

An aerial photograph showing the Pickering Nuclear Power Plant on the right side of the image, situated on a peninsula. The plant consists of several large, white, cylindrical containment domes and various industrial buildings. To the left of the plant is a lush green landscape with numerous trees and winding paths. The foreground is dominated by a large body of blue water, likely Lake Ontario. The sky is clear and blue.

# 2023 Results of OPG's Pickering Environmental Monitoring Program

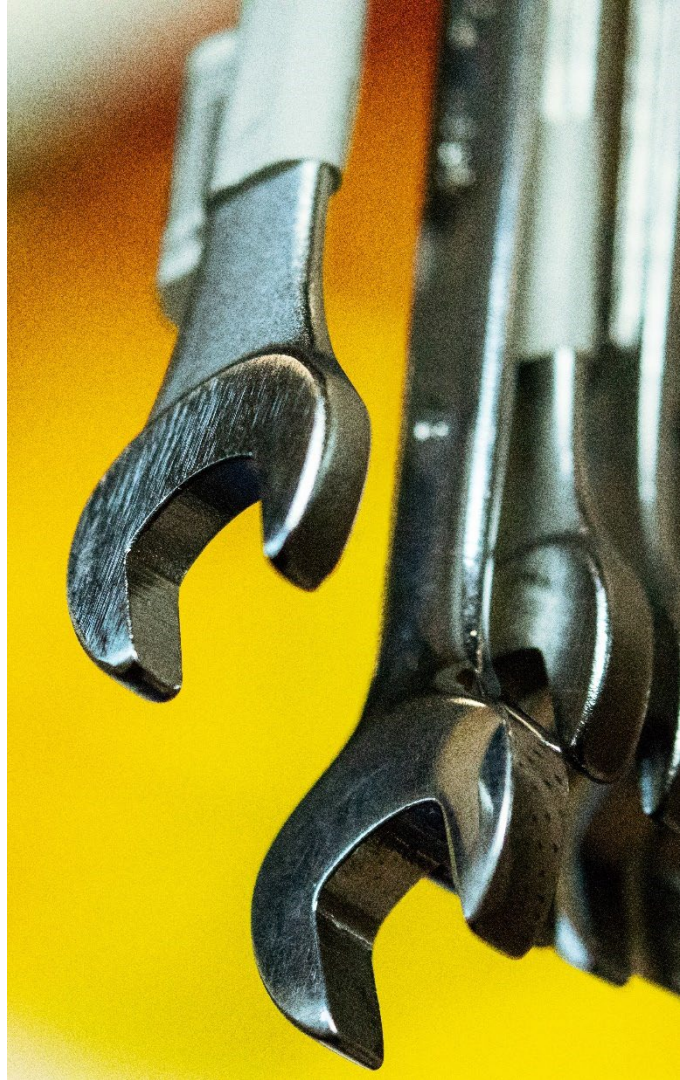
September 17, 2024  
PN CAC Meeting

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# Agenda

- 1 | EMP Key Objectives
- 2 | EMP Sampling Locations
- 3 | 2023 Public Dose
- 4 | Radiological and Non-Radiological Emissions
- 5 | 2023 EMP Summary
- 6 | Impingement & Entrainment
- 7 | Audits & Inspections
- 8 | Looking Ahead



