ONTARIO POWER GENERATION

Environmental Emissions Data for Nuclear Sustainability Service - Western

Q2 2022

OVERVIEW

This report summarizes the environmental emissions data for Q2 2022 for OPG's Nuclear Waste Management operations located at the Bruce Nuclear Power Development site in Bruce County. OPG's Nuclear Sustainability Services – Western (NSS-W) stores low and intermediate level radioactive waste from the operation of OPG and Bruce Power nuclear reactors. The low level waste is stored or compacted. The facility also provides used fuel dry storage for the Bruce Power reactors. OPG's Radioactive Waste Operations Site 1 (RWOS-1) stores low and intermediate level radioactive waste.

This report includes:

- Radioactive Effluents: Releases to air remained well below the regulatory limits.
- Groundwater Monitoring: OPG continued to analyze groundwater results to examine trends.
- Spills to the Environment: There were no spills to the environment that were reportable to a regulatory authority.

Note: The contents of this report are consistent with environmental data OPG is required to provide to the Canadian Nuclear Safety Commission (CNSC) on a quarterly basis. These reporting requirements are periodically revised.

ENVIRONMENTAL EMISSIONS MANAGEMENT

OPG has an environmental management program to ensure its activities are conducted in a manner that minimizes any adverse impact on the public and the environment. OPG's environmental program conforms to CNSC requirements for environmental protection and the International Organization for Standardization (ISO) standard for environmental management systems. The quality assurance programs for OPG's chemistry and health physics laboratories conform to the requirements of national and international standards.

As part of OPG's environmental management program, OPG has established an effluent monitoring and control program that is based on the "ALARA" principle. That is, measures are in place to ensure emissions to the environment are kept As Low As Reasonably Achievable while taking social and economic factors into account.

Public Radiation Dose Data

Annual environmental monitoring program results for NSS-W, including an assessment of radiation dose to the public and protection of the environment, are available at: www.opg.com/news-and-media/Pages/reports.aspx

Annual assessments of environmental radiological data for the Bruce Nuclear Power Development site, including OPG's NSS-W, are available at: www.brucepower.com/resources-and-publications/reports

MONITORING OF RADIOACTIVE EFFLUENTS

Release Limits & Action Levels

OPG uses radiation dose limits specified in federal legislation to derive Release Limits for the radionuclides that may be released to air and water from its nuclear facilities. OPG's NSS-W must maintain its radiological emissions well below these limits to meet the terms of its operating licence. OPG also sets Action Levels that are much lower than the Release Limits to identify and control emissions before a limit can be reached.

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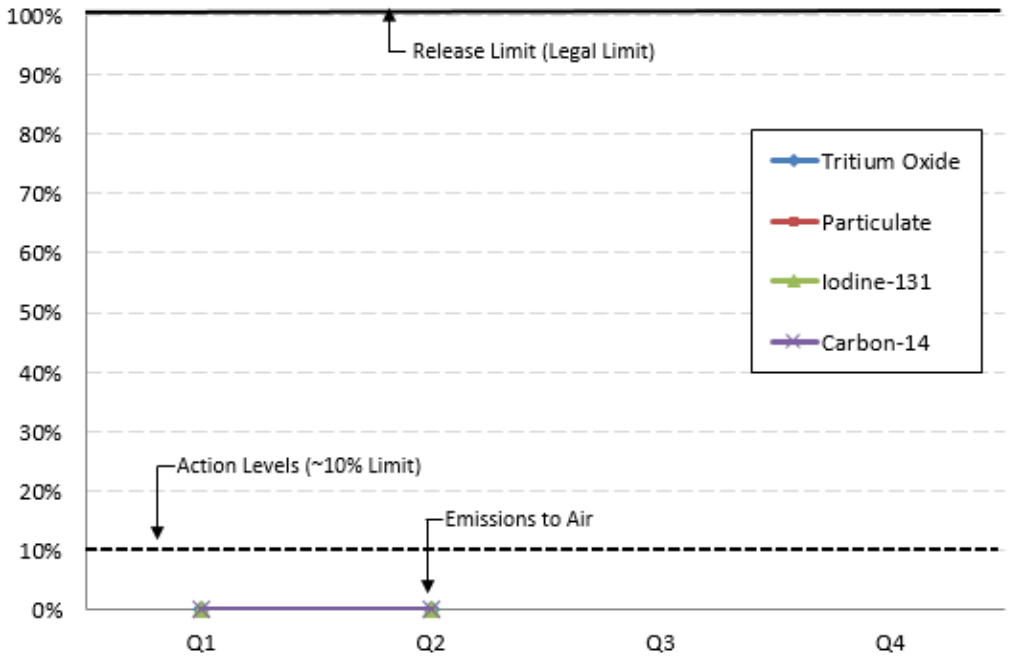
Performance Results

Emissions from NSS-W are monitored to track performance. For Q2 2022, radiological emissions to air remained well below the Release Limits and no Action Levels were exceeded. (Appendix A, Table A.1) The following graphs show radiological emissions for the year to date as a percentage of the Release Limits.

