete fuel channel inspection activities identified an alternative method for retrieving the inspection head, which is inserted in the reactor core, from the fueling machine. The method involved using the fueling machine's automated ram to push the inspection head onto the trough following the fuel channel inspection, rather than having a worker manually reach inside the fueling machine with a long handled tool and pull the inspection head out. This permitted workers to be located farther away from the inspection head and for radiation surveys to be completed as the head was slowly being pushed onto the trough. Using this approach, it was possible to retract the head back into the fueling machine to be flushed with water if the dose rates were higher than expected and challenged the radiation exposure permit alarm set points for the workers.

- **Installation of Shielding to Decrease Dose Rates in Waiting Areas:**
  Prior to executing work in the boiler cabinets, shielding was added to the platforms below the work area. This helped to reduce the dose rates in waiting/staging areas for workers performing activities in the higher dose rate boiler cabinet areas.

1.3 Planned Initiatives and Targets

The following initiatives are planned for 2025 but are subject to change based on station prioritization.

- Work activities in Outage 2025 to replace the Rocky Mountain Fittings on the Primary Heat Transport (PHT) system are scheduled later in the outage (~3.5 months following shutdown) to take advantage of lower dose rates from the decay of predominant nuclides in the station source term (i.e., Zr/Nb-95).

- Mock-up training and preparation activities for the Rocky Mountain Fitting replacement in advance of the work in Fall 2025.

- Benchmarking with peer utilities and participation in radiation safety strategy meetings in preparation for Single Fuel Channel Replacement in Outage 2026.

- Revision of station Action Levels to align with industry peers is planned in 2025.

1.4 Significant Revisions to Radiation Protection Procedures or Governance

There were revisions to three of the Licensing Basis Documents listed in the station's Licence Conditions Handbook LCH or other radiation protection program related documents as indicated in Table 1.4 below. All documents listed in the LCH are sent to CNSC staff upon revision. There were no significant changes to radiation protection procedures or governance in 2024.

Document Number	Document Title	Significant Changes
EXP-03400-0001	*Radiation Protection Expectations and Directives*	Not Revised.
SDP-01368-A046	*Controlling Radiation Exposures As Low As Reasonably Achievable (ALARA)*	Not Revised.
GU-08300-0006	*Code of Practice for Respiratory Protection*	Updates to the procedure for non-radiological aspects and re-organization of the information.
IR-03541-0006	*Technical Basis for Management of Alpha Hazards at PLNGS*	Not Revised.
HP-03541-H100	*How to Approve a Radiation Work Approval*	Not Revised.
HP-03541-H101	*Considerations for Pregnant and Breastfeeding NEWs*	Not Revised.
RPP-03400-0009	*Dosimetry*	Minor revision to include a new tracking form for issue of extremity dosimeters in outages.
SDP-01368-A042	*Planning Radiation Work*	Not Revised.
SDP-01368-A051	*Establishing Exposure Limits*	Not Revised.
IR-03400-0004	*ALARA Five Year Plan*	Updated for current 5 year period.
IR-03541-0013	*Technical Basis for Ascertaining and Assigning Lens of Eye Dose at PLNGS*	Not Revised.

1.5 Significant Radiation Protection Trends

The station's problem identification and resolution process is described in station instruction *SI-01365-A063, Implementing the Corrective Action Process*. Station Departmental Procedure *SDP-01368-CA04, Screening a PICA* outlines the action category criteria for classifying entries in the Problem Identification and Corrective Action (PICA) database. Category 1 and Category 2 designation is given to significant events that either "cause a major reduction in the margin of safety to the public or to station personnel" (Category 1), or "cause some reduction in the margin of safety to the public or to station personnel" (Category 2).

There were no Category 1 PICAs raised in 2024 related to radiation protection.

