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Interim Report

Rapport intérimaire

**Regulatory Oversight
Report for 2010 – 2014
Ontario Power
Generation Inc.'s
Darlington, Pickering
and Western Waste
Management Facilities**

**Rapport de surveillance
réglementaire des
installations de gestion
des déchets Darlington,
Pickering et Western
d'Ontario Power
Generation Inc. pour
la période 2010-2014**

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Summary

This Commission Member Document (CMD) presents a consolidated interim status report by Canadian Nuclear Safety Commission (CNSC) staff of the operational performance at Ontario Power Generation Inc.'s (OPG) Darlington, Pickering and Western Waste Management Facilities (WMFs) for the period from July 2010 to December 2014.

This CMD is for information only. No action is requested from the Commission in this regard.

Résumé

Ce document à l'intention des commissaires (CMD) présente un rapport d'étape intérimaire consolidé rédigé par le personnel de la Commission canadienne de sûreté nucléaire (CCSN) sur le rendement opérationnel des installations de gestion des déchets Pickering, Darlington et Western d'Ontario Power Generation Inc., pour la période allant de juillet 2010 à décembre 2014.

Ce CMD est pour information seulement. Aucune action n'est requise de la part de la Commission à cet égard.

Signed/signé le

28 April 2015

A handwritten signature in black ink, appearing to read 'D. Newland', is written over a horizontal line.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1 OVERVIEW.....	3
1.1 Background	3
1.2 Management of Radioactive Waste at OPG's WMFs	4
1.2.1 Low-Level Radioactive Waste (LLW)	4
1.2.2 Intermediate-Level Radioactive Waste (ILW)	5
1.2.3 High-Level Radioactive Waste (HLW)	5
1.3 Overview of OPG's WMFs	6
1.3.1 Darlington WMF	6
1.3.2 Pickering WMF	7
1.3.3 Western WMF	8
1.4 CNSC Compliance Plan	9
1.5 Licensing Update.....	11
1.5.1 Status of Licences	11
1.5.2 Licence Amendments.....	12
1.5.3 Licence Renewals	12
1.6 Relevant Safety and Control Areas	12
2 OTHER MATTERS FOR CONSIDERATION.....	13
2.1 Status Update on the CNSC Integrated Action Plan: Lessons Learned From The Fukushima Accident.....	13
2.2 Other Matters of Regulatory Interest.....	13
3 GENERAL ASSESSMENT OF SCAS	14
3.1 Management System	16
3.1.1 Discussion.....	16
3.2 Human Performance Management	17
3.2.1 Discussion.....	17
3.3 Operating Performance	18
3.3.1 Discussion	19
3.4 Safety Analysis.....	21
3.4.1 Discussion	22
3.5 Physical Design.....	23
3.5.1 Discussion	24
3.6 Fitness for Service.....	24
3.6.1 Discussion.....	25
3.7 Radiation Protection	27
3.7.1 Discussion	27
3.8 Conventional Health and Safety.....	30
3.8.1 Discussion	31
3.9 Environmental Protection	32
3.9.1 Discussion	32
3.10 Emergency Management and Fire Protection.....	38
3.10.1 Discussion.....	38
3.11 Waste Management	41
3.11.1 Discussion	41
3.12 Security	42
3.12.1 Discussion	43

3.13	Safeguards and Non-Proliferation	44
3.13.1	Discussion	45
3.14	Packaging and Transport	46
3.14.1	Discussion	47
4	OTHER MATTERS OF REGULATORY INTEREST	48
4.1	Aboriginal Consultation	48
4.2	Cost Recovery	48
4.3	Financial Guarantees	49
4.4	Nuclear Liability Insurance	49
4.5	Improvement Plan and Significant Future Activities	49
4.5.1	Future Construction	49
4.5.2	Proposed Long-Term Approach	49
4.6	Public Information and Disclosure	50
4.7	Interaction with Other Government Agencies	51
5	OVERALL CONCLUSIONS	52
	ACRONYMS	55
	GLOSSARY	57
	APPENDIX A. RATING LEVELS	60
	APPENDIX B. DATA TABLES	61

LIST OF FIGURES

Figure 1: Location of OPG's Waste Management Facilities (Source: Google Maps).....	3
Figure 2: OPG's Darlington Waste Management Facility (Source: OPG)	6
Figure 3: OPG's Pickering Waste Management Facility (Source: OPG).....	7
Figure 4: OPG's Western Waste Management Facility (Source: OPG)	8
Figure 5: Average Effective Dose of OPG WMF NEWs.....	29
Figure 6: Maximum Effective Dose of OPG WMF NEWs	29
Figure 7: Airborne Nuclear Substances Released Annually from the Western WMF	36
Figure 8: Liquid Nuclear Substances Released Annually from the Western WMF	37

LIST OF TABLES

Table 1: Number of CNSC Compliance Inspections Conducted.....	10
Table 2: OPG's Waste Facility Operating Licences	11
Table 3: Functional Areas and Safety and Control Areas	12
Table 4: Other Matters of Regulatory Interest.....	13
Table 5: OPG's WMF Performance Ratings for the Reporting Period	14
Table 6: Number of DSCs Loaded at the WMFs.....	20
Table 7: OPG's LLW and ILW Processing and Storage Statistics for the Western WMF.....	20
Table 8: Storm Water Sample Administrative Limits.....	34
Table 9: Airborne Hazardous Substance Releases from the Western WMF Incinerator	36
Table 10: Effective Dose Statistics for OPG WMF NEWs.....	61
Table 11: Airborne Nuclear Substances Released Annually from the Western WMF	63
Table 12: Liquid Nuclear Substances Released Annually from the Western WMF	63

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EXECUTIVE SUMMARY

Ontario Power Generation Inc. (OPG) is the owner and licensee of the Darlington Waste Management Facility (WMF), Pickering WMF and Western WMF. These three facilities manage radioactive waste generated by OPG-owned nuclear generating stations (NGS) and are licensed as Class 1B nuclear facilities by the Canadian Nuclear Safety Commission (CNSC), separate from the facilities and activities authorized by the power reactor operating licences (PROL).

This information Commission member document (CMD) provides CNSC staff's assessment of OPG's performance at these three WMFs for the reporting period from the beginning of July 2010 until the end of December 2014. This is the second consolidated interim status report to the Commission for these OPG WMFs.

CNSC staff compliance activities during this reporting period included site inspections, follow-up on OPG's responses to inspection findings, desktop reviews, event reviews and general communication and exchange of information with OPG. The following observations support CNSC staff's overall conclusion of safe operation at each WMF for the reporting period:

- OPG has fully satisfied security program requirements at each WMF by providing suitable infrastructure, barriers, procedures, systems, devices and security personnel.
- At each WMF, doses to the public associated with operations activities were well below the regulatory annual public dose limit of 1 millisievert (mSv).
- At each WMF, OPG has implemented radiation protection programs that meet regulatory requirements. These programs ensure that doses are kept as low as reasonably achievable (ALARA), social and economic factors taken into consideration. No worker at any WMF site received a radiation dose that exceeded the regulatory dose limits.
- At each WMF, OPG has implemented conventional health and safety programs that meet regulatory requirements and provide safe work practices and conditions to achieve a high level of personnel safety.
- At each WMF, OPG has implemented environmental protection programs that meet regulatory requirements and effectively monitor, assess and control releases of nuclear and hazardous substances to the environment (all releases remained well below Ontario Ministry of the Environment and Climate Change (MOECC) emission limits and CNSC licence limits).
- OPG has complied with regulatory requirements concerning Canada's international safeguards obligations.

CNSC staff conclude that OPG continues to operate each WMF in accordance with the *Nuclear Safety and Control Act* (NSCA) and its associated regulations, as well as with the authorizations and the conditions of each waste facility operating licence (WFOL). CNSC staff will continue to conduct the compliance activities mentioned above on an ongoing basis, to verify OPG's continued safe operation of the Darlington, Pickering and Western WMFs.

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1 OVERVIEW

1.1 Background

There are three nuclear generating stations (NGS) in Ontario, namely the Darlington NGS, the Pickering NGS, and the Bruce NGS. Each NGS has an onsite waste management facility (WMF) that is owned and operated by Ontario Power Generation Inc. (OPG). The three WMFs in Ontario are the Darlington WMF, the Pickering WMF, and the Western WMF. The Darlington WMF and the Pickering WMF are located at the sites of the Darlington NGS and the Pickering NGS, respectively. The Western WMF is located at the site of the Bruce NGS. Figure 1 below depicts the location of these three waste management facilities graphically.

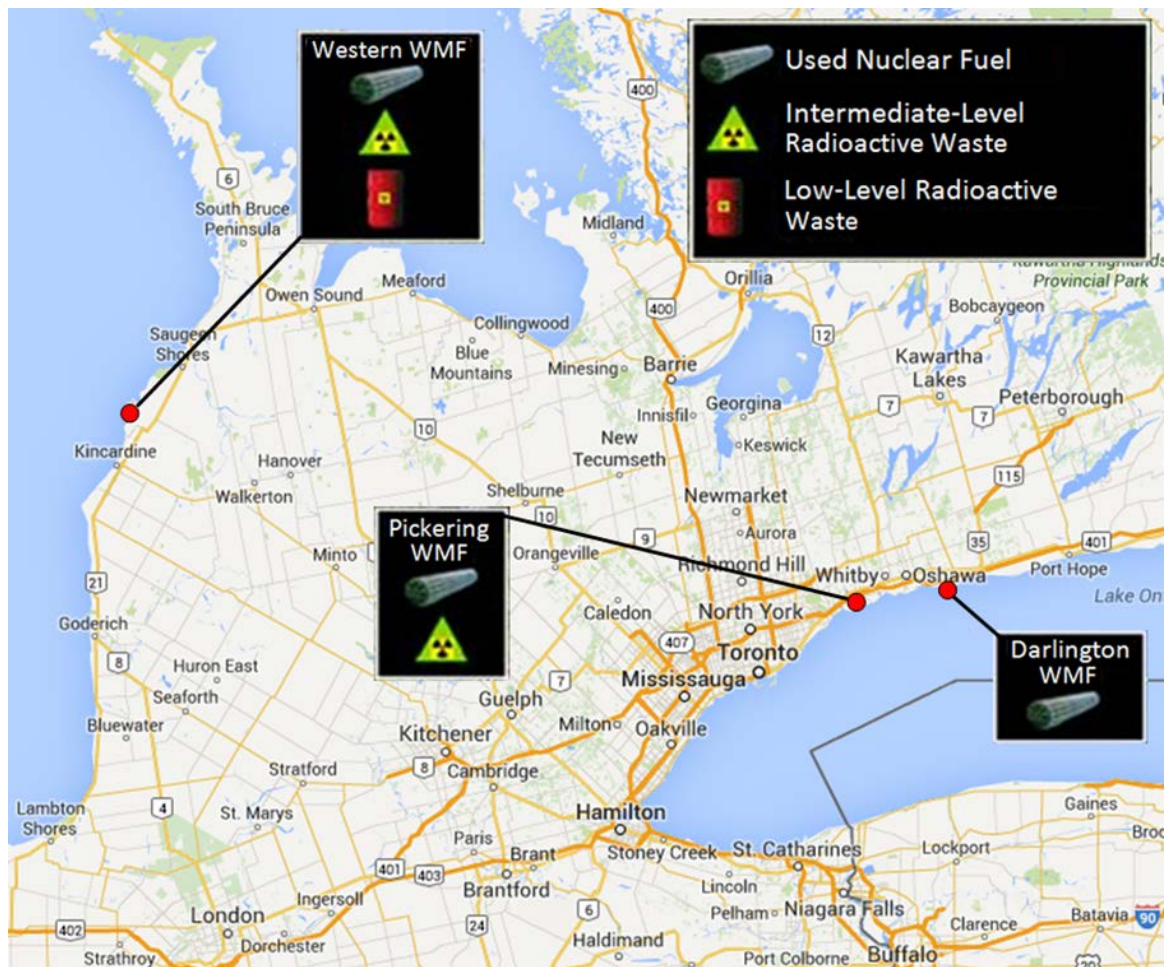


Figure 1: Location of OPG's Waste Management Facilities (Source: Google Maps)

The Darlington, Pickering and Western WMFs manage radioactive waste generated by OPG-owned NGSs (including the Bruce NGS) and are licensed separately as Class IB nuclear facilities by the Canadian Nuclear Safety Commission (CNSC) under the *Class I Nuclear Facilities Regulations (Class I Regulations)*. OPG's Decommissioning and Nuclear Waste Management Division (DNWMD) is responsible for the conduct of

operations authorized under the CNSC licences at the Darlington, Pickering and Western WMFs.

The eight units at the Bruce NGS are owned by OPG, but are operated by Bruce Power Limited (Bruce Power) through a long-term lease. As part of this lease agreement with Bruce Power, OPG accepts and stores the wastes generated from the operation of the Bruce NGS at the Western WMF. Bruce Power handles and transports the wastes to the Western WMF and once accepted by OPG, the wastes become their responsibility.

1.2 Management of Radioactive Waste at OPG's WMFs

At the Darlington, Pickering and Western WMFs OPG manages high-level radioactive waste (HLW), intermediate-level radioactive waste (ILW), and low-level radioactive waste (LLW). An overview of each of these types of radioactive waste will be provided in the following subsections.

ILW and LLW destined for the Western WMF is sorted and packaged at its point of origin into categories based on activity and waste type, according to the waste acceptance criteria established by OPG.

1.2.1 Low-Level Radioactive Waste (LLW)

The LLW generated from the operation of the Darlington, Pickering and Bruce NGSs is stored at the Western WMF. LLW consists of materials that have become contaminated with nuclear substances during their use at the NGSs, such as mop heads, rags, paper towels, floor sweepings and tools. This type of waste is comprised of materials like: paper, plastics, metal, rubber and cotton. LLW can be safely handled without shielding, and is transported in plastic bags to the Western WMF for processing and storage.

OPG processes LLW for the purpose of volume reduction. Up to 30 percent of the LLW received at the Western WMF is incinerated, producing a stable form of ash waste. This waste minimization technique has the potential to reduce the storage volume of LLW 70-fold. For LLW not suitable for incineration, compaction is performed resulting in a 5-fold volume reduction. Some waste cannot be processed, such as contaminated tools, and is stored at the Western WMF.

Some of the waste that was generated from the refurbishment of the Bruce NGS, such as some fuel channel waste and the steam generators, is categorized as LLW and does not undergo further processing before being safely stored at the Western WMF.

Considering only the LLW and ILW stored at the Western WMF, LLW comprises roughly 95 percent of the waste (by volume).

1.2.2 Intermediate-Level Radioactive Waste (ILW)

The ILW generated from the operation of the Darlington, Pickering and Bruce NGSs is stored at the Western WMF, excluding the ILW generated from the refurbishment of the Pickering NGS. ILW does not undergo further processing (unlike LLW which does) and consists mostly of used reactor components, as well as the resins and filters used to keep the reactor water systems clean. ILW that is not generated from the refurbishment of a NGS is loaded into specially reinforced and designed transport packages (certified by the CNSC) at the site of its generation, for shipment to the Western WMF for storage.