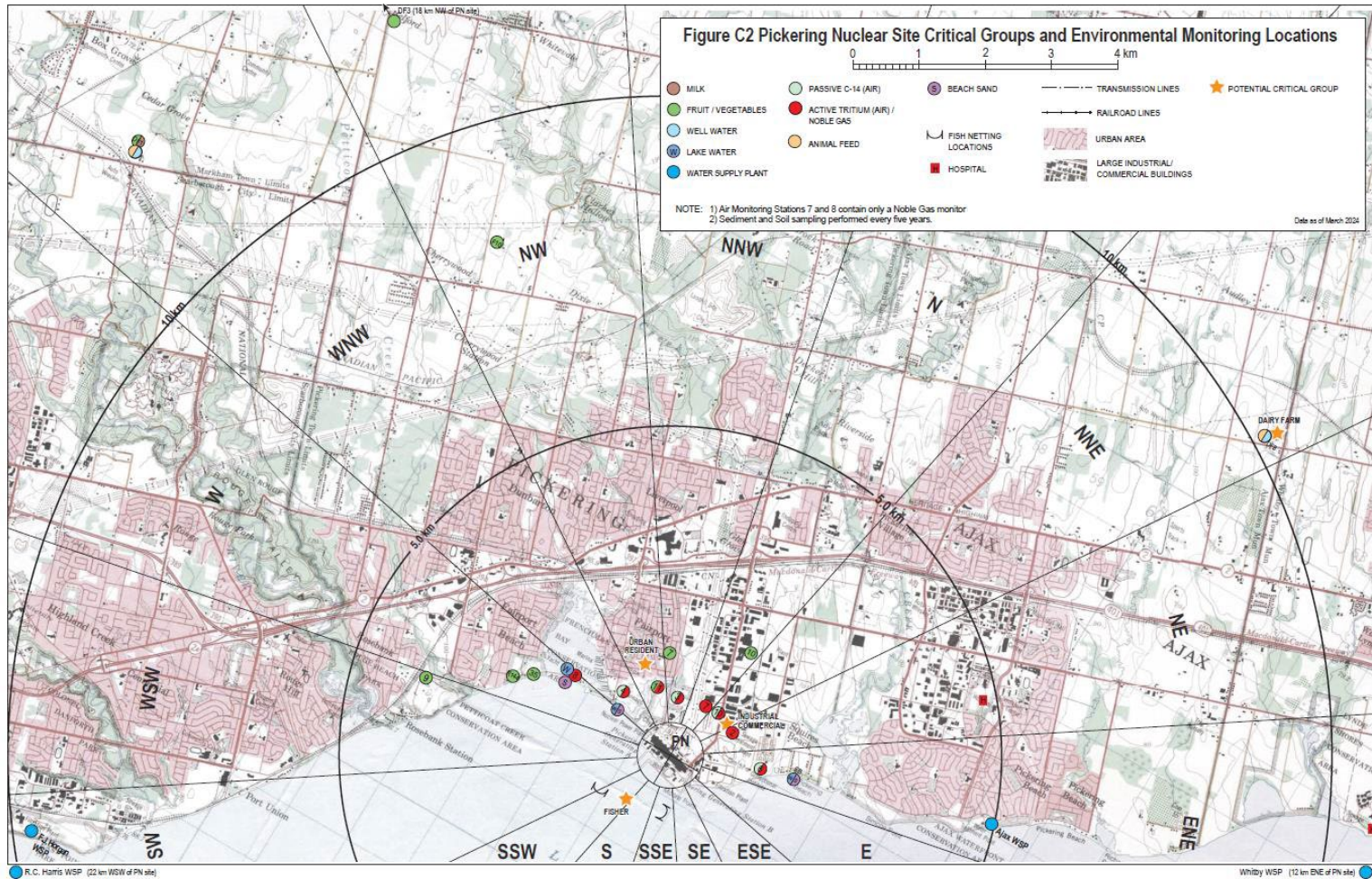
# Environmental Monitoring Programs

## Key Objectives

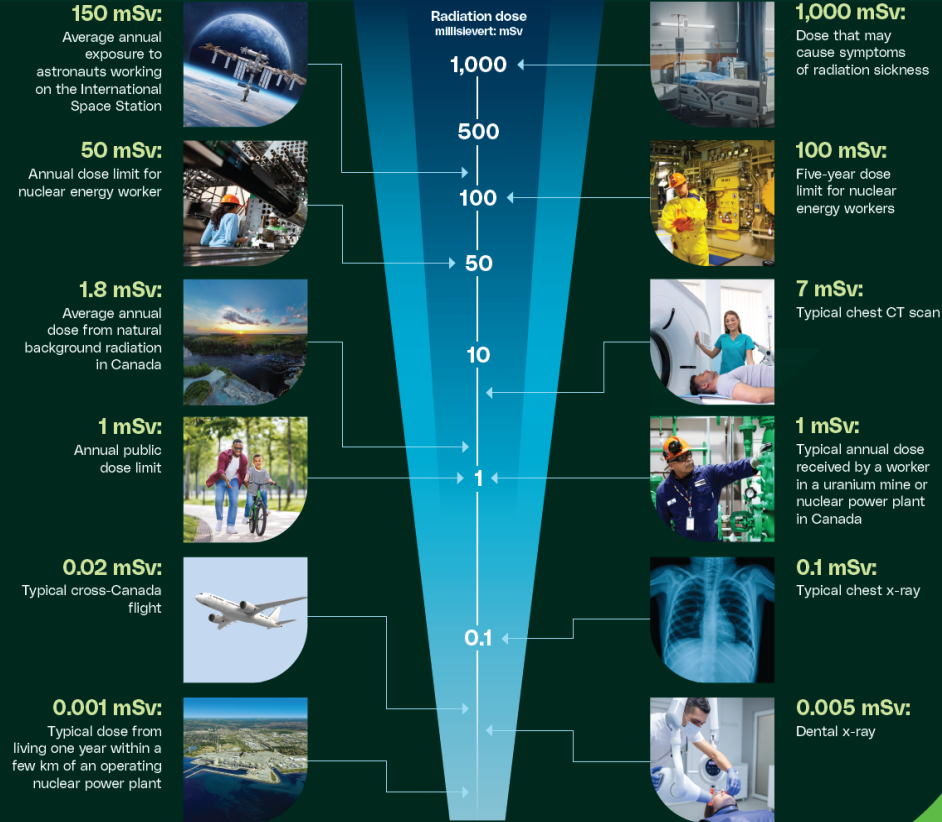
- Provide data to assess the level of risk on human health and the environment resulting from operation of OPG nuclear facilities;
- Demonstrate, independent of effluent monitoring, the effectiveness of containment and effluent control;
- Demonstrate compliance with limits on the concentration/intensity of contaminants/physical stressors in the environment;
- Confirm predictions made by environmental risk assessments, refine models used, and reduce the uncertainty in the predictions made by these assessments and models.