There were two Category 2 PICAs raised in 2024 related to radiation protection. The event descriptions are as follows:

1) **Access Control Door Damaged** – the locking mechanism for an access control door in the Reactor Building was found in the open position with its locking mechanism damaged. The reactor was in the Guaranteed Shutdown State in support of a planned maintenance outage at the time and no elevated radiation fields were present in the area. Operational procedures were immediately initiated, with barrier tape being immediately established to prevent entry. The locking mechanism was fully repaired. There was no dose consequence to workers as a result of this issue and Event Report *ER-62030-2404-022-A-00, Access Control* was submitted to the CNSC.

2) **Request Pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Potential Neutron Exposure of Workers** – NB Power received a request from the CNSC related to operating experience from peer stations in which workers were exposed to neutron dose rates from refurbishment waste. NB Power took immediate action to assess our on-site refurbishment waste storage facility and confirmed similar hazards did not exist at PLNGS. NB Power participated in industry meetings and an industry joint project to understand the cause of the neutron dose rates. The operating experience has been captured in radiation protection training materials for station staff and will be used in the future for any work involving component removal from the reactor. NB Power provided several updates on actions taken based on the CNSC's request for information in 2024 and early 2025.

1.6 Major Trends Associated with Unplanned Internal Exposures

There were no unplanned internal exposures in 2024 and no internal doses assigned as a result of radionuclides other than tritium in 2024.

1.7 Major Trends Associated with Contamination Events

There were no significant events or trends associated with contamination events in 2024. The summary of information submitted as part of the *REGDOC-3.1.1* Safety Performance Indicator Data Sheets for each quarter of 2024 can be found in the following sections.

1.7.1 Major Trends for Personnel Contamination Events

The following table contains the trend information for Personnel Contamination Events (PCE) for each quarter of 2024. The majority of the open radioactive system work for Outage 2024 was completed in Quarter 2. There were no dose consequences as a result of any PCE in 2024.

Personnel Contamination Event Tiers	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1 (>50,000 cpm)	0	1	0	0
2 (>5,000 cpm)	0	9	0	0
3 (≥100 cpm)	0	25	0	1

1.7.2 Major Trends for Loose Contamination Events

The following table contains the trend information for Loose Contamination Events for each quarter of 2024. The majority of the open radioactive system work for Outage 2024 was completed in Quarter 2.

Loose Contamination Tiers	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1 (Loose/fixed contamination ≥37 kBq/m^2 in Zone 1 or public domain)	0	0	0	0
2 (Loose/fixed contamination in Unzoned Area, Zone 1 or public domain or widespread loose in Zone 2)	0	0	0	0
3 (Widespread loose contamination in Zone 3 or isolated loose in Zone 2)	0	20	1	0

2.0 Results of Dose Monitoring for 2024

This section includes a summary of the information requested in Item 2 of *REGDOC-3.1.1, Section 3.5*. The information is presented in the table format recommended in *Appendix D* of *REGDOC-3.1.1*.

2.1 Total Collective Effective Dose

The total collective effective dose for the station for the 2024 calendar year (and previous 3 years) is outlined in Table 2.1 below.

Table 2.1: Total Collective Effective Dose

Collective Dose by NPP: Point Lepreau Nuclear Generating Station						
	Collective Dose by Activity (person-mSv)			Collective Dose by Exposure Pathway (person-mSv)		Total Collective Effective Dose (p-mSv)
Year	Routine Operations	Outages (including forced outages)	Major Projects	Internal Dose	External Dose	
2024	**107**	**1216**	**N/A**	**195**	**1128**	**1323**
2023	258	167	N/A	137	288	425
2022	176	1207	N/A	369	1014	1382
2021	170	117	N/A	66	221	287

2.2 Effective Dose

The histogram of the effective doses received by workers is given in Table 2.2a below. The average effective dose for workers who received non-zero doses in 2024 was 1.44 mSv. The maximum individual effective dose received by a worker at PLNGS in 2024 was 11.41 mSv (see Table 2.2b). This person is a member of the Fuel Handling work group, who received the dose while completing Fuel Handling related work activities, including work on fuel channel inspections and on the fueling machine bridge in Outage 2024.