The ILW generated from the refurbishment of the Bruce NGS is stored at the Western WMF, whereas the ILW generated from the refurbishment of the Pickering NGS is stored at the Pickering WMF. Refurbishment ILW consists of irradiated core components such as pressure tubes, calandria tubes and end fittings. At the Western WMF, this ILW is stored inside in the Retube Waste Storage Building (RWSB), whereas at the Pickering WMF, this ILW is stored outside in the Retube Component Storage Area (RCSA) in Dry Storage Modules (DSMs).

The current Darlington WMF licence authorizes the construction of one building for the storage of ILW for the future refurbishment of the Darlington NGS. This is further discussed in Section 1.3.1 of this report.

Considering only the ILW and LLW stored at the Western WMF, ILW comprises roughly 5 percent of the waste (by volume).

1.2.3 High-Level Radioactive Waste (HLW)

The HLW that is owned by OPG consists of the used nuclear fuel that is associated with the operation of the Darlington, Pickering and Bruce NGSs. Interim storage of HLW occurs at the site of the NGS at which it was produced. The Darlington, Pickering and Western WMFs each have dedicated buildings for the processing and storage of Dry Storage Containers (DSCs), for the containment of used nuclear fuel.

Each DSC is a free-standing reinforced container constructed of steel and concrete that provides the required shielding for radioactivity and allows for thermal release from the radioactive decay of the used nuclear fuel. Each DSC has the capacity to store 384 used fuel bundles.

OPG's DSC design has been reviewed and accepted by the CNSC for its use as both a storage container and as part of a CNSC-certified transportation package under the *Packaging and Transport of Nuclear Substances Regulations*.

Specially-designed vehicles are used to transport empty and loaded DSCs between the NGSs and their associated WMF. These vehicles are also used to move the DSCs within the WMFs between the processing and storage buildings.

1.3 Overview of OPG's WMFs

1.3.1 Darlington WMF

The Darlington WMF is located at the site of the Darlington NGS which is located on the north shore of Lake Ontario, in the Municipality of Clarington. Figure 2 provides a side profile aerial view of this facility.



Figure 2: OPG's Darlington Waste Management Facility (Source: OPG)

The Darlington WMF processes and stores DSCs containing used nuclear fuel solely from the Darlington NGS. The Darlington WMF is contained within its own protected area, separate from the protected area of the Darlington NGS, but within the site boundary of the Darlington NGS.

The Darlington WMF consists of an amenities building, one DSC processing building, and one DSC storage building (Storage Building #1). The transfer of loaded DSCs from the Darlington NGS to this WMF is conducted on OPG property with a security escort.

The Darlington WMF has the capacity to store 500 DSCs in Storage Building #1. The Waste Facility Operating Licence (WFOL) for the Darlington WMF, WFOL-W4-355.00/2023 [1], authorizes the construction of three additional storage buildings, which would allow for an additional storage capacity of 1500 DSCs. OPG is currently constructing Storage Building #2, the location of which can be seen in Figure 2.

The WFOL for the Darlington WMF also authorizes the construction of one ILW storage building. In November, 2014 CNSC staff received advance notification of OPG's intent to construct this ILW storage building, the RWSB, at the site of the Darlington NGS.

In accordance with Licence Conditions 2.1 and 2.2, prior to the commencement of construction activities, OPG shall submit an Environmental Management Plan, a Construction Verification Plan and Project Design Requirements. These documents were included in OPG's November, 2014 submission and in February, 2015, CNSC staff accepted OPG's submission. The construction of the RWSB can now proceed.

1.3.2 Pickering WMF

The Pickering WMF is located at the Pickering NGS site in Pickering Ontario. Figure 3 provides a side profile aerial view of this facility.

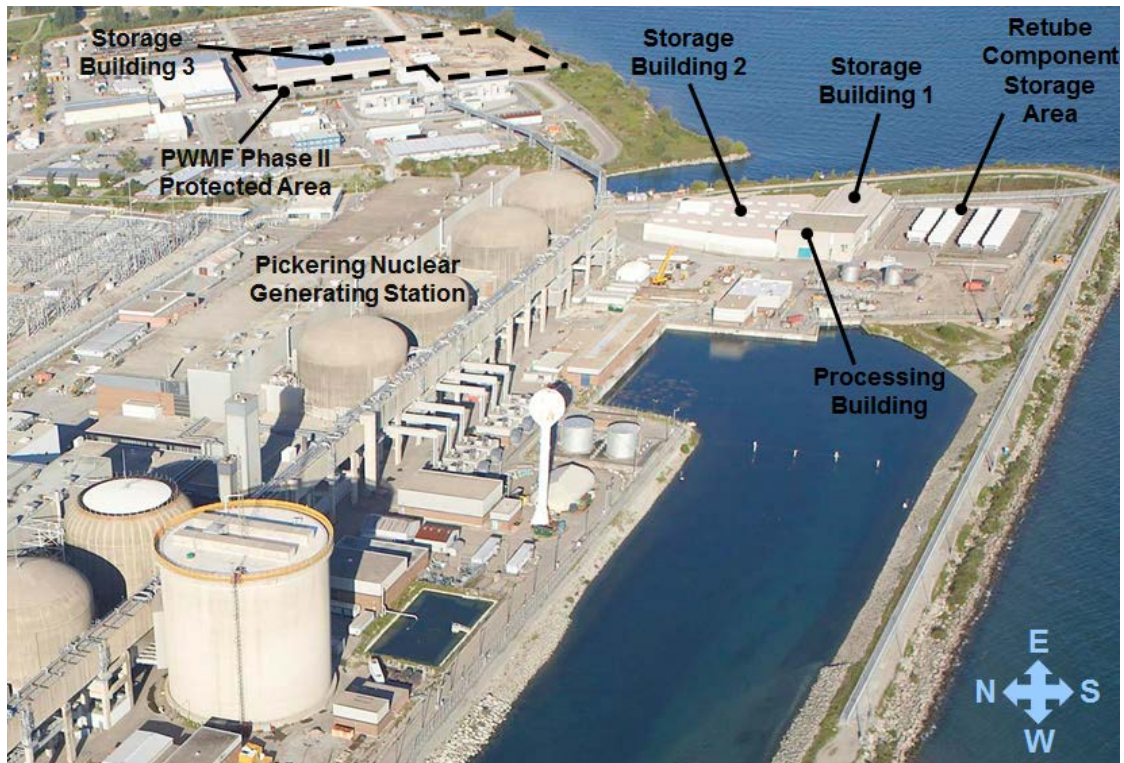


Figure 3: OPG's Pickering Waste Management Facility (Source: OPG)

The Pickering WMF processes and stores DSCs containing used nuclear fuel solely from the Pickering NGS. The transfer of loaded DSCs from the Pickering NGS to this WMF is conducted on OPG property with a security escort.

The Pickering WMF is separated into two phases (Phase I and, Phase II). Phase I is located within the protected area of the Pickering NGS and consists of: one DSC processing building, two DSC storage buildings (Storage Building #1 and Storage Building #2) and the Retube Component Storage Area (RCSA) for the storage of the ILW generated from the refurbishment of the Pickering A NGS. Phase II of the Pickering WMF is located north-east of Phase I and is contained within its own protected area, separate from the protected area of the Pickering NGS and Phase I of the Pickering WMF, but within the site boundary of the Pickering NGS. Phase II contains Storage Building #3.

The Pickering WMF has the capacity to store 1,154 DSCs in three storage buildings. This facility also has the potential for a further storage capacity of an additional 500 DSCs by the construction of an additional storage building (Storage Building #4), as is authorized by the WFOL for the Pickering WMF, WFOL-W4-350.02/2018 [2]. OPG has plans for additional construction at the Phase II site including a new processing building to replace the current processing building in Phase I and two additional Storage Buildings (Storage Building #5 and Storage Building #6).

The Pickering WMF also stores ILW from the refurbishment of the Pickering A NGS in 34 above-ground DSMs located at the RCSA. The RCSA is closed to the receipt of any new ILW.

1.3.3 Western WMF

The Western WMF is located at the site of the Bruce NGS which is located on the east shore of Lake Huron, in Tiverton, Ontario. Figure 4 provides an aerial view of this facility.

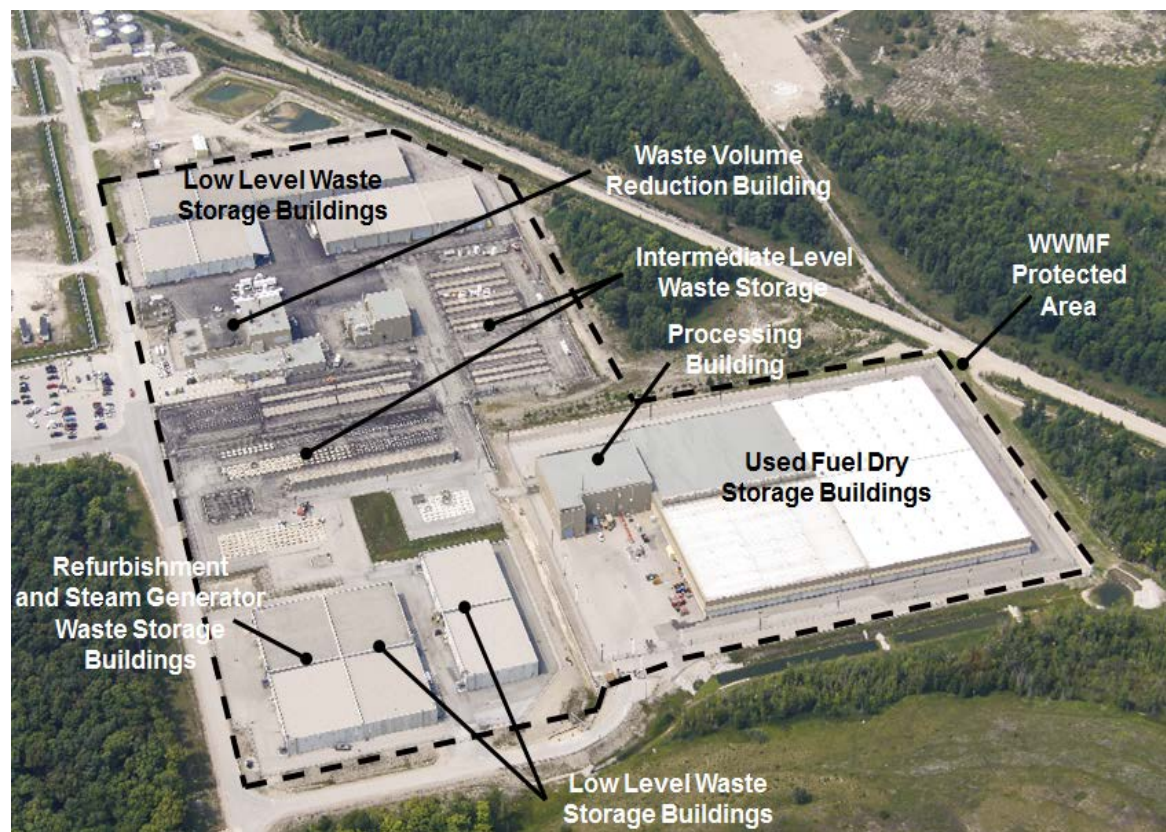


Figure 4: OPG's Western Waste Management Facility (Source: OPG)

The Western WMF includes both the Western Low- and Intermediate-Level Waste Storage Facility and the Western Used Fuel Dry Storage Facility (UFDSF). The Western Low- and Intermediate-Level Waste Storage Facility consists of the Waste Volume Reduction Building (WVRB), the Transportation Package Maintenance Building (TPMB), 14 above-ground Low Level Storage Buildings (LLSBs), two above-ground refurbishment waste storage buildings, and various in-ground containers, trenches and tile holes for ILW storage. The Western UFDSF processes and stores DSCs containing used nuclear fuel solely from the Bruce NGS. The Western UFDSF is contained within its own protected area, separate from the protected area of the Bruce NGS, but within the site boundary of the Bruce NGS and consists of one DSC processing Building and four DSC storage buildings. The Western UFDSF has the capacity to store 2,000 DSCs.

The transfer of loaded DSCs from the Bruce NGS to this WMF is conducted on the Bruce Power site with a security escort. The WFOL for the Western WMF, WFOL-W4-314.03/2017 [3], authorizes the construction of an additional 9 storage buildings for LLW and ILW, one hundred and twenty eight (128) in-ground storage containers for ILW and two DSC storage buildings.

The WVRB receives LLW from the Darlington, Pickering and Bruce NGSs where it may be stored as-is, or processed to reduce its volume through either incineration or compaction. At the Western WMF TPMB, OPG maintains radioactive material transportation packages.

1.4 CNSC Compliance Plan

Compliance activities of verification, enforcement and reporting are in place to ensure that CNSC licensees exhibit a high level of compliance with the CNSC regulatory framework. These activities enable the CNSC to provide assurance to Canadians of the continuing compliance and safety performance of licensees.

The verification activities for OPG's WMFs consist of reviewing operations reports, reviewing reportable event submissions, reviewing situations reported to CNSC staff that are not reportable under the regulations, but may have public interest and conducting compliance inspections.

The Darlington, Pickering, and Western WMF WFOLs require OPG to provide the CNSC with reports including quarterly operations reports, monthly reports specific to safeguards accounting, third-party fire protection review reports and commissioning activity reports. The Darlington WMF WFOL also requires the submission of an annual operations report. Throughout the period of July 2010 – December 2014, OPG met all licensing reporting requirements identified under each WFOL.

Sections 29 and 30 of the *General Nuclear Safety and Control Regulations* outline specific scenarios, called reportable events, under which licensees must file reports to the CNSC. Reportable events are discussed further in Section 3.3 of this document under the subheading "Reporting and Trending".

CNSC staff reviewed all reportable events from the licensee during this reporting period, including all follow-up correspondence, and found the actions taken by OPG to be satisfactory in all cases.

CNSC staff conduct baseline compliance inspections, which cover a general overview of the entire facility being inspected, and focused compliance inspections, which focus on the implementation of OPG programs for specific Safety and Control Areas (SCA), such as Emergency Management and Fire Protection. CNSC inspections are planned and documented activities to verify the results of licensee processes. An inspection can be announced or unannounced and typically they include routine inspections and rounds, focusing on specified equipment, facility material systems, or of discrete records, products, or outputs from licensee processes. Inspection criteria include requirements of the *Nuclear Safety and Control Act* (NSCA) and its associated regulations, licence conditions, codes or standards, and OPGs own policies, procedures, or instructions that OPG has established to meet licensing requirements and form the licensing basis.