# PN Critical Groups and Sampling Locations



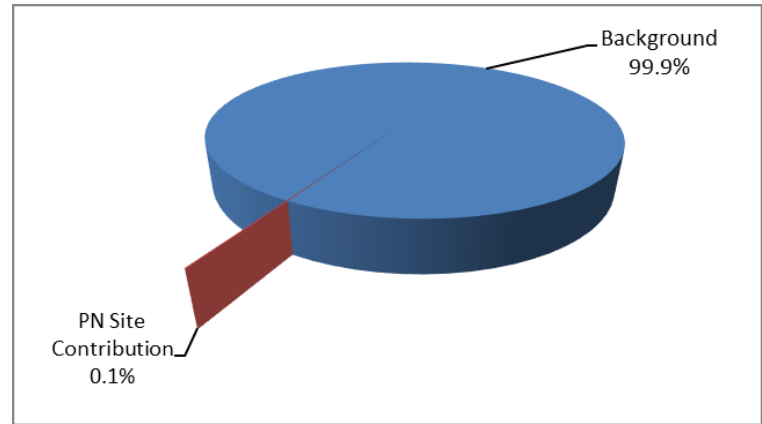
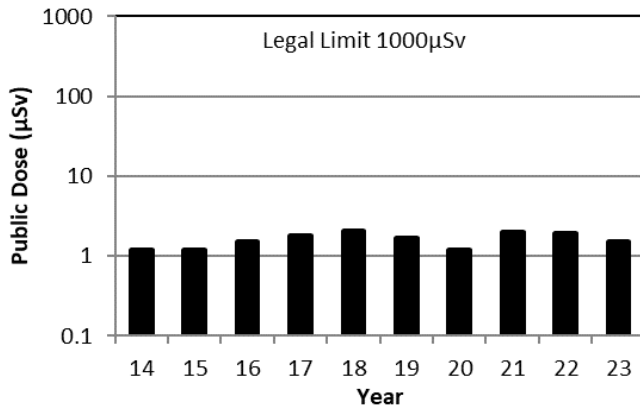
# Radiation dose examples



Source: Canadian Nuclear Safety Commission Radiation Dose Examples

# Pickering Station 2023 Public Dose

- 2023 public dose was 1.5  $\mu\text{Sv}$ , represented by the Urban Resident adult
- Pickering public dose continues to be very low and is consistent with the 2022 dose
- HTO and noble gases are the main dose contributors
- 0.2% of annual regulatory limit of 1000  $\mu\text{Sv}$  and 0.1% of annual natural background radiation of 1,400  $\mu\text{Sv}$



# 2023 Results of Radiological Emissions Monitoring

Site Emissions <sup>(d)</sup>	PNA & PNB (Units 1-8) <sup>(e)</sup>	
	Bq	% DRL
<b>AIR</b>		
Tritium Oxide	4.8E+14	0.47
Elemental Tritium <sup>(a)</sup>	NA	NA
Noble Gas <sup>(b)</sup>	1.2E+14	0.45
I-131 <sup>(c)</sup>	1.0E+07	<0.01
Particulate	1.2E+07	<0.01
C-14	3.2E+12	0.12
<b>WATER</b>		
Tritium Oxide	3.8E+14	0.05
Gross Beta/Gamma	2.2E+10	1.19
C-14	3.3E+09	<0.01

NOTES: NA = Not Applicable, Bq = Bequerels

(a) Emissions from Darlington Tritium Removal Facility

(b) Units for noble gas emissions are Bq-MeV

(c) Weekly samples are usually < Method Detection Limit (MDL)

(d) Annual air emissions are the sum of continuous samples analysed weekly.