Table 2.2a: Effective Dose

NPP: Point Lepreau Nuclear Generating Station								
Monitoring Year	**Dose (mSv)**							
	<0.01*	**0.01-1**	**1.01-5**	**5.01-10**	**10.01-15**	**15.01-20**	**20.01-50**	**>50**
2024	**1698**	**532**	**330**	**50**	**6**	**0**	**0**	**0**
2023	1369	439	120	12	0	0	0	0
2022	1576	553	318	56	7	0	0	0
2021	1348	353	75	8	0	0	0	0

*Below the minimum reporting limit of 0.01 mSv

Table 2.2b: Average and Maximum Effective Dose

Year	Average Effective Dose (mSv)	Maximum Effective Dose (mSv)
2024	**1.44**	**11.41**
2023	0.74	8.90
2022	1.48	14.76
2021	0.68	8.69

2.3 Lens of Eye Dose

The histogram of the lens of eye doses received by workers is given in Table 2.3a below. The average dose to the lens of the eye was 1.47 mSv and the maximum dose was 11.58 mSv (see Table 2.3b). The year-over-year dose trend will be included in subsequent annual compliance report submissions.

Table 2.3a: Dose to the Lens of the Eye

NPP: Point Lepreau Nuclear Generating Station								
	Dose (mSv)							
	<0.01*	0.01-1	1.01-5	5.01-10	10.01-15	15.01-20	20.01-50	>50
Number of Workers Monitored in 2024	1698	532	325	53	8	0	0	0

*Below the minimum reporting limit of 0.01 mSv

Table 2.3b: Average and Maximum Lens of Eye Dose

Year	Average Lens of Eye Dose (mSv)	Maximum Lens of Eye Dose (mSv)
2024	1.47	11.58

2.4 Skin Dose

The histogram of the skin doses received by workers is given in Table 2.4a below. The average skin dose was 1.45 mSv and the maximum skin dose was 11.74 mSv (see Table 2.4b). The year-over-year dose trend will be included in subsequent annual compliance report submissions.

Table 2.4a: Skin Dose

NPP: Point Lepreau Nuclear Generating Station				
	Dose (mSv)			
	<0.01*	0.01-50	50.01-250	>250
Number of Workers Monitored in 2024	1698	918	0	0

*Below the minimum reporting limit of 0.01 mSv

Table 2.4b: Average and Maximum Skin Dose

Year	Average Skin Dose (mSv)	Maximum Skin Dose (mSv)
2024	1.45	11.74

2.5 Extremity Dose

The histogram of the extremity doses received by workers is given in Table 2.5a below. Workers who were issued extremity dosimeters (227 in total) are included in this section; otherwise the shallow dose for the worker is equal to the extremity dose. The average extremity dose was 2.52 mSv and the maximum extremity dose was 11.49 mSv (see Table 2.5b). The year-over-year dose trend will be included in subsequent annual compliance report submissions.

Table 2.5a: Extremity Dose

NPP: Point Lepreau Nuclear Generating Station				
	Dose (mSv)			
	<0.01*	0.01-50	50.01-250	>250
Number of Workers Monitored in 2024	88	139	0	0

*Below the minimum reporting limit of 0.01 mSv

Table 2.5b: Average and Maximum Extremity Dose

Year	Average Extremity Dose (mSv)	Maximum Extremity Dose (mSv)
2024	2.52	11.49

2.6 Miscellaneous

The total number of workers monitored, maximum effective dose to non-Nuclear Energy Workers (NEW), and the maximum individual effective dose for the current 5-year dosimetry period can be found below in Table 2.6.

Table 2.6: Miscellaneous

Total number of workers monitored in 2024	2616
Maximum effective dose received by (non-NEWs) in 2024	0 mSv
Maximum individual whole-body dose for the current 5-year dosimetry period (i.e., 2021-2025; dose included up to 2024-12-31)	36.66 mSv