CNSC staff has developed minimum annual inspection frequency targets for the OPG WMFs. These targets are as follows: 2 inspections of the Darlington WMF, 2 inspections of the Pickering WMF and 3 inspections of the Western WMF. CNSC staff met the minimum annual inspection frequency targets for each WMF during the reporting period. In addition, CNSC safeguards staff and CNSC security staff independently conducted inspections at all WMFs over the reporting period in order to verify that OPG is operating each facility in compliance with regulatory requirements.

Table 1 summarizes the number of inspections that were conducted by CNSC staff over the reporting period at the Darlington, Pickering and Western WMFs, categorized into baseline compliance inspections, focused compliance inspections, security inspections, and safeguards inspections.

Table 1: Number of CNSC Compliance Inspections Conducted

Waste Management Facility	Baseline	Focused	Security	Safeguards	Total
Darlington	9	3	5	3	20
Pickering	8	2	5	2	17
Western	9	2	5	0	16

No significant items of non-compliance were identified during any inspection of the three WMFs and OPG addressed all written notifications associated with the inspections in a satisfactory manner.

CNSC staff have developed a preliminary plan for site visits and focused inspections to be conducted at the Darlington, Pickering and Western WMFs for 2015 through to 2017. During this time, CNSC staff plan on conducting site visits for CNSC specialist familiarization in the areas of Management System, Radiation Protection, Physical

Design (Pressure Boundary), and Environmental Protection and focused inspections in the areas of Human Performance Management (Training), Fitness for Service, Management System, Radiation Protection, Physical Design (Pressure Boundary), and Environmental Protection.

1.5 Licensing Update

1.5.1 Status of Licences

The Darlington, Pickering and Western WMFs are licensed under the *Class I Regulations* by the CNSC as Class 1B nuclear facilities. The type of licence issued for each WMF is a WFOL. Each licence had a 10-year licence term from the date that it was issued. Table 2 contains information regarding the licence held for each facility.

Table 2: OPG's Waste Facility Operating Licences

OPG WMF	Licence Number	Licence Issuance Date	Last Licence Amendment Date	Licence Expiration*
Darlington	WFOL-W4-355.00/2023	March 13, 2013	N/A	April 30, 2023
Pickering	WFOL-W4-350.02/2018	April 1, 2008	December 19, 2012	March 31, 2018
Western	WFOL-W4-314.03/2017	June 1, 2007	December 19, 2012	May 31, 2017

*unless otherwise suspended, amended, revoked, replaced, or transferred by the Commission.

The WFOLs authorize OPG to conduct the following activities at each WMF (paraphrased from the licences):

- Possess, transfer, use, process, package, manage, and store nuclear substances
- Transport used fuel associated with each site-specific NGS
- Modify existing or construct new storage buildings and structures upon meeting certain licensing requirements; and
- Possess and use prescribed equipment and prescribed information

Each licence includes requirements that can be broken down into the following categories: general, construction, safety and control area and facility specific, that together ensure that OPG provides adequate provision for the protection of workers, the public and the environment.

1.5.2 Licence Amendments

In December 2012, the Pickering and Western WMF WFOLs were amended to include licence condition requirements for maintaining a decommissioning plan and a financial guarantee that is acceptable to the Commission. The decommissioning plan must be reviewed and updated at least every five years. Additionally, the financial guarantee must remain valid, in effect and adequate to fund the decommissioning plan. The Darlington WMF was issued a renewed WFOL in March, 2013 that included licence condition requirements for maintaining a decommissioning plan and a financial guarantee that is acceptable to the Commission.

1.5.3 Licence Renewals

There was only one licence renewal during the reporting period. In March, 2013 the Darlington WMF WFOL was renewed for a 10-year period. This licence followed the new CNSC licence format with an accompanying Licence Conditions Handbook (LCH).

1.6 Relevant Safety and Control Areas

The CNSC evaluates how well licensees meet regulatory requirements for the performance of programs in 14 SCAs grouped according to three functional areas, see Table 3. Section 3 of this document provides CNSC staff's assessment of OPG's performance at each site against all 14 CNSC SCAs.

Table 3: Functional Areas and Safety and Control Areas

FUNCTIONAL AREAS	SAFETY AND CONTROL AREAS
Management	Management System
	Human Performance Management
	Operating Performance
Facility and Equipment	Safety Analysis
	Physical Design
	Fitness for Service
Core Control Processes	Radiation Protection
	Conventional Health and Safety
	Environmental Protection
	Emergency Management and Fire Protection
	Waste Management
	Security
	Safeguards and Non-Proliferation
Packaging and Transport	

2 OTHER MATTERS FOR CONSIDERATION

2.1 Status Update on the CNSC Integrated Action Plan: Lessons Learned From The Fukushima Accident

In August, 2013 CNSC staff updated the Commission on CNSC's action plans in response to the Fukushima accident [4]. The status update to the Commission indicated that, as a result of a request for information pursuant to subsection 12(2) of the *General Nuclear Safety and Control Regulations*, OPG was required to re-examine the safety cases for its WMFs and report on implementation plans for short-term and long-term measures to address any gaps discovered. In response to CNSC's request, OPG completed the requested actions and reported that no significant issues requiring immediate corrective or compensatory measures were identified for the WMFs.

However, OPG identified additional improvements and enhancements that included assessing whether additional fire response capability would be required in the event of a severe weather emergency at the Western WMF; investigating whether an alternate fire water supply is required in the event of a severe weather emergency at all WMFs; purchasing satellite phones for all facilities; and, developing a procedure to lower a suspended DSC in the event of a crane failure as a result of a beyond design basis event.

CNSC staff has been monitoring the implementation of these improvements and is satisfied. CNSC staff will continue to monitor OPG's implemented improvements through routine compliance activities.

2.2 Other Matters of Regulatory Interest

Table 4 identifies matters relevant to this Commission Member Document (CMD) that are addressed in section 4 of this document.

Table 4: Other Matters of Regulatory Interest

OTHER MATTERS OF REGULATORY INTEREST	RELEVANCE
CNSC Consultation - Aboriginal	Yes
Cost Recovery	Yes
Financial Guarantees	Yes
Improvement Plans and Significant Future Activities	Yes
Nuclear Liability Insurance	Yes
Licensee's Public Information Program	Yes
Interaction with Other Government Agencies	Yes

3 GENERAL ASSESSMENT OF SCAS

This section provides an update to the Commission with respect to OPG's performance and compliance with regulatory requirements, and OPG's safety programs under each SCA.

Table 5 presents the performance ratings for OPG's Darlington, Pickering and Western WMFs for the reporting period of July 2010 to December 2014, inclusive. The three WMFs were individually rated but the results are presented together since they each received the same ratings for all SCAs throughout this reporting period. Performance ratings are based on information from all licensing and compliance activities including: reviews of OPG documents in support of a licence renewal or amendment; quarterly operations reports; assessments of commissioning reports; compliance inspections; and, reviews and assessments of other OPG submissions.

Table 5: OPG's WMF Performance Ratings for the Reporting Period

FUNCTIONAL AREAS	SAFETY AND CONTROL AREA	RATING				
		2010 (Q3/Q4)	2011	2012	2013	2014
1. Management	Management System	SA	SA	SA	SA	SA
	Human Performance Management	SA	SA	SA	SA	SA
	Operating Performance	SA	FS	FS	FS	FS
2. Facility and Equipment	Safety Analysis	SA	FS	FS	FS	FS
	Physical Design	SA	SA	SA	SA	SA
	Fitness for Service	SA	SA	SA	SA	SA
3. Core Control Processes	Radiation Protection	SA	SA	SA	SA	SA
	Conventional Health and Safety	SA	FS	FS	FS	FS
	Environmental Protection	SA	SA	SA	SA	SA
	Emergency Management and Fire Protection	SA	SA	SA	SA	SA
	Waste Management	SA	SA	SA	SA	SA
	Security	SA	FS	FS	FS	FS

FUNCTIONAL AREAS	SAFETY AND CONTROL AREA	RATING				
		2010 (Q3/Q4)	2011	2012	2013	2014
	Safeguards and Non-Proliferation	SA	SA	SA	SA	SA
	Packaging and Transport	SA	SA	SA	SA	SA

Note: SA = Satisfactory and FS = Fully Satisfactory (for definitions of ratings refer to Appendix A)
Q3 = Quarter 3 (July 1 to September 30) and Q4 = Quarter 4 (October 1 to December 31)

For 2011 through to 2014, CNSC staff rated OPG's performance under the WFOLs as Fully Satisfactory (FS) for the following SCAs: Operating Performance, Safety Analysis, Conventional Health & Safety and Security. OPG's programs associated with these SCAs are consistent across all three WMFs. These ratings were assigned due to OPG's stable and mature programs, proactive implementation of facility/process improvements, results of CNSC inspections and proactive reporting and follow-up to non-reportable events. In all other SCA areas and time periods, CNSC staff assessed OPG's performance as Satisfactory (SA) which indicates that program areas meet CNSC requirements. Details regarding OPG's performance are provided in the following SCA specific sections of this document.

3.1 Management System

The Management System SCA covers the framework that establishes the processes and programs required to ensure an organization achieves its safety objectives and continuously monitors its performance against these objectives and fostering a healthy safety culture.

The following table presents performance ratings for all OPG's WMFs and includes an overall conclusion for this SCA.

SCA MANAGEMENT SYSTEM				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a management system at each WMF that meets the requirements of CSA Standard N286-05, <i>Management System Requirements for Nuclear Power Plants</i> .				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.1.1 Discussion

An overall discussion for the Management System SCA is presented in this section.

It is a requirement of the *Class I Nuclear Facilities Regulations* that licensees have in place a quality assurance program at WMFs. In 2012 [6], the Darlington WMF licence was revised to include a licence condition that requires OPG to implement and maintain a Management System in accordance with the Canadian Standards Association (CSA) Standard N286-05, *Management System Requirements for Nuclear Power Plants*.

OPG has implemented a Management System (quality assurance program) as described in OPG governance program documents *Nuclear Waste Management* (OPG Document Number W-PROG-WM-0001) [7] and *Nuclear Management System* (OPG Document Number N-CHAR-AS-0002) [8] at all of its WMFs. CNSC staff assessed OPG's Management System for all three WMFs and found that it met the requirements of CSA Standard N286-05, *Management System Requirements for Nuclear Power Plants*.

OPG has begun to implement a Business Transformation Initiative that has resulted in changes to the OPG Nuclear organization and how the OPG Nuclear Management System will be implemented, including the need for governance document changes to reflect this initiative. CNSC staff will continue to monitor OPG's implementation of these changes including a Management System focused compliance inspection at the Darlington WMF that is currently planned for 2016.

3.2 Human Performance Management

The Human Performance Management SCA covers activities that enable effective human performance through the development and implementation of processes that ensure a sufficient number of personnel are in all relevant job areas and have the necessary knowledge, skills, procedures and tools in place to safely carry out their duties.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA HUMAN PERFORMANCE MANAGEMENT				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a human performance program at each WMF, in a manner that satisfies regulatory requirements, to ensure personnel receive the appropriate training to safely carry out their duties.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met regulatory requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reporting on OPG's WMFs [5].

3.2.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Human performance program; and
- Personnel training.

Human Performance Program

The *General Nuclear Safety and Control Regulations* require OPG to have various elements related to licensee human performance programs at its WMFs. In 2012, the Darlington WMF licence was revised to include a licence condition requiring OPG to implement and maintain a human performance program.

OPG has implemented a human performance program for all three WMFs as described in its program document *Human Performance* (OPG Document Number N-PROG-AS-0002) [9].

During the reporting period CNSC staff reviewed the quarterly operational reports, events reportable under sections 29 and 30 of the *General Nuclear Safety and Control Regulations*, and conducted follow-up on OPG's responses to inspection findings. As a result, CNSC staff conclude that OPG continues to meet Human Performance Management regulatory requirements.

Personnel Training

It is a requirement of the *Class I Regulations* to have in place a training program. In 2012, the Darlington WMF licence was revised to include a licence condition requiring OPG to implement and maintain a training program.

OPG has a well-documented and robust Systematic Approach to Training (SAT)-based training system across OPG Nuclear, as described in its program document *Training* (OPG Document Number N-PROG-TR-0005) [10] and its associated procedural document *Systematic Approach to Training (SAT)* (OPG Document Number N-PROC-TR-0008) [11], as verified by CNSC compliance verification activities. During routine compliance inspections over the reporting period, CNSC staff reviewed OPG's training procedures and records; interviewed workers to determine whether they are receiving the appropriate level and frequency of training; and, observed onsite pre-job briefings. Also a training focused compliance inspection was conducted at the Pickering WMF in January 2013 which identified a need for OPG to update, and to ensure the consistency of, its task-to-training matrix, which OPG has since addressed. In 2015, CNSC staff plan to conduct an inspection at the Darlington WMF, with a focus on training. Based on these activities, CNSC staff are satisfied with OPG's training programs and found them to be well managed and appropriate for the activities being conducted at each WMF.

3.3 Operating Performance

The Operating Performance SCA covers an overall review of the conduct of the licensed activities and the activities that enable effective performance.

The table below presents performance ratings for OPG’s WMFs and includes an overall conclusion for this SCA.

SCA OPERATING PERFORMANCE				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	FS	FS	FS	FS
OPG maintains safe operation of each WMF in accordance with the licensing basis for each WMF in a manner that fully satisfies regulatory requirements.				

Note: SA = Satisfactory; FS = Fully Satisfactory (for definitions of ratings refer to Appendix A).

For 2010, CNSC staff rated OPG’s performance as “Satisfactory”. Overall, this performance rating indicates that OPG has met regulatory requirements. For 2011-2014, CNSC staff rated OPG’s performance as “Fully Satisfactory”. This indicates that compliance within the area exceeded regulatory requirements, and that any problems or issues that arose were promptly addressed by OPG. More details supporting the “Fully Satisfactory” ratings are presented in the following subsections

3.3.1 Discussion

CNSC staff evaluated OPG’s Operating Performance by conducting various compliance verification activities including reviewing quarterly operational reports, reviewing the reports and follow-up actions associated with events reportable under the *General Nuclear Safety and Control Regulations*, conducting various compliance activities such as the conduct of baseline and focused inspections and follow-up on OPG’s responses to inspection findings. During inspections, CNSC staff reviewed OPG’s Station Condition Record (SCR) system used for tracking corrective actions, observed safe work practices, and held many discussions with OPG staff and management regarding operational safety.

The following SCA specific areas were considered relevant to OPG’s WMFs:

- Conduct of licensed activity; and
- Reporting and trending

Conduct of Licensed Activity

The implementation of OPG’s WMF operations programs provides safe and secure facility operation with adequate regard for health, safety, security, radiation protection, environmental protection, and international obligations. This section is divided into the following subsections: HLW Operations; LLW and ILW Operations; and WMF Construction Activities.

HLW Operations

Table 6 outlines the number of DSCs that were loaded at the Darlington, Pickering and Western WMFs on an annual basis over this reporting period.