Air Emissions as a Per Cent of Release Limits



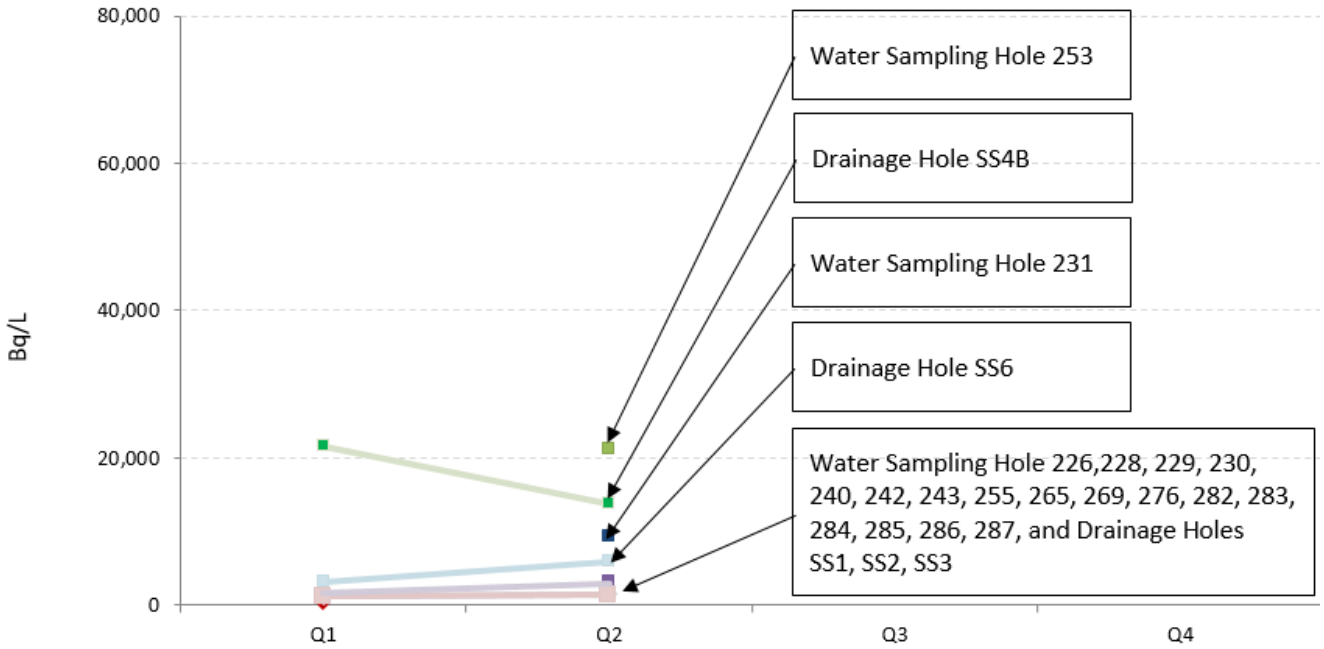
WATER EMISSIONS

Water removed from NSS-W storage structures and building sumps is transferred to Bruce Power Active Liquid Waste (ALW) system, and is accounted for in that station's emissions.

GROUNDWATER MONITORING

Starting in January 2022, the groundwater monitoring, except for subsurface drainage locations, will be conducted semi-annually in Q2 and Q4 of every year and the respective monitoring data of these sampling locations will be available in the 2022 Q2 and Q4 environmental emissions data report. Groundwater will no longer be sampled for Gross Beta or Carbon-14. Subsurface drainage location monitoring is conducted in and around the NSS-W waste storage structures to analyze water quality (Appendix A, Tables A.2).

Groundwater Monitoring Tritium Concentration Results



SPILLS TO THE ENVIRONMENT

OPG has extensive programs to ensure the risk of spills to the environment is effectively assessed and managed. All spills are reported by OPG to the appropriate federal, provincial and municipal authorities as required.

OPG classifies its reportable spills as Category A, B or C spills based on the actual or potential impacts. Category A spills are considered very serious due to the scale of injury or damage, health effects, or safety impairment. Category B spills are considered serious due to localized injury or impacts to property. Category C spills are all other reportable spills that are less serious than Category A and B spills.

There were no reportable spills at the NSS-W site in Q2 2022.