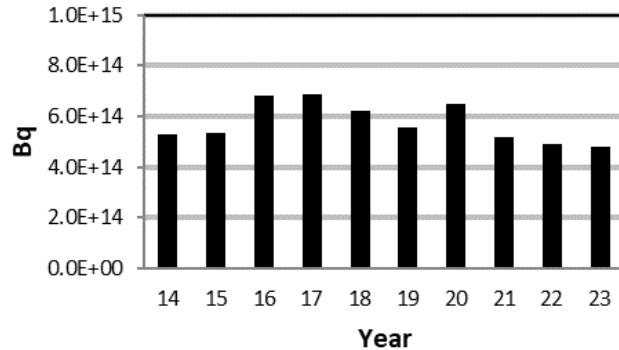
Note that if interim Noble Gas sampling is in place, samples may not be continuous.

Annual water emissions are the sum of monthly composite samples for C-14, and weekly composite samples for tritium oxide and gross beta/gamma.

(e) As of 2019 PN DRLs and emissions are for PNA and PNB combined rather than separate as in the past.

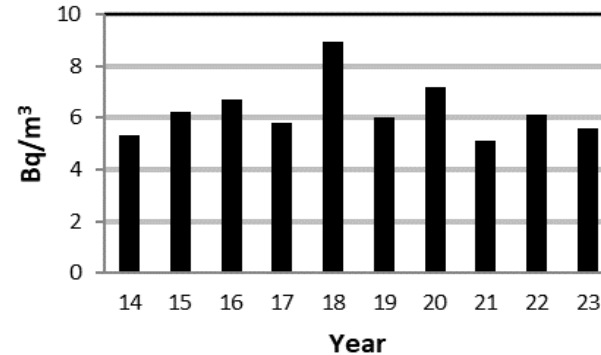
# Emissions and EMP Data

## PN HTO to Air Emissions



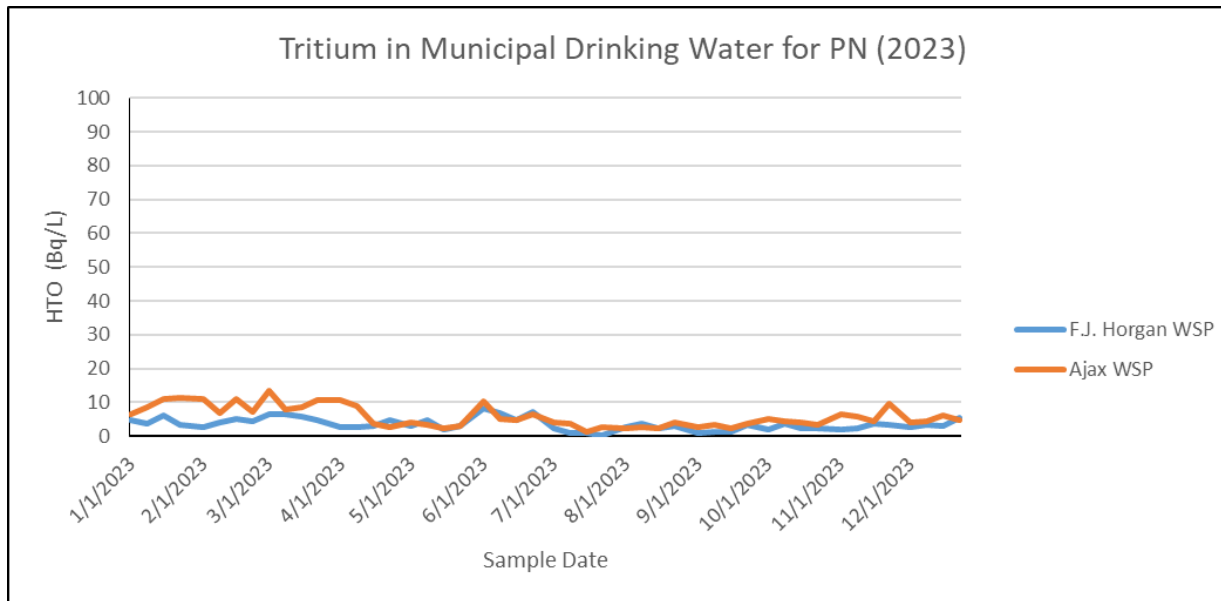
2023 =  $4.8 \times 10^{14}$  Bq

## PN HTO to Air at Site Boundary



2023 = 5.7 Bq/m<sup>3</sup>

# Tritium at Water Supply Plants Near PN



- Average HTO Concentrations: F.J. Horgan = 3.5 Bq/L, Ajax = 5.8 Bq/L
- Ontario Drinking Water Quality Standard is 7000 Bq/L
- Water Supply Plant annual average concentrations far below OPG's commitment of < 100 Bq/L