Table 6: Number of DSCs Loaded at the WMFs

OPG Facility	Year					Total Loaded*	Capacity
	2010	2011	2012	2013	2014		
Darlington WMF	42	44	60	60	60	373	500
Pickering WMF	20	35	50	51	51	759	1154
Western WMF	98	120	130	130	110	1051	2000

*Total loaded from the start of facility production to the end of December, 2014

LLW and ILW Operations

At the Western WMF, OPG processes and stores LLW and ILW generated by OPG-owned NGSs. OPG conducts LLW incineration and compaction activities in order to minimize storage volume 70-fold (by incineration) and 5-fold (by compaction). Table 7 provides a summary of LLW and ILW processing and storage activities at the Western WMF from January 2010 to December 2014.

Table 7: OPG's LLW and ILW Processing and Storage Statistics for the Western WMF

Year	Processed LLW Waste (m ³)		Total LLW and ILW Stored (m ³)	Total Stored Activity (TBq)
	Incinerable	Compactable		
2010	1332	527	1999	38
2011	1437	1727	3719	157
2012	530	963	2639	39
2013	600	657	2455	99
2014	397	950	2402	65

WMF Construction Activities

While all three WMF licences authorize the construction of additional storage buildings and structures, during the reporting period construction activities only took place at the Western WMF. Prior to carrying out operational activities in newly-constructed structures, licensing requirements make it necessary for OPG to submit Commissioning Reports for CNSC staff review and acceptance.

During the reporting period, CNSC staff reviewed and accepted commissioning reports for the following Western WMF buildings and structures: LLSB #12 (September 2011); DSC Storage Buildings 3 and 4 (November 2012); and LLSB 13, LLSB 14 and In-Ground Container (IC-18) Batch #5 (March 2013).

Reporting and Trending

Overall, OPG has met the licensing requirements for WMF reporting during the reporting period. This remains consistent with the findings of CNSC staff's previous consolidated interim status reporting on OPG's WMFs [5]. More details regarding types of reports are presented within the particular subsections below.

Early Notification

OPG is required to notify the CNSC of significant events that occur in the course of its operations of each WMF. During the reporting period, no Event Initial Report (EIR) were presented to the Commission.

Reportable Events

Sections 29 and 30 of the *General Nuclear Safety and Control Regulations* outline specific scenarios under which a Licensee, in this case OPG, must file a report to the CNSC. For every reportable event OPG must file a full report that provides details regarding the event, including effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation and actions that OPG has taken or proposes to take with respect to the reportable event.

During the reporting period, there were six reportable events at the Darlington WMF, six reportable events at the Pickering WMF, and 21 reportable events at the Western WMF. There were no adverse effects on the health and safety of persons or the environment as a result of the reportable events during this reporting period. OPG's actions were verified by CNSC staff and were considered to be acceptable. CNSC staff continues to be satisfied with OPG's response to reported events.

3.4 Safety Analysis

The Safety Analysis SCA covers maintenance of the safety analysis that supports the overall safety case for each WMF.

Safety Analysis is a systematic evaluation of the potential hazards associated with the conduct of a proposed activity or facility and considers the effectiveness of preventative measures and strategies in reducing the effects of such hazards.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA SAFETY ANALYSIS				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	FS	FS	FS	FS
OPG implemented and maintains the safety analysis that supports the overall safety case for each WMF in a manner that fully satisfies regulatory requirements.				

Note: SA = Satisfactory; FS = Fully Satisfactory (for definitions of ratings refer to Appendix A).

For 2010, CNSC staff rated OPG's performance as "Satisfactory". Overall, this performance rating indicates that OPG has met regulatory requirements. For 2011-2014, CNSC staff rated OPG's performance as "Fully Satisfactory". This indicates that OPG has exceeded regulatory requirements, and any problems or issues that arise are promptly addressed by OPG. More details supporting the "Fully Satisfactory" ratings are presented in the following subsections.

3.4.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Hazard analysis; and
- Criticality safety.

In accordance with the licence requirement for each WMF, OPG is required to carry out activities within the limits specified in the Safety Report associated with each WMF.

Hazard Analysis

During the reporting period OPG maintained a safety analysis through the development and maintenance of a Safety Report for each WMF.

In 2012, the Darlington WMF licence was revised to include a licence condition that requires OPG to maintain a safety report for this facility. Updates are made to each WMF Safety Report every 5 years to reflect newly constructed buildings and other facility modifications.

Hazard analysis for the three WMFs were completed by OPG under the Safety Report for each facility. During the reporting period, and in response to the Fukushima accident, OPG re-examined each WMF safety case and determined that there were no significant issues requiring immediate corrective or compensatory measures.

Nevertheless, potential improvement opportunities were identified, as discussed in more detail in Section 2.1 of this report. CNSC staff will continue to follow OPG's implemented improvements through routine compliance activities.

Criticality Safety

In accordance with the licence, OPG is required to carry out activities within the limits specified in the Safety Report associated with each WMF. In 2012, the Darlington WMF licence was revised to include a licence condition that requires OPG to assure nuclear criticality safety requirements are met.

OPG's inventory of fissionable materials at its WMFs contains only depleted uranium and natural uranium fuel bundles. No other fissionable materials nor significant quantities of graphite, heavy water, beryllium, or other moderators more effective than light water are in OPG's inventory.

Nuclear criticality safety requirements are specified in CNSC Regulatory Document RD-327, *Nuclear Criticality Safety* [12]. OPG's WMF Safety Reports address criticality safety requirements, that are revisited when the Safety Reports are updated as required or when needed. CNSC staff's assessment confirms that OPG meets the requirements of RD-327 [12] and its licensing requirements.

3.5 Physical Design

The "Physical Design" SCA relates to activities that impact the ability of structures, systems and components to meet and maintain their design basis given new information arising over time and taking changes in the external environment into account.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA PHYSICAL DESIGN				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains structures, systems and components according to their design basis in a manner that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.5.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Structure design; and
- Pressure boundary design

Structure Design

In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to maintain the physical design of the facility to ensure that the equipment and processes accurately reflect the designed condition as intended in the Safety Report associated with this facility. During the reporting period no structural safety-significant issues were identified regarding WMF structures and buildings.

Pressure Boundary Program

In accordance with licence requirements for all three WMFs, OPG is required to implement and maintain a Pressure Boundary Program. OPG has implemented a Pressure Boundary Program at these WMFs. During the reporting period, pressure boundary related activities at each WMF were found to meet the requirements of each WFOL, including reporting requirements, through CNSC desktop reviews. Over the reporting period, OPG has also implemented improvements for its pressure boundary related activities including code classification for all pressure retaining systems. OPG has additionally implemented improvements in its Pressure Boundary Program over this reporting period, by adopting the OPG Nuclear Pressure Boundary Program, N-PROG-MP-0004 [13].

3.6 Fitness for Service

The Fitness for Service SCA covers activities that impact on the physical condition of systems, structures and components during operation to ensure that they remain effective over time. This includes programs that ensure all systems, structures and components are available to perform their intended design functions when called upon to do so.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA FITNESS FOR SERVICE				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG continues to conduct activities to ensure the safe physical condition of systems, structures and components in a manner that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.6.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Structural integrity;
- Aging management; and
- Periodic inspection and testing.

Structural Integrity

In 2012, the Darlington WMF licence was revised to include a licence condition that requires OPG to implement and maintain a program for the inspection, testing and maintenance (ITM) of systems, structures and components at this facility.

OPG conducts various activities to ensure the structural integrity of systems, structures and components at each WMF to protect the health and safety of persons and the environment. As an example, OPG conducts Phased Array Ultrasonic Testing (PAUT) at each WMF to verify the integrity of the lid closure weld on each loaded DSC.

In addition to requiring ultrasonic testing inspection personnel certification in accordance with the national certification standard (CGSB 48.9712) OPG has implemented in-house personnel training and qualification requirements specific to DSC seal weld inspection.

OPG identified a used nuclear fuel DSC base flange lamination issue in 2010, which was attributed to original manufacturing defects. OPG implemented repairs for the affected DSCs and has established inspection procedures and dispositioning and repair processes acceptable to CNSC staff to address possible future findings of base flange laminations.

In September 2014, CNSC staff conducted a focused Type II compliance inspection at the Darlington WMF to review the results of the process used by OPG to disposition DSC seal closure weld indications for the DSCs that had to be stored temporarily while a weld repair technique was developed. The inspection team concluded that the dispositioning process met regulatory requirements and expectations.

OPG has met licence requirements and regulatory requirements for Fitness for Service established in the *Class I Nuclear Facilities Regulations* related to maintaining the nuclear facility and limiting the effects of operation on the environment and the health and safety of persons. CNSC staff will continue to monitor OPG's activities related to this specific area.

Aging Management

In 2012, the Darlington WFOL was revised to include a licence condition that OPG to implement and maintain an Aging Management Program.

OPG has implemented an *Integrated Aging Management* Program (OPG Document Number N-PROG-MP-0008) [14] at all three of its WMFs which CNSC staff found to meet the requirements specified in the CNSC REGDOC-2.6.3, *Aging Management* [15].

Under this Aging Management Program, OPG has developed the *Used Fuel Dry Storage Container Aging Management Plan* [16] which is implemented at all OPG WMFs to address aging mechanisms, such as corrosion, which could potentially affect DSCs. In addition, OPG has implemented a biannual base inspection program, of stored DSCs at each of its WMFs.

During the reporting period, OPG conducted DSC base inspections at the Darlington WMF, Pickering WMF and Western WMF, the results of which indicated that no significant degradation has occurred. CNSC staff will continue to monitor the results of OPGs DSC base inspection activities. Furthermore, OPG has developed and initiated the *Darlington Waste Management Facility Welding Bay Walls Inspection Plan* [17] which will govern the inspection of the wall structures of the Welding Bay at the Darlington WMF.

OPG has also established a methodology for a WMF life cycle assessment and defined processes, to determine life-limiting characteristics of the DSC critical components and to provide timely detection and mitigation of significant aging effects.

As part of this program, OPG implemented a two-year study in 2012 to verify the presence and extent of corrosion by fitting a DSC at the Darlington WMF with sensors and monitoring for corrosion. Data has been collected every six months however no conclusions have been generated to date. OPG has decided to continue this study. CNSC staff will continue to monitor these and other corrosion monitoring activities being conducted by OPG under its Aging Management Program for its WMFs.

Periodic Inspection and Testing

In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to implement and maintain a program for the ITM of systems, structures and components at this facility. OPG has developed the *Darlington Waste Management Facility Welding Bay Walls Inspection Plan* [17] for the Darlington WMF and the *Used Fuel Dry Storage Container Aging Management Plan* [16] for all three WMFs. Inspection results provided by OPG during the reporting period confirm the integrity of civil structures used to store radioactive wastes at these facilities. CNSC staff will continue to monitor OPG's inspection program activities and results.

3.7 Radiation Protection

This SCA covers the implementation of a Radiation Protection Program in accordance with the *Radiation Protection Regulations*. This program must ensure that contamination levels and radiation doses received by individuals are monitored, controlled and maintained As Low As Reasonably Achievable (ALARA).

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA RADIATION PROTECTION				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a radiation protection program that satisfies regulatory requirements, to ensure that contamination levels and radiation doses received by workers are monitored, controlled and maintained. Doses to workers and members of the public continue to be well below regulatory dose limits.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.7.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Radiation protection program performance;
- Application of ALARA;
- Worker dose control;
- Radiological hazard control; and
- Estimated dose to public.

Radiation Protection Program Performance

In accordance with requirements of the *Radiation Protection Regulations*, OPG is required to implement a Radiation Protection Program at the Darlington, Pickering, and Western WMFs to ensure that there are adequate measures in place to monitor and control radiological hazards.

The Radiation Protection Program also ensures that doses to workers do not exceed prescribed dose limits and are kept ALARA, social and economic factors being taken into account. In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to implement and maintain a Radiation Protection Program.

OPG's WMFs have implemented a Radiation Protection Program as described in its program document *Radiation Protection* (OPG Document Number N-PROG-RA-0013) [18]. Numerous OPG documents supporting this program provide the means by which radiation protection is integrated within the day-to-day operations of OPG's WMFs.

Action levels for radiological exposures and contamination control are a part of the WMF's Radiation Protection Program. If reached, they trigger OPG staff to establish the cause for reaching the action levels and, if applicable, restore the effectiveness of the Radiation Protection Program. During the reporting period, no worker at a WMF exceeded OPG's established action levels at any time.

In October 2011 and February 2012, OPG reported events that involved reversed airflow between radiation protection zones occurring at the WVRB of the Western WMF. In both cases, an incorrect positioning of air dampers led to the minor pressure differential that was observed. OPG determined there were no adverse effects on the health and safety of persons or the environment as a result to these events, and OPG's corrective actions for both events were reviewed and considered to be acceptable by CNSC staff.

The performance of OPG's Radiation Protection Program has been assessed, at each WMF, through various CNSC staff compliance activities during the reporting period, such as verification of posted dose rates and conducting swipe samples in radiological areas to test for loose contamination. Results from the radiological surveys performed by CNSC staff have demonstrated that dose rates and levels of radioactive contamination met regulatory requirements and CNSC expectations.

Application of ALARA

As stated earlier, OPG's Radiation Protection Program at the Darlington, Pickering, and Western WMFs must ensure that contamination levels and radiation doses received by individuals are monitored, controlled and maintained ALARA. CNSC staff's assessment of OPG's Radiation Protection Program confirm that OPG integrates ALARA into planning, scheduling, and work control, and establishes and monitors performance against ALARA dose targets for work conducted at each WMF. During the reporting period, OPG has also ensured that radiation exposures and doses to workers are below regulatory dose limits and remain ALARA.

Worker Dose Control

Workers involved in radiological activities at each WMF are classified as Nuclear Energy Workers (NEW) in accordance with the *Radiation Protection Regulations*. Table 9 in Appendix B provides the average and maximum doses received by NEWs at the Darlington, Pickering, and Western WMFs during the reporting period.

Figure 5 below depicts the average effective dose to NEWs at each WMF over the reporting period.