APPENDIX A

ENVIRONMENTAL EMISSIONS DATA

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Table A.1: Airborne Radionuclide Releases[a]

	Tritium Oxide (Bq)	Particulate (Bq)	Iodine-131 (Bq)	Carbon-14[b] (Bq)
SUMMARY: ANNUAL				
Release Limit (Bq/year)[c]	3.45×10^{17}	6.65×10^{11}	1.99×10^{12}	2.41×10^{15}
Total Releases As of Q2 2022	6.4×10^{12}	0	4.0×10^{3}	1.4×10^{9}
DETAILS: QUARTERLY[d]				
Action Level (Bq/week)[e]	6.91×10^{14}	1.33×10^{9}	3.98×10^{9}	4.82×10^{12}
Q1	3.0×10^{12}	0	1.9×10^{3}	8.0×10^{8}
Q2	3.4×10^{12}	0	2.1×10^{3}	5.6×10^{8}

(a) The Waste Volume Reduction Building radioactive ventilation exhaust stack is monitored for tritium, particulate, and iodine-131 emissions.. The Transportation Package Maintenance Building ventilation stack is monitored for tritium and particulate emissions. The Used Fuel Dry Storage Facility ventilation stack is monitored for particulate emissions.

(b) OPG has completed an effluent monitoring assessment project and is in the process of reviewing its impact on C-14 emission data.

(c) The derived Release Limit for a given radionuclide is the release rate of that radionuclide to air during normal operation of a nuclear facility over the period of a calendar year, which would result in an individual receiving a dose equal to the regulatory annual dose limit for a member of the public. New Release Limits have been implemented for NSS-W starting in 2020.

(d) Releases have been summarized by quarter for this report.

(e) Exceedances of Action Levels must be reported by OPG to the CNSC. To prevent an Action Level from being reached, OPG has set Internal Investigation Levels that require emissions to be reviewed when they reach the high end of the normal range. Corrective actions are taken if necessary. There were no CNSC Action Level exceedance events in the second quarter of 2022. New Action Levels have been implemented for Nuclear Sustainability Services – Western starting in 2020.

A becquerel (Bq) is the standard international unit for measuring radioactive decay or radioactivity. One becquerel is the decay of one atom of a radioisotope per second, and is an extremely small amount of radioactivity. Becquerel is a measure of the rate (not energy) of radiation emission from a source.

Another unit of measuring radioactivity is the curie (Ci). 1 Ci = 3.7 x 10^{10} Bq.

Table A.2: NSS-W Groundwater and Subsurface Monitoring Results

As per regulatory requirements, Section 4 of CNSC REGDOCS-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices,* RWOS-1 data will now be reported annually in Q4 in the Annual Compliance Monitoring Report.

		Tritium (Bq/L)
		Q2
WSH 226		9.13×10^{0}
WSH 228		1.59×10^{2}
WSH 229		1.29×10^{3}
WSH 230		6.56×10^{2}
WSH 231		9.26×10^{3}
WSH 240		1.02×10^{1}
WSH 242		4.85×10^{1}
WSH 243		2.70×10^{2}
WSH 253		2.11×10^{4}
WSH 255		3.11×10^{3}
WSH 265		4.28×10^{2}
WSH 269		5.44×10^{2}
WSH 276		2.36×10^{1}
WSH 282		6.93×10^{2}
WSH 283		1.12×10^{2}
WSH 284		3.39×10^{2}
WSH 285		2.99×10^{2}
WSH 286		2.69×10^{2}
WSH 287		2.87×10^{2}
WWMF SS1[(b)]	April	1.47×10^{3}
	May	1.36×10^{3}
	June	1.30×10^{3}
WWMF SS2[(b)]	April	1.76×10^{3}
	May	1.14×10^{3}
	June	1.13×10^{3}
WWMF SS3[(b)]	April	1.95×10^{3}
	May	1.98×10^{3}
	June	4.63×10^{3}
WWMF SS4B[(b)]	April	1.38×10^{4}
	May	1.15×10^{4}
	June	1.57×10^{4}
WWMF SS6[(b)]	April	5.17×10^{3}
	May	6.73×10^{3}
	June	5.66×10^{3}

(a) Values prefixed by an "<" indicate that reported results were less than the minimum detectable limit.
(b) Water Sampling Holes are sampled on a semi-annual basis, except for Subsurface drainage locations SS1, SS2, SS3, SS4B, SS6 which are sampled monthly. It has been determined the source of the tritium at WSH 231 is evaporated water from waste in the Low Level Storage Buildings, which has likely migrated as condensate via underground electrical infrastructure. Various mitigating measures have been taken and the tritium concentration at WSH 231 shows a decreasing trend, with seasonal variations. WSH 253 and WSH 255 were incorporated into the groundwater monitoring program in 2017 and are used to monitor the extent of the tritium migration.