# Results of Non-Radiological Emissions Monitoring

Hazardous Material <sup>(a)</sup>	PN
	Mg
<b>AIR</b>	
SO <sub>2</sub> to Air <sup>(b)(c)</sup>	6.0E-02
NO <sub>2</sub> to Air <sup>(c)</sup>	3.4E+01
CO <sub>2</sub> to Air <sup>(b)(c)</sup>	6.2E+03
Ammonia to Air	6.6E+00
Hydrazine to Air <sup>(d)</sup>	5.4E-03
Ozone Depleting Substances (ODS) Releases <sup>(e)</sup>	3.5E-05
<b>WATER</b>	
Ammonia to Water	6.9E-01
Hydrazine to Water <sup>(d)</sup>	2.7E-01

NOTES:

Mg = Megagrams

(a) Hazardous Materials as calculated for NPRI reporting requirements

(b) Reported in OPG Sustainable Development Report as an OPGN aggregate value.

(c) Based on annual fuel consumption.

(d) Based on annual consumption.

(e) Based on estimated quantity when a release occurs.

- 2023 emissions continue to be reported through 2024, therefore the 2023 EMP Report summarized the complete set of emissions for 2022.
- In 2022, there were no ODS releases in excess of 100kg at PN. Any ODS releases between 10 kg and 100 kg are reported to Environment Canada in semi-annual halocarbon release reports.
- In 2022, there were no regulatory non-compliances associated with the sulphur dioxide, nitrogen oxides, carbon dioxide, hydrazine or ammonia emissions.

# 2023 Environmental Monitoring Program Summary

- 321 laboratory analyses performed for the 2023 PN dose calculation
- Site emissions remained at a very small fraction of their respective DRLs.
- The 2023 the PN site public dose remains a small fraction of both the annual legal dose limit and the annual natural background radiation in the area.
- Tritium in drinking water measured at local water supply plants remained at a small fraction of the Ontario Drinking Water Quality Standard (7000 Bq/L) and OPG's voluntary commitment (100 Bq/L).
- Dose calculations and annual report were reviewed and verified by an independent third party.
- 2023 EMP report was submitted to CNSC on April 25, 2024 and is available on [www.opg.com](http://www.opg.com).
- The overall EMPs encompass other programs that are reported separately.

# Impingement & Entrainment

- Results of the 2023 monitoring program are presented in the Pickering Nuclear 2023 Impingement Monitoring Report submitted to both DFO and CNSC and will be available on [www.opg.com](http://www.opg.com)
- The combined biomass of all species and ages impinged in 2023 was 2,511 kg, a rate equivalent to 0.51 kg per million cubic metres of station intake volume.
- The residual impingement and entrainment impacts at both PNGS and DNGS are counterbalanced by offset measures.
  - An allocated portion of the OPG Big Island Wetland habitat bank, situated in the Bay of Quinte, is an offset measure for both PNGS and DNGS.
  - Additional offset measures for PNGS include stocking of Atlantic Salmon into Duffins Creek and the construction and monitoring of the Simcoe Point Wetland at the mouth of Duffins Creek.

# Audits & Inspections

- The Ministry of the Environment, Conservation and Parks (MECP) performed an audit of the Health Physics Laboratory (HPL) in May, 2023. There was one finding to confirm whether there is a statement about processing drinking water samples without undue delay present in documentation and one request for evidence of sampling instructions provided to clients. The one finding and one request for evidence were completed and responses were accepted by the MECP.
- MECP conducted an unannounced inspection at HPL between November 2023 and January 2024. There were no non-compliant findings during this inspection. The Final Inspection Rating was 100%.
- An independent audit of the EMPs is conducted once every five years by OPG's Nuclear Oversight department. The most recent audit was just concluded in May 2024. Results concluded that the managed system controls for the EMPs are generally effective. One finding (related to NSS-WWMF EMP documentation) and six insights are currently under review and will be addressed accordingly.



# Looking Ahead

- In 2023, no major changes to the routine sampling program were identified. Non-intent revisions to EMP documentation were identified through recent inspections and self-assessments and will be implemented.
- No supplementary studies are planned in 2024 as part of the EMP.
- The site-specific surveys, which identify the potential critical groups for DN and PN EMPs, are currently under review and will be revised accordingly.
- Changes to the EMP as a result of the latest PN and DN ERAs will be identified and captured in the next EMP design review.

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