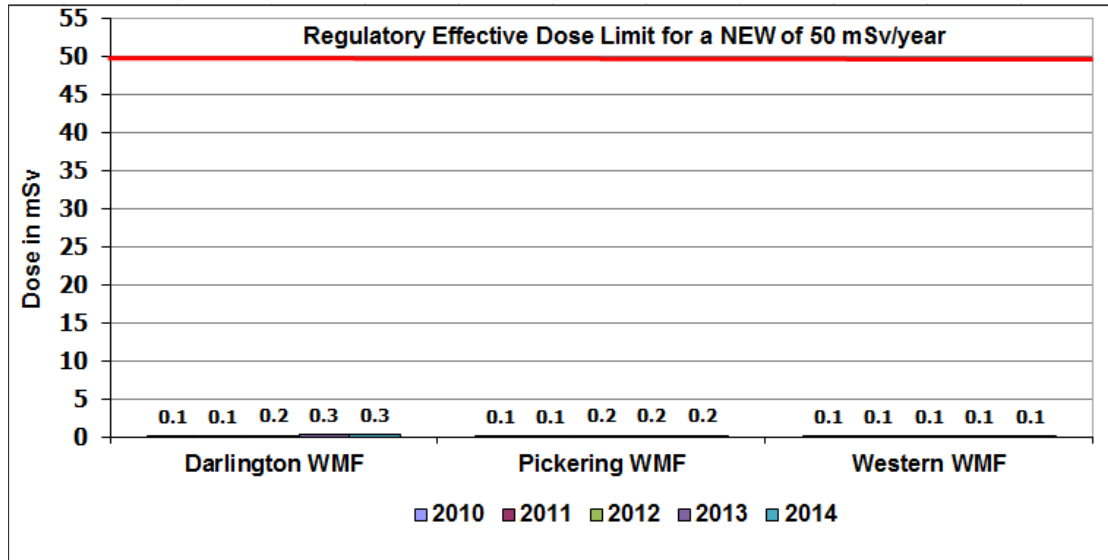


Figure 5: Average Effective Dose of OPG WMF NEWs

No worker during the reporting period received a radiation dose in excess of the CNSC regulatory dose limit of 50 millisievert/year (mSv/year), as defined in the *Radiation Protection Regulations*. The maximum dose received by a worker over the years 2010 – 2014 was 1.8 mSv, which is approximately 4% (four percent) of the regulatory dose limit. CNSC staff’s review of the WMF worker dose information for the review period found that radiation doses are being adequately controlled.

Figure 6 below depicts the maximum effective dose to NEWs at each WMF over the reporting period:

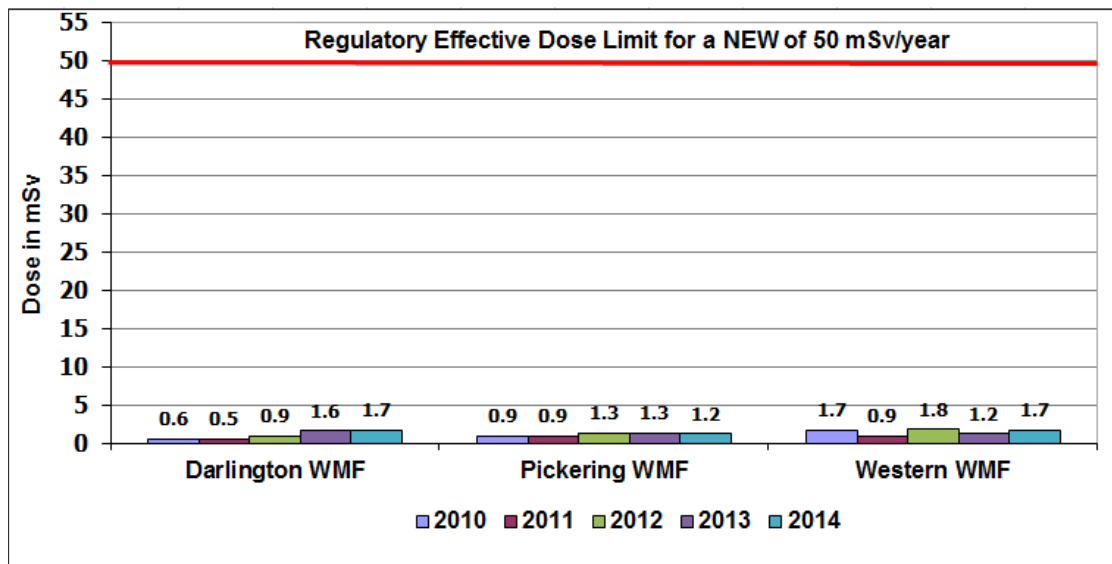


Figure 6: Maximum Effective Dose of OPG WMF NEWs

Radiological Hazard Control

OPG's Radiation Protection Program implemented at the Darlington, Pickering, and Western WMFs ensure that there are adequate measures in place to monitor and control radiological hazards. Radiological dose rate and contamination monitoring measurements were conducted by OPG at the WMFs during the review period. The results of this program indicate that adequate measures are in place to monitor and control radiological hazards, and no adverse trends or deficiencies have been identified.

Estimated Dose to the Public

Each WMF is located within the site boundary of a NGS. In accordance with licence requirements, each NGS has its own programs to verify that radiation doses to members of the public, as a result of releases from each site, remain ALARA. Dose to the public associated with operational activities at each WMF for the reporting period were well below the regulatory annual public dose limit of 1 mSv. CNSC staff are satisfied that OPG continues to keep doses to the members of the public below regulatory limits.

3.8 Conventional Health and Safety

The Conventional Health and Safety SCA covers the implementation of a program to manage workplace safety hazards and to protect personnel and equipment.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA CONVENTIONAL HEALTH AND SAFETY				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	FS	FS	FS	FS
Compliance verification activities conducted during the reporting period confirm that OPG continues to provide safe work practices and conditions to achieve a high level of personnel safety at each WMF, in a manner that fully satisfies regulatory requirements.				

Note: SA = Satisfactory; FS = Fully Satisfactory (for definitions of ratings refer to Appendix A).

For 2010, CNSC staff rated OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met regulatory requirements. For 2011-2014, CNSC staff rated OPG's performance as "Fully Satisfactory". This indicates that OPG exceeded regulatory requirements and any problems or issues that arise are promptly addressed by OPG.

3.8.1 Discussion

It is a requirement of the *General Nuclear Safety and Control Regulations* for licensees to take all reasonable precautions to protect the environment and the health and safety of persons, and to make available to all workers the health and safety information with respect to each WMF. In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to implement and maintain a Conventional Health and Safety Program.

The following SCA specific areas were considered relevant to OPG's WMFs:

- Performance;
- Practices; and
- Awareness

Practices

Hazardous materials found at these facilities include: compressed gases such as carbon dioxide for fire suppression; propane used at the Western WMF incinerator; and, other gases used for welding activities and for emission monitors. Other materials include lubricants, solvents, paints and other maintenance and cleaning supplies. Additional to hazardous materials, the risks from conventional hazards at each WMF are primarily associated with the control and safe handling of large, heavy waste packages, heavy equipment, and the use of conventional x-ray equipment for security-related purposes.

In accordance with licence requirements, OPG is required to report in its quarterly operations reports any reports made to other regulatory bodies. This includes reporting to the Province of Ontario under the *Occupational Health and Safety Act of Ontario* and the *Labour Relations Act*. Section 4.7 of this report provides additional information regarding CNSC and OPG interactions with other government agencies, including the Ontario Ministry of Labour (MOL).

Performance

Health and safety related incidents are reported by OPG on an ongoing basis. With respect to the incidents presented below, OPG's actions were verified by CNSC staff and assessed to be appropriate.

- In August 2011, OPG reported that an employee at the Western WMF was struck by a pallet frame. While this was not a medically treated injury, all associated work was halted by OPG in order to conduct a further investigation and assessment activities to minimize reoccurrence.
- In January 2012, OPG reported that, at the Western WMF, an OPG employee was exposed to a weld arc resulting in eye irritation that required medical treatment. Following medical treatment, the employee was able to return to work immediately. To prevent reoccurrence, OPG has since revised work procedures and signage.

During the conduct of baseline and focused inspections, CNSC staff participated in pre-inspection health and safety briefings held with OPG staff and Management. During inspections of these facilities, CNSC staff also recorded observations on safety practices and the controls being employed to address conventional hazards. In this regard, there have not been any areas of concern in the area of Conventional Health and Safety that were of concern.

Awareness

Employees are made aware of the hazards identified in the “Practices” section above through OPG training programs.

3.9 Environmental Protection

The Environmental Protection SCA covers programs that identify, control and monitor all releases of nuclear and hazardous substances, and the effects on the environment from facilities or as the result of licensed activities.

The following table presents performance ratings for OPG’s WMFs and includes an overall conclusion for this SCA.

SCA ENVIRONMENTAL PROTECTION				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains an environmental protection program to control and monitor liquid and air releases of nuclear and hazardous substances to the environment in a manner that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG’s performance as “Satisfactory”. Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff’s previous consolidated interim status reports on OPG’s WMFs [5].

3.9.1 Discussion

The following SCA specific areas were considered relevant to OPG’s WMFs:

- Environmental Management System (EMS);
- Assessment and monitoring; and
- Effluent and emissions control (releases).

It is a requirement of the *General Nuclear Safety and Control Regulations* for licensees to take all reasonable precautions to protect the environment and the health and safety of persons at each WMF. In 2012, the Darlington WMF licence was revised to include a licence condition that requires OPG to implement and maintain an Environmental Protection Program.

OPG has implemented an Environmental Protection Program at the Darlington, Pickering, and Western WMFs in accordance with CNSC Regulatory Document REGDOC 2.9.1 - *Environmental Protection Policies, Programs and Procedures* [19].

Provincial legislations require OPG to comply with approvals issued by the Ontario Ministry of the Environment and Climate Change (MOECC) for non-radiological air emissions and surface water released from the WMFs. Section 4.7 of this document provides additional information regarding CNSC and OPG interactions with other government agencies, including the MOECC.

Environmental Management System (EMS)

OPG has established and implemented a corporate-wide EMS that applies to its Darlington, Pickering, and Western WMFs.

OPG's corporate-wide EMS is registered to the CSA ISO 14001: 2004 Standard, *Environmental Management Systems – Requirements with Guidance for Use*. As an outcome of registration, OPG's EMS is subject to periodic independent audits and reviews in an effort to verify its sufficiency and also identify potential improvements.

Assessment and Monitoring

OPG reports its radiological monitoring results on a quarterly basis in accordance with licence requirements that apply to all three WMFs.

Radiological monitoring activities include the placement of environmental radiation detectors on perimeter fencing to assess doses to non-NEWs, and continuous monitoring of airborne and waterborne emissions. OPG's environmental monitoring programs confirm that airborne and liquid releases of nuclear and hazardous substances to the environment remained below Ontario MOECC's emission limits and CNSC licence limits.

Effluent and Emissions Control (Releases)

OPG continues to implement and maintain its Environmental Protection Programs to control and monitor liquid and air releases of nuclear and hazardous substances from the Darlington, Pickering, and Western WMFs to the environment.

Further details pertaining to each WMF are provided below.

Darlington WMF

At Darlington, OPG conducts site wide monitoring and the airborne and liquid release sample results are included in the NGS release reports. The Darlington NGS has facility-specific Derived Release Limits (DRL) for airborne and liquid releases. The Darlington WMF falls under the DRLs for the Darlington NGS. However, administrative limits were derived for the Darlington WMF using the DRLs to create effluent and emission limits that are in-line with the specific operations of the waste management facility, rather than of the whole Darlington site. For example, the DRL for particulate in air for the Darlington site is 1.3×10^{10} Bq/week whereas the administrative limit for the Darlington WMF is 3×10^4 Bq/week, which is just a small fraction of the DRL.

In accordance with the licence for the Darlington WMF, OPG provides airborne and liquid release monitoring results in quarterly operational reports submitted to the CNSC.

Airborne releases from the processing building stack are sampled weekly (and averaged over the quarter) and analyzed for particulates. The stack sampler particulate results were consistently below the administrative limit (3×10^4 Bq/week) and all weekly samples except one were below the minimum detectable activity (1×10^3 Bq/week), throughout the reporting period. The sole weekly sample that was above the minimum detectable activity was taken during Q3 2012 at 1.3×10^3 Bq/week, which is less than 5% of the administrative limit and significantly below the DRL.

Storm water runoff collection is also sampled weekly (and averaged over the quarter) and analyzed for radioactive substances. The storm water sample results were also consistently below the administrative limits (seen in Table 8), throughout the reporting period.

Table 8: Storm Water Sample Administrative Limits

	Administrative Limit (2010) Bq/L	Administrative Limit (2011-2014) Bq/L
Gross Gamma	20.35	37.00
Tritium	7.40×10^2	1.85×10^3

Note: the administrative limits for the Darlington WMF in 2011 were changed to agree with the limits specified in the Darlington site Environmental Manual.

The Darlington WMF is not required, under their licence, to conduct ground water sampling as part of their facility-specific environmental monitoring activities. However, the Darlington NGS site does have a ground water sampling program. This information is captured in the NGS environmental monitoring annual reporting to the CNSC.

Pickering WMF

At Pickering, OPG conducts site wide monitoring and the airborne and liquid release sample results are included in the NGS release reports. The Pickering A and Pickering B NGSs have facility-specific DRLs for airborne and liquid releases.

The Pickering WMF falls under the DRLs for the Pickering B NGS. In accordance with the licence for the Pickering WMF, OPG provides airborne and liquid release monitoring results in quarterly operational reports submitted to the CNSC.

Airborne releases from the processing building stack are sampled weekly (and averaged over the month) and analyzed for particulates. The stack sampler particulate results were consistently well below the DRL (1.4×10^{10} Bq/week) and in most cases at or below the minimum detectable activity (3.3×10^3 Bq/week), throughout the reporting period. The highest stack sampler particulate sample result, taken over the reporting period, was 7.8×10^3 Bq/week which is less than 0.0001% of the DRL.

The active liquid waste tank is sampled on a quarterly basis and analyzed for radioactive substances. The active liquid waste from the Pickering WMF is not released directly into the environment, but is pumped into the Pickering NGS's active liquid waste system.

Samples are taken on a quarterly basis from the Storage Building #3 ground water sample stations and analyzed for radioactive substances. The Storage Building #3 ground water sample results for gross beta/gamma were consistently significantly below the DRL (2.6×10^{11} Bq/month) and in most cases at or below the minimum detectable activity (11.5 Bq/L), throughout the reporting period.

The RCSA has six catch basins for gross beta/gamma sampling. Throughout the reporting period, the catch basin sampling results were consistently significantly below the DRL (2.6×10^{11} Bq/month) and in most cases at or below the minimum detectable activity (11.5 Bq/L).

Western WMF

CNSC staff's assessment of OPG's environmental monitoring activities at the Western WMF for the reporting period is provided below.

Airborne Releases

In accordance with the licence for the Western WMF, OPG has facility-specific DRLs for airborne releases and provides monitoring results to the CNSC in quarterly operational reports. OPG has also established action levels for airborne releases from the Western WMF. If reached, action levels trigger OPG staff to establish the cause for reaching the action level and, if applicable, restore the effectiveness of the Environmental Protection Program. During the reporting period, all annual airborne releases at the Western WMF were within its annual DRLs and no action level exceedances were reported to the CNSC.

OPG updated its DRLs for this facility in 2011, and implemented in 2013, to reflect a revision of the CSA Standard N288.1 *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*, which modified the methodology for calculating DRLs.

The emissions reported in the various tables and figures to follow, and in Appendix B, use the DRLs that were in place at the time for the years 2010 to 2014, as reported in OPG's quarterly operations reports for each year.

Airborne releases from various facility stacks including the incinerator are sampled weekly and analyzed for radioactive substances and particulates.

Table 9 below shows the airborne hazardous substance releases from the incinerator at the Western WMF from 2010 through to 2014.

Table 9: Airborne Hazardous Substance Releases from the Western WMF Incinerator

Parameter	Unit	2010	2011	2012	2013	2014	CofA Emissions Limit
Total Suspended Particulate	mg/R.m ³	0.60	0.44	1.47	0.85	N/A ¹	14
Mercury	µg/R.m ³	<0.025	<0.40	0.038	0.17	N/A ¹	20
Dioxins and Furans	pg/R.m ³	2.97	1.79	3.03	1.80	N/A ¹	80
Total Hydrocarbons	ppm	1.33	1.13	2.43	1.1	N/A ¹	50

¹Note: OPG received permission from the MOECC to suspend Source Testing on the incinerator for the calendar year of 2014.

As depicted in Table 11 in Appendix B and in Figure 7 below, airborne nuclear substances released from the Western WMF were less than 0.03 percent of its annual DRL from 2010 to 2014 inclusive. Figure 7 was derived from the data presented in Table 11.

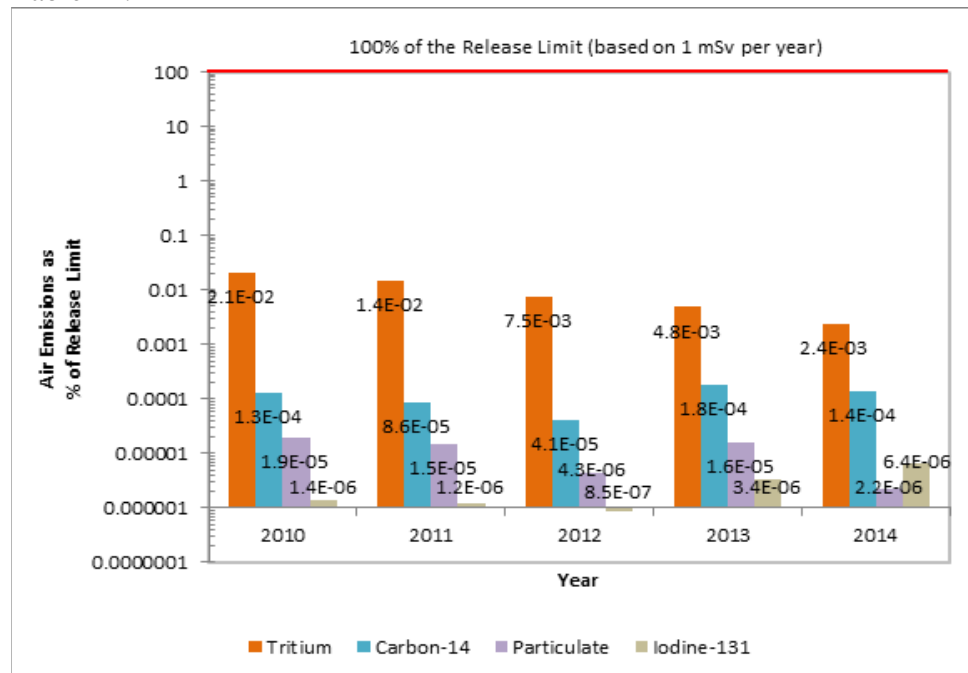


Figure 7: Airborne Nuclear Substances Released Annually from the Western WMF

Liquid Releases

In accordance with the licence for the Western WMF, OPG has facility-specific DRLs for liquid releases and provides monitoring results to the CNSC in quarterly operations reports.

OPG has also established action levels for liquid releases from the Western WMF. If reached, action levels trigger OPG staff to establish the cause for reaching the action level and, if applicable, restore the effectiveness of the Environmental Protection Program. During the reporting period there were six action level exceedances for gross beta waterborne emissions at the Western WMF (three in 2011 and three in 2012). In each instance, action level exceedances remained below 0.2 percent of the monthly DRL and below 0.03 percent of the annual DRL ($4.56\text{E}+11$ Bq/year). Each year the action levels are re-assessed, using Operating Experience (OPEX) from the previous year, to ensure that they reflect the operating practices of the WMF. These action levels at the Western WMF were subsequently updated in 2013. Currently, the monthly action level for gross beta waterborne emissions ($3.6\text{E}+09$ Bq/month) is set at 0.1 percent of the monthly DRL ($3.80\text{E}+10$ Bq/month) for the Western WMF.

Storm water runoff collection from the Western WMF is sampled on a weekly basis and analyzed for radioactive substances. As depicted in Table 12 in Appendix B and in Figure 8, liquid nuclear substances released from the Western WMF were less than 0.10 percent of its annual DRL for the reporting period. As a result, there were no adverse effects on the health and safety of persons or the environment as a result of releases during this reporting period. Figure 8 was derived using the data presented in Table 12.

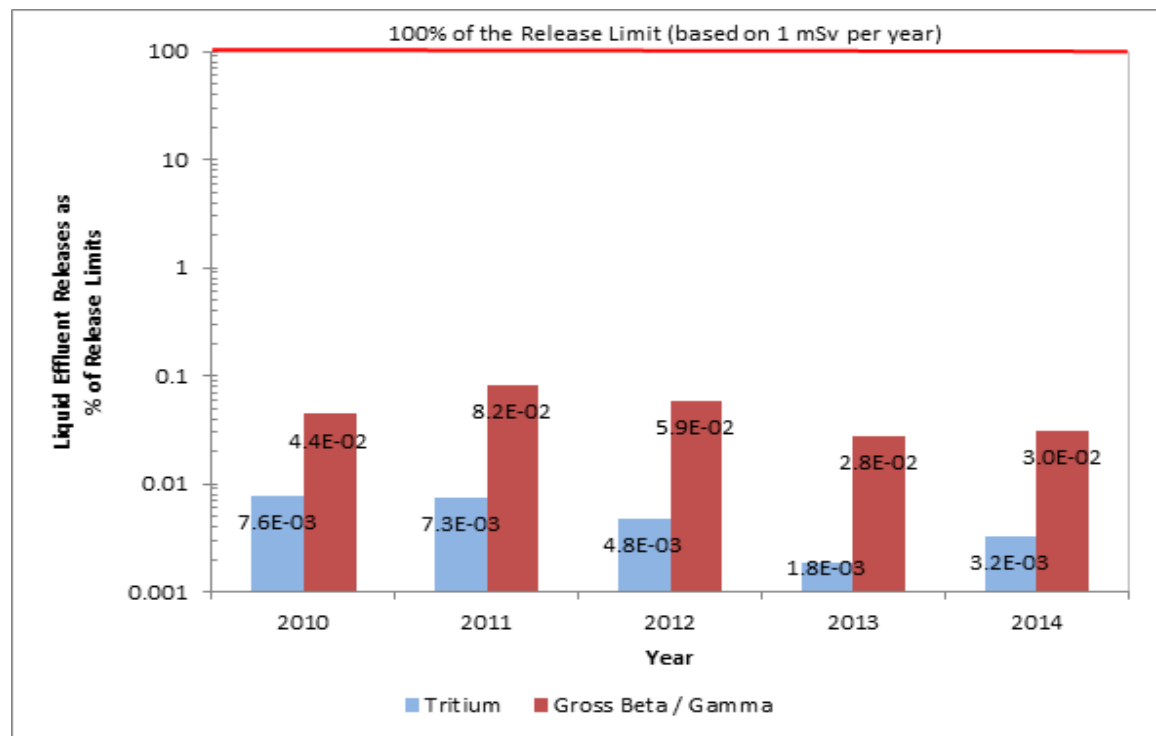


Figure 8: Liquid Nuclear Substances Released Annually from the Western WMF

Ground Water Monitoring

The Western WMF has a network of 20 monitoring wells that are regularly monitored to measure tritium and gross beta concentrations in groundwater. Groundwater monitoring results identified elevated tritium concentrations in monitoring well WSH-231 since the late 90's. After numerous studies, OPG determined in 2010 that electrical conduits exiting the LLSBs, and leading to electrical manholes that interacted with the local mid-sand aquifer, acted as a pathway for tritium to reach onsite groundwater. In order to eliminate this pathway, OPG sealed LLSB floor cable penetrations. Subsequent groundwater monitoring results so far indicate a declining trend of tritium concentrations at well WSH-231 since these corrective actions were implemented in 2011. OPG continues to monitor this trend in order to verify the effectiveness of this corrective action and to ensure that OPG workers, the public, and the environment remain protected.

3.10 Emergency Management and Fire Protection

The Emergency Management and Fire Protection SCA covers emergency plans and emergency preparedness programs that exist for emergencies and for non-routine conditions. This area also includes any results of participation in exercises.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA EMERGENCY MANAGEMENT AND FIRE PROTECTION				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a comprehensive and well-documented emergency management program and fire response at each WMF that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.10.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Conventional and nuclear emergency preparedness and response; and
- Fire emergency preparedness and response.

Conventional and Nuclear Emergency Preparedness and Response

It is a requirement of the *Class I Regulations* to have in place proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security at each WMF. In 2012, the Darlington WFOL was revised to include a licence condition that specifically requires OPG to implement and maintain an emergency preparedness and response program.

OPG's Emergency Preparedness Program is documented in its governance document *Consolidated Nuclear Emergency Plan (CNEP)* (OPG Document Number N-POL-0006) [20].

A CNSC compliance inspection of OPG's Emergency Preparedness Program was conducted in 2010 for the Pickering and Western WMFs and in 2011 for the Darlington WMF. As a result of these inspections, CNSC staff confirmed the effective implementation of OPG's Emergency Preparedness Program at all three WMFs.

CNSC staff are satisfied with OPG's performance in the area of emergency management during the reporting period.

Fire Emergency Preparedness and Response

It is a requirement of each WFOL for licensees to comply with the fire protection requirements of the *National Building Code of Canada* (NBCC), 2005, and the *National Fire Code of Canada* (NFCC), 2005. Each WFOL also points to registration requirements for fire protection systems. In 2012, the Darlington WFOL was revised to include a licence condition that specifically requires OPG to implement and maintain a Fire Protection Program.

OPG has a Fire Protection Program in place at its WMFs. This program complies with the requirements of the NBCC 2005, the NFCC 2005 and the *General Nuclear Safety and Control Regulations*, and have been established in order to minimize both the probability of occurrence and the consequences of fire at the three WMFs.

In accordance with licence requirements, OPG is required to submit independent third-party reviews of ITM of fire protection features every three years, as well as of modifications that have the potential to impact protection from fire for each of the facilities as required. These reviews confirmed that the ITM activities relating to fire safety systems and equipment meet the requirements of the NFCC 2005 and that modifications are in compliance with the NBCC 2005 and best industry practices.

CNSC staff conducted a fire protection focused compliance inspection at the Western WMF in March 2013.

Also during the reporting period OPG and CNSC staff participated in meetings held to discuss fire protection improvement initiatives (physical and programmatic) and ongoing projects such as the development of Fire Hazard Assessments (FHA) for all of the WMFs. OPG's FHAs, along with the development of corrective action plans to address FHA recommendations, are considered satisfactory by CNSC staff. As a recommended means to reduce the number of unplanned impairments, an FHA recommendation for the Western WMF is the installation of linear heat detectors to replace the beam type smoke detectors that are currently in use in LLSBs, that are prone to intermittent weather-related trouble signals.

In July 2013, OPG informed the CNSC of a reportable event, under paragraph 29(1)(f) of the *General Nuclear Safety and Control Regulations*, that occurred at the Western WMF due to a localized overheating of an incinerator air duct in the WVRB. OPG submitted the full 21 day report for this event on August 1, 2013. Following a similar event that occurred February 2014, OPG has since taken measures to prevent interim re-occurrence of this type of incident and will implement design modifications to permanently prevent re-occurrence. On August 9, 2013, CNSC staff confirmed that OPG's submission met the intent of subsection 29(2) of the *General Nuclear Safety and Control Regulations*, and that CNSC staff had no additional inquiries on the event. OPG's actions were verified by CNSC staff and found to be acceptable. OPG has a planned outage scheduled for April through to July of 2015 to implement the design modifications that will permanently prevent the re-occurrence of this event.

OPG has provided monthly updates on planned and unplanned impairments of fire protection features at each WMF. Planned impairments include situations where a fire protection system is taken out of service for scheduled testing. Unplanned impairments are situations such as fault alarms occurring on fire detection systems. During the reporting period, OPG revised its *Fire Impairment Manual* documentation that identifies OPG's process to address impairments of fire protection features. OPG's *Fire Impairment Manual* has been submitted to the CNSC for acceptance and is currently undergoing review. The monthly updates provide CNSC staff confidence that the impairment times are being minimized and appropriate compensatory measures are being implemented to provide a comparable level of safety to the unimpaired system.

3.11 Waste Management

The Waste Management SCA covers internal waste-related programs that form part of the facility's operations up to the point where the waste is removed from the facility to a WMF. This SCA also covers planning for WMF decommissioning.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA WASTE MANAGEMENT				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a program for the management of radioactive waste in a manner that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.11.1 Discussion

The following SCA specific areas were deemed relevant to OPG's WMFs:

- Waste minimization;
- Waste management practices; and
- Decommissioning plans.

In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to implement and maintain a waste management program. In accordance with licence requirements, OPG is required to have in place at its WMFs procedures for managing (i.e., handling, storing, loading and transporting) nuclear substances.

Waste Minimization

Minimal radioactive waste is generated from the waste management activities conducted at the WMFs. Nonetheless, OPG has set a goal to minimize the generation of radioactive waste due to operational activities. At its Western WMF, OPG uses incineration and compaction minimization techniques to reduce LLW storage volume 70-fold (by incineration) and 5-fold (by compaction).

In 2013, OPG implemented a “Likely Clean” program at the Western WMF. The “Likely Clean” program allows for the separation of waste at the source that is likely not radioactive (i.e. “clean), so as to minimize the generation of LLW at this facility. During routine compliance inspections CNSC staff observed OPG’s implementation of this program in its efforts to minimize LLW generation.

Waste Management Practices

OPG continues to provide safe interim storage for LLW, ILW and HLW, while also moving forward with long-term solutions for the management of these wastes. CNSC staff made observations regarding OPG’s safe waste management practices during inspections of these facilities (for example, the use of the “Likely Clean” program, efforts to minimize the generation of wastes, and appropriately identifying and marking hazards), over the course of the reporting period. These observations contribute to the overall performance rating of the waste management area.

Decommissioning Plans

In accordance with licence requirements, OPG is required to maintain a decommissioning plan that sets out the manner by which each WMF will be decommissioned in the future. Decommissioning plans for the Darlington, Pickering, and Western WMFs were last revised and presented to the Commission in 2012 [21]. OPG’s WMFs remain in compliance with the regulatory requirements identified in CNSC Policy P-290 *Managing Radioactive Waste* [22] and Regulatory Document G-219 *Decommissioning Planning for Licensed Activities* [23].

3.12 Security

This SCA covers the programs required to implement and support the security requirements stipulated in the regulations and the licences of these facilities.

The following table presents performance ratings for OPG’s WMFs and includes an overall conclusion for this SCA.

SCA SECURITY				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	FS	FS	FS	FS
OPG implemented and maintains a security program at each WMF that successfully controls access to facilities, nuclear material and prescribed/classified information in a manner that fully satisfies regulatory requirements.				

Note: SA = Satisfactory; FS = Fully Satisfactory (for definitions of ratings refer to Appendix A).

For 2010, CNSC staff rated OPG's performance as "Satisfactory" indicating that OPG's implementation and maintenance of their Security Program met regulatory requirements. For 2011-2014, CNSC staff rated OPG's performance as "Fully Satisfactory". These performance ratings are tied to OPG's completion of several security-related improvements at its WMFs, detailed below, during this reporting period. Overall, these performance ratings indicate: that OPG meets, and in some areas, exceeds regulatory requirements; that compliance is stable or improving; and, that any problems or issues that arise are promptly addressed by OPG.

3.12.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Facilities and equipment;
- Security practices;
- Response arrangements; and
- Drills and exercises.

The *General Nuclear Safety and Control Regulations*, the *Class I Regulations* and the *Nuclear Security Regulations* contain security requirements for OPG's WMFs.

CNSC staff conduct compliance activities to verify that security program implementation at each WMF continues to meet these regulatory requirements. CNSC staff last conducted a CNSC security inspection in October 2014 at the three WMFs. The results of this compliance activity confirmed that OPG continues to meet security requirements, based on the inspection report issued and OPG's response to the report.

Facilities and Equipment

OPG has demonstrated compliance in this specific area through the provision of adequate infrastructure, physical delay barriers, procedures, systems, devices and security personnel to meet its Security Program requirements. In addition, OPG has preventive and corrective maintenance programs in place for critical security systems and devices.

OPG WMFs are effectively equipped with intrusion detection systems. OPG has instituted improvements to training of Nuclear Security Officers (NSO) to ensure consistent application of alarm testing processes as part of its preventative maintenance program.

OPG's WMFs utilize concrete and steel-lined DSCs to store used fuel from the adjacent NGSs. These containers are very robust, weighing approximately 70 tons each when loaded. In combination with the physical barriers in place along the Protected Area perimeters, CNSC staff confirm that there is sufficient delay time for response forces to make an effective intervention in the event of an attempt of theft or sabotage of nuclear material at these locations.

Security Practices

OPG has demonstrated compliance in this area through the provision of effective programs and procedures to control access to facilities, nuclear material and prescribed/classified information.

OPG maintains a security clearance program for access control to the facilities.

Response Arrangements

OPG provides trained and suitably equipped NSOs for its WMFs. Nuclear Response Forces are located at the adjacent NGSs, and written arrangements with off-site response forces are held if additional response force services are required.

Drills and Exercises

In accordance with the *Nuclear Security Regulations*, OPG is required to conduct a security drill at the facilities at least once each 30 days to test the operation of one or more of its physical protection measures and the readiness of its security personnel. Training, exercises and drills are implemented by OPG as a means of validating security procedures, regulatory compliance and identifying areas for improvement in all facets of security operations. This is conducted through a Drill, Tabletop and Exercise Program and applies to NSOs assigned to OPG WMFs. OPEX and lessons learned are communicated to the required staff. CNSC staff have assessed the training program and are satisfied.

3.13 Safeguards and Non-Proliferation

The Safeguards and Non-Proliferation SCA covers the programs required for the successful implementation of the obligations arising from the Canada/ International Atomic Energy Agency (IAEA) safeguards agreements as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons*.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA SAFEGUARDS AND NON-PROLIFERATION				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a safeguards and non-proliferation program in a manner that satisfies regulatory requirements and meets Canada's international safeguards obligations.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.13.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Nuclear material accountancy and control;
- Access and assistance to the IAEA;
- Operational and design information; and
- Safeguards equipment, containment and surveillance.

The scope of the non-proliferation program for the WFOLs is limited to the tracking and reporting of the foreign obligations and origins of nuclear material.

The *General Nuclear Safety and Control Regulations* and the *Class I Regulations* contain safeguards requirements relevant to OPG's WMFs. In 2012, the Darlington WFOL was revised to include a licence condition that requires OPG to implement and maintain a safeguards program. The Pickering and Western WMF licences also contain safeguards-specific licence conditions. Regardless of licensing structure, OPG WMFs are required to undertake all measures required to ensure safeguards implementation.

Nuclear Material Accountancy and Control

OPG's WMFs remain in compliance with the regulatory requirements identified in CNSC Regulatory Document RD-336 *Accounting and Reporting of Nuclear Material* [24]. In addition, section 30 of the *General Nuclear Safety and Control Regulations* outlines specific safeguards events under which OPG must file a report to the CNSC. During this period, OPG met this requirement at all three WMFs.

OPG's WMFs remain in compliance with the regulatory requirements identified in CNSC Regulatory Document RD-336 *Accounting and Reporting of Nuclear Material* [24].

Access and Assistance to the International Atomic Energy Agency (IAEA)

Pursuant to the Canada/IAEA safeguards agreements and licence conditions of each WMF, OPG grants access and assistance to the IAEA for both inspection activities and when required for the maintenance and upgrade of IAEA equipment. During the reporting period, the IAEA performed 23 inspections at OPG's WMFs, including design information verifications, short-notice random inspections, and, physical inventory verifications. In addition, the IAEA also performed dozens of unannounced inspections each year within the NGSs, targeting transfers of spent fuel to dry storage facilities.

Operational and Design Information

OPG has met the reporting requirements associated with the submission of its annual operational program and associated updates during the reporting period. In addition, all three WMFs have either submitted up-to-date design information to the IAEA or are in the process of updating their documentation to reflect the implementation of RD-336 [24] and the addition of safeguards laydown areas (where applicable) to store partially processed DSCs under IAEA surveillance.

Safeguards Equipment, Containment and Surveillance

During the reporting period, the IAEA conducted field trials of new verification equipment and also conducted maintenance and minor upgrades to IAEA equipment, including the surveillance systems. In order to enhance safeguards efficiency, laydown areas used to store partially processed DSCs under IAEA surveillance were established at the Western WMF in 2012, the Pickering WMF in 2013, and the Darlington WMF in 2014.

3.14 Packaging and Transport

The Packaging and Transport SCA covers programs for the safe packaging and transport of nuclear substances including package design, maintenance and repair and training of personnel for shipments within, to and from the licensed facility.

The following table presents performance ratings for OPG's WMFs and includes an overall conclusion for this SCA.

SCA PACKAGING AND TRANSPORT				
Overall Performance Ratings				
2010 (Q3/Q4)	2011	2012	2013	2014
SA	SA	SA	SA	SA
OPG implemented and maintains a packaging and transport program in a manner that satisfies regulatory requirements.				

Note: SA = Satisfactory (for definitions of ratings refer to Appendix A).

For the reporting period, CNSC staff rate OPG's performance as "Satisfactory". Overall, these performance ratings indicate that OPG has met licensing requirements, and are consistent with the performance ratings presented in CNSC staff's previous consolidated interim status reports on OPG's WMFs [5].

3.14.1 Discussion

The following SCA specific areas were considered relevant to OPG's WMFs:

- Packaging and transport; and
- Package design and maintenance.

Packaging and Transport

The *General Nuclear Safety and Control Regulations* and the *Packaging and Transport of Nuclear Substances Regulations* contain packaging and transport requirements relevant to each WMF. In 2012, the Darlington WFOL was revised to include a licence condition that specifically requires OPG to implement and maintain a Packaging and Transport Program.

Transport of nuclear substances is jointly regulated by the CNSC and Transport Canada. The CNSC is primarily responsible for package design aspects such as setting the package design requirements, establishing and enforcing the Radiation Protection Program for carriers, and all aspects of physical security measures of nuclear substances during transport. Transport Canada is primarily responsible for establishing and enforcing any transportation requirements for carriers, conveyances, training, and requirements for an emergency response plan.

For off-site shipments, OPG has developed and implemented a radioactive materials transportation program for activities at all OPG WMFs that ensure compliance with the *Packaging and Transport of Nuclear Substances Regulations* and Transport Canada's *Transportation of Dangerous Goods Regulations*. OPG maintains and decontaminates radioactive material transportation packages at the Western WMF TPMB.

While the *Packaging and Transport of Nuclear Substance Regulations* do not apply to on-site transfers of packages, OPG's WMFs have a Packaging and Transport Program as described in its program document *Radioactive Material Transportation* (OPG Document Number W-PROG-WM-00002) [25]. This program specifies packaging and transport requirements including training, preparation for shipment, loading and unloading, and maintenance and design requirements for waste packages. It provides an equivalent level of safety to workers, the general public and the environment as is required for off-site transportation.

OPG has a Quality Assurance Program that covers all aspects of packaging and transport activities including design, testing, manufacture, inspection and maintenance. All workers at the WMFs who carry, handle or transport nuclear substances are required to have training certificates issued by OPG in accordance with the *Transportation of Dangerous Goods Regulations*. OPG is also required to maintain records of its transport activities in accordance with the *Packaging and Transport of Nuclear Substances Regulations*.

In October 2013, CNSC staff conducted a packaging and transport focused compliance inspection at the Western WMF. The inspection scope included aspects such as personnel training, documentation, records management, safety markings, transport procedures for shipping and receiving, package maintenance and handling of in-house non-compliances, and transport related incidents. CNSC staff concluded that the packaging and transportation of nuclear substances at the Western WMF continues to be acceptable to the CNSC.

Package Design and Maintenance

Packages used to transport high risk levels of radioactive material require certification by and registration by the CNSC. While packages designed for the transport of low risk levels of radioactive material do not require certification by the CNSC due to a low level of risk, these packages are still required to comply with the *Packaging and Transport of Nuclear Substances Regulations*. OPG's program document *Radioactive Material Transportation* (OPG Document Number W-PROG-WM-00002) [25] specifies requirements for training, preparation for shipment, loading and unloading, and maintenance and design requirements for waste packages.

OPG conducted testing on a new DSC transporter vehicle in 2013. CNSC staff has assessed the design and testing information to date which confirms the operation of the vehicle remains within the safe operating envelope for the onsite transport of DSCs. OPG plans to complete minor modifications to the design based in order to operate the vehicle at all three WMFs in 2015. CNSC staff will continue to review OPG's testing information and verify the safe operation of the vehicle during future compliance inspections.

4 OTHER MATTERS OF REGULATORY INTEREST

4.1 Aboriginal Consultation

The common law duty to consult with Aboriginal groups applies when the Crown contemplates actions that may adversely affect potential or established Aboriginal and/or treaty rights. As this report is for information purposes only, this activity does not trigger the duty to consult as the Commission is not expected to make any decisions in relation to the report.

In accordance with the CNSC's approach to Aboriginal consultation, CNSC staff consulted Aboriginal groups who have expressed interest in receiving information concerning OPG's WMFs. Section 4.7 of this document provides additional information regarding OPG's Public Information Programs for its WMFs.

4.2 Cost Recovery

CNSC staff confirm that OPG remain in compliance with the CNSC *Cost Recovery Fees Regulations* during the reporting period.

4.3 Financial Guarantees

OPG maintains a consolidated financial guarantee for decommissioning its Ontario assets including the Darlington, Pickering, and Western WMFs. Based on OPG's January, 2015 evaluation, the present value of the financial guarantee, for all OPG facilities, stands at \$15,4 million.

The financial guarantee that was accepted by the Commission in 2012 for these facilities includes segregated funds established pursuant to the Ontario Nuclear Funds Agreement (ONFA) between OPG and the Province of Ontario, the trust fund for the management of used nuclear fuel established pursuant to the Nuclear Fuel Waste Act, and the Provincial Guarantee pursuant to the Provincial Guarantee Agreement between the CNSC and the Province of Ontario [21].

Currently, the financial guarantee is in effect and is sufficient to fund the future decommissioning activities as anticipated by decommissioning plans. In accordance with licence requirements, OPG is required to review and revise decommissioning plans, including the associated cost estimates and the proposed financial guarantee on a next five-year cycle.

CNSC staff are satisfied that OPG's financial guarantee continues to meet the guidance as set out in Regulatory Guide G-206, *Financial Guarantees for the Decommissioning of Licensed Activities* [26].

4.4 Nuclear Liability Insurance

OPG remains compliant with the *Nuclear Liability Act* as OPG continues to maintain nuclear liability insurance for its required facilities.

4.5 Improvement Plan and Significant Future Activities

4.5.1 Future Construction

Any future construction not currently approved by the current licence would require OPG to submit an application to the CNSC for a licence amendment. Furthermore, existing licence conditions require OPG to submit an environmental management plan, a construction verification plan, and project design requirements before beginning such construction authorized in their current licences.

For detailed information regarding future construction activities at the Darlington, Pickering and Western WMFs, see sections 1.3.1, 1.3.2, and 1.3.3, respectively.

4.5.2 Proposed Long-Term Approach

Under the *Nuclear Fuel Waste Act*, the Nuclear Waste Management Organization (NWMO) was established and mandated to submit a proposal for the long-term management of Canada's used nuclear fuel (HLW).

The Government of Canada has selected the NWMO recommendation of the Adaptive Phased Management (APM) approach for the long-term management of used nuclear fuel from Canadian nuclear facilities in a deep geologic repository. The NWMO is currently implementing this approach. As an international best practice, the CNSC gets involved early in proposed new nuclear projects to ensure that potential licence applicants and affected communities have a comprehensive understanding of the CNSC's role in regulating Canada's nuclear sector. With respect to the APM approach, the CNSC has been engaging the public to provide information regarding how the CNSC regulates the nuclear sector to protect the health, safety and security of Canadians and the environment.

OPG has proposed a Deep Geologic Repository (DGR) for the long-term management of LLW and ILW. The DGR project is currently undergoing a Joint Review Panel process initiated by the Canadian Environmental Assessment Agency (CEAA) and the CNSC. A decision on the Environmental Assessment by the Federal Minister of the Environment must occur before the Panel of temporary Commission Members may take a decision on issuing a licence for site preparation and construction of the DGR. If approved, the proposed DGR would be constructed on lands adjacent to the Western WMF on the Bruce site and would be located 680 meters below surface. Transfer of LLW and ILW from the Western WMF into the proposed DGR would only occur once an operating licence is granted for that proposed facility, and would require operational activities associated with waste transfer to be authorized under the Western WMF WFOL.

4.6 Public Information and Disclosure

In accordance with OPG's Standard Document, Nuclear Public Information and Disclosure (OPG Document Number N-STD-AS-0013) [27], OPG is required to implement public information programs at the WMFs according to the CNSC Regulatory Document RD/GD-99.3 *Public Information and Disclosure* [28]. These programs outline the types of information and activities related to the facility that will be shared with the public, and details on the manner in which they will be shared. The information can include, but is not limited to environmental performance reports, incidents, and changes to operational activities.

OPG's Standard Document, Nuclear Public Information and Disclosure (OPG Document Number N-STD-AS-0013) [27] sets targets to ensure it meets "regulatory and OPG disclosure requirements for effective, and timely external communications to the public related to operations, health, safety, security and environment."

Based on the information reviewed, CNSC staff conclude that OPG's Public Information and Disclosure Program meets the requirements of RD/GD-99.3 [28].

During the reporting period, CNSC staff have been satisfied with OPG's engagement activities and consider them appropriate to keep the public informed.

When dealing specifically with Aboriginal groups interested in OPG's nuclear facilities, OPG conducts targeted engagement activities including meetings, site tours and information updates.

CNSC staff continue to be satisfied with OPG's implementation of the public information program for the activities at all three WMFs.

4.7 Interaction with Other Government Agencies

There is ongoing communication between CNSC staff and other federal and provincial regulators in relation to the licensing and compliance of OPG's WMFs. Representatives of the Ontario MOECC and Environment Canada also have an open invitation to join CNSC staff during the routine compliance inspections of the three WMFs.

Ontario Ministry of Labour (MOL)

Conventional health and safety aspects of OPG's WMFs are also regulated provincially under the *Occupational Health and Safety Act of Ontario* and the *Labour Relations Act*.

The mandate of the Ontario MOL is to set, communicate and enforce provincial workplace standards for occupational health and safety, employment rights and responsibilities, and labour relations. The Ontario MOL also develops, coordinates and implements strategies to prevent workplace injuries and illnesses and can set standards for health and safety training.

In July 2011, the CNSC and the Ontario MOL signed a Memorandum of Understanding to establish a formal mechanism for cooperation and for the exchange of information and technical expertise related to their respective areas of jurisdiction, such as occupational health and safety practices at nuclear facilities.

On October 1, 2013, near the Western WMF, an OPG crane operator was driving a mobile crane from an exterior fueling area back to the Western WMF after refueling. When exiting the fueling area, the boom of the crane made contact with a 4160V overhead power line. This contact caused an electrical arc, one broken line and two visibly damaged lines. The crane operator was not injured. The crane was not carrying any radioactive material and the incident did not occur on the Western WMF site. Immediate actions were taken by OPG to correct the circumstances that led to this incident. OPG reported the occurrence to the Ontario MOL and the CNSC. Further, OPG completed an investigation and followed up with the Ontario MOL and the CNSC, as required.

Representatives of the Ontario MOL have an open invitation to join CNSC staff during routine compliance inspections of the three WMFs. Ontario MOL participated in an inspection of the Darlington WMF in 2012 during which no items of non-compliance were identified by this regulator.

Ontario Ministry of the Environment and Climate Change (MOECC)

The Ontario MOECC develops and implements environmental legislation, regulations, standards, policies, guidelines and programs. As a requirement of the Ontario MOECC, OPG has in place Environmental Compliance Approvals (ECA), formerly Certificate of Approval (CofA), for various operational activities at the Western WMF including LLW incineration. Emission sources associated with used nuclear fuel processing and storage (welding bays and ventilation exhaust) at the Darlington and Pickering WMFs are considered to be negligible and are not included as a significant emission source in the MOECC ECAs.

At the Western WMF, OPG conducts annual incinerator stack testing for non-radiological air emissions as a requirement of the Ontario MOECC ECA. In order to further assess OPG's adequate provision of the protection of human health and the environment, CNSC staff also regularly conduct reviews of this information reported to the MOECC. Hazardous airborne releases for the reporting period were well below Ontario MOECC's emission limits set within Ontario MOECC ECAs.

Ontario MOECC conducted four inspections over the reporting period at the Western WMF in March 2011, October 2011, February 2012, and February 2014. Ontario MOECC identified no specific or significant actions resulting from these compliance activities. There were no emission releases in excess of the Ontario MOECC's emission limits during the reporting period. Ontario MOECC also had no recorded complaints from the public during the reporting period.

Environment Canada

Environment Canada coordinates environmental policies and programs for the federal government. In July 2013, an OPG contractor at the Western WMF disturbed the nest of a migratory bird. Environment Canada's Enforcement Branch is responsible for Canada's environmental and wildlife legislation such as the *Migratory Birds Convention Act* (MBCA), 1994. OPG's contractor self-reported this contravention of the MBCA to the Canadian Wildlife Service, a directorate within the Environmental Stewardship Branch of Environment Canada. OPG's response to this incident included follow-up with its contractor to ensure adherence to the MBCA legislative requirements. Environment Canada representatives participated in a CNSC routine compliance inspection of the Pickering WMF in August 2010, during which no items of non-compliance were identified by this regulator.

5 OVERALL CONCLUSIONS

CNSC staff conclude that OPG continues to operate each WMF in compliance with the NSCA and its associated regulations as well as the authorizations and the conditions of each licence. CNSC staff will continue to conduct compliance activities on an ongoing basis to verify OPG's continued safe operation of the Darlington, Pickering, and Western WMFs.

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ACRONYMS

ALARA	As Low As Reasonably Achievable
APM	Adaptive Phased Management
Bq	Becquerel
CEAA	Canadian Environmental Assessment Agency
CMD	Commission Member Document
CNEP	Consolidated Nuclear Emergency Plan
CNSC	Canadian Nuclear Safety Commission
CofA	Certificate of Approval
CSA	Canadian Standards Association
DGR	Deep Geologic Repository
DNWMD	Decommissioning and Nuclear Waste Management Division (formerly Nuclear Waste Management Division)
DRL	Derived Release Limit
DSC	Dry Storage Container
DSM	Dry Storage Module
ECA	Environmental Compliance Approvals
EIR	Event Initial Report
EMS	Environmental Management System
FHA	Fire Hazard Assessment
FS	Fully Satisfactory
HLW	High-Level radioactive Waste
IAEA	International Atomic Energy Agency
ILW	Intermediate-Level radioactive Waste
ITM	Inspection, Testing and Maintenance
LCH	Licence Conditions Handbook
LLW	Low-Level radioactive Waste
LLSB	Low Level Storage Building
MBCA	<i>Migratory Birds Convention Act</i>
MDL	Method Detection Limit
MOECC	Ministry of the Environment and Climate Control (Ontario) (formerly Ministry of the Environment)

MOL	Ministry of Labour (Ontario)
mSv	Millisievert
NBCC	National Building Code of Canada
NEW	Nuclear Energy Worker
NFCC	National Fire Code of Canada
NGS	Nuclear Generating Station
NSCA	<i>Nuclear Safety and Control Act</i>
NSO	Nuclear Security Officer
NWMO	Nuclear Waste Management Organization
ONFA	Ontario Nuclear Funds Agreement
OPEX	OPERating EXperience
OPG	Ontario Power Generation Inc.
PAUT	Phased Array Ultrasonic Technology
PROL	Power Reactor Operating Licence
Q	Quarter
RCSA	Retube Component Storage Area
RD	Regulatory Document
RWSB	Retube Waste Storage Building
SA	Satisfactory
SAT	Systematic Approach to Training
SCA	Safety and Control Area
SCR	Station Condition Record
TPMB	Transportation Package Maintenance Building
UFDSF	Used Fuel Dry Storage Facility
WFOL	Waste Facility Operating Licence
WMF	Waste Management Facility
WVRB	Waste Volume Reduction Building

GLOSSARY

Accept	Accept means to indicate compliance with requirements (from <i>CSA N285.0</i>).
Acceptable	Acceptable means to meet the requirements of CNSC staff.
Action Level	Action level for radiation protection means a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee's radiation protection program and triggers a requirement for specific action to be taken (from <i>Radiation Protection Regulations</i>).
Approval	Approval means the granting of consent by a regulatory body. Typically used to represent any form of consent from the regulatory body that does not meet the definition of authorization (from <i>IAEA Glossary</i>).
Authorization	<p>Authorization means the granting by a regulatory body or other governmental body of written permission for an operator to perform specified activities. (from <i>IAEA Glossary</i>):</p> <ul style="list-style-type: none">▪ Authorization could include, for example, licensing, certification or registration.▪ The term authorization is also sometimes used to describe the document granting such permission.▪ Authorization is normally a more formal process than approval.
CMD	A document prepared for Commission hearings and meetings by CNSC staff, proponents and interveners. Each CMD is assigned a specific identification number.
Commission	<p>A corporate body of not more than seven members, established under the NSCA and appointed by the Governor in Council, to perform the following functions:</p> <ul style="list-style-type: none">▪ Regulate the development, production and use of nuclear energy and the production, possession, use and transport of nuclear substances.▪ Regulate the production, possession and use of prescribed equipment and prescribed information.▪ Implement measures respecting international control of the development, production, transport and use of nuclear energy and nuclear substances, including those respecting the non-proliferation of nuclear weapons and nuclear explosive devices.• Disseminate scientific, technical and regulatory information concerning the activities of the CNSC and the effects on the environment and on the health and safety of persons, of the development, production, possession, transport and uses referred to above.

Design Basis	Design basis means the range of conditions and events taken into account in the design of the facility, according to established criteria, such that the facility can withstand them without exceeding authorized limits for the planned operation of safety systems.
DRL	A limit imposed by the CNSC on the release of a radioactive substance from a licensed nuclear facility, such that compliance with the DRL gives reasonable assurance that the regulatory dose limit is not exceeded.
Effective Dose	The sum of the products, in Sieverts, obtained by multiplying the equivalent dose of radiation received by and committed to each organ or tissue set out in column 1 of an item of schedule 1 of the <i>Radiation Protection Regulations</i> , by the weighting factor set out in column 2 of that item.
Hazardous Substance	Hazardous substance or hazardous waste means a substance or waste, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons (from <i>General Nuclear Safety and Control Regulations</i>).
IAEA	An independent international organization related to the United Nations (UN) system. The IAEA, located in Vienna, works with its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies. The IAEA reports annually to the UN General Assembly and, when appropriate, to the Security Council regarding non-compliance by States with their safeguards obligations, as well as on matters relating to international peace and security.
Licensing Basis	The “licensing basis” for a regulated facility or activity is the information demonstrating that (i) the applicant is qualified to carry out the authorized activity, and (ii) that appropriate provisions are in place for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. The licensing basis consists of (i) the applicable legislative and regulatory requirements, (ii) the facility’s or activity’s license and the documents and conditions cited in that license, and (iii) the license application and the documents submitted in support of that license application (from Harmonized Plan Initiative G 1.7: CNSC Consistent Definition of “Licensing Basis” for all Major Facilities).

Management System	A “management system” is “a set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective way. The management system integrates all elements of an organization into one coherent system to enable all of the organization’s objectives to be achieved. These elements include the structure, resources and processes (from IAEA Safety Standard GS-R-3 “The Management System for Facilities and Activities”).
Notification	The submission of information by the Licensee to CNSC staff.
Person Authorized by the Commission	Person authorized by the Commission means the Project Officers overseeing the licensing and compliance activities for the Darlington, Pickering and Western WMFs, the Director WDD, the Director General or Executive Vice-President of the CNSC.
Shall	For the purpose of this handbook, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with CSA Standard N286-05 MANAGEMENT SYSTEM REQUIREMENTS FOR NUCLEAR POWER PLANTS (2007) .

Appendix A. Rating Levels

The following rating levels reflect a recent transition in the rating terminology used by the CNSC.

Fully Satisfactory (FS)

Safety and control measures implemented by the licensee are highly effective. In addition, compliance with regulatory requirements is fully satisfactory and compliance within the SCA or specific area exceeds requirements and CNSC expectations. Overall, compliance is stable or improving, and any problems or issues that arise are promptly addressed.

Satisfactory (SA)

Safety and control measures implemented by the licensee are sufficiently effective. In addition, compliance with regulatory requirements is satisfactory. Compliance within the area meets requirements and CNSC expectations. Any deviation is minor, and any issues are considered to pose a low risk to the achievement of regulatory objectives and CNSC expectations. Appropriate improvements are planned.

Below Expectations (BE)

Safety and control measures implemented by the licensee are marginally ineffective. In addition, compliance with regulatory requirements falls below expectations. Compliance within the area deviates from requirements or CNSC expectations to the extent that there is a moderate risk of ultimate failure to comply. Improvements are required to address identified weaknesses. The licensee is taking appropriate corrective action.

Unacceptable (UA)

Safety and control measures implemented by the licensee are significantly ineffective. In addition, compliance with regulatory requirements is unacceptable and is seriously compromised. Compliance within the overall area is significantly below requirements or CNSC expectations, or there is evidence of overall non-compliance. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk. Issues are not being addressed effectively, no appropriate corrective measures have been taken, and no alternative plan of action has been provided. Immediate action is required.

Appendix B. Data Tables

Table 10: Effective Dose Statistics for OPG WMF NEWs

Facility	Year	Number of NEWs	Average Individual Effective Dose (mSv)	Maximum Individual Effective Dose (mSv)	Regulatory Effective Dose Limit (mSv/year)
Darlington WMF	2010	45	0.1	0.6	50
	2011	37	0.1	0.5	
	2012	41	0.2	0.9	
	2013	44	0.3	1.6	
	2014	44	0.3	1.7	
Pickering WMF	2010	45	0.1	0.9	50
	2011	49	0.1	0.9	
	2012	42	0.2	1.3	
	2013	37	0.2	1.3	
	2014	38	0.2	1.2	
Western WMF	2010	227	0.1	1.7	50
	2011	225	0.1	0.9	
	2012	229	0.1	1.8	
	2013	197	0.1	1.2	
	2014	205	0.1	1.7	

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Table 11: Airborne Nuclear Substances Released Annually from the Western WMF

Parameter	Annual Airborne Releases (Bq per year)					DRL (Bq/y)	
	2010	2011	2012	2013	2014	2010 - 2012	2013 - 2014
Tritium	2.90 E+13	1.99 E+13	1.04 E+13	1.43 E+13	7.17 E+12	1.39 E+17	2.96 E+17
Carbon-14	6.00 E+09	3.99 E+09	1.88 E+09	1.96 E+09	1.56 E+09	4.64 E+15	1.09 E+15
Particulate	5.61 E+05	4.36 E+05	1.26 E+05	3.78 E+05	5.12 E+04	2.93 E+12	2.34 E+12
Iodine-131	9.76 E+04	8.86 E+04	6.06 E+04	6.38 E+04	1.22 E+05	7.16 E+12	1.90 E+12

Note: the increase in 2014 iodine emissions is due to the change from using half the Method Detection Limit (MDL) in calculating emissions to using the MDL value, which explains the increase for the year.

Table 12: Liquid Nuclear Substances Released Annually from the Western WMF

Parameter	Unit	2010	2011	2012	2013	2014	DRL (Bq/y)	
							2010 - 2012	2013 - 2014
Tritium	Bq/y	1.60 E+11	1.54 E+11	1.00 E+11	1.42 E+11	2.50 E+11	2.10 E+15	7.70 E+15
Gross Beta	Bq/y	5.11 E+07	9.55 E+07	6.79 E+07	1.26 E+08	1.39 E+08	1.16 E+11	4.56 E+11