Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CMD 23-H9.1

File / dossier : 6.01.07
Date: 2022-10-28
Edocs: 6898520

Written submission from Ontario Power Generation Inc.

Mémoire d' Ontario Power Generation Inc.

In the Matter of the

Ontario Power Generation Inc.

Application to Renew the Class IB Waste Facility Operating licence for Ontario Power Generation in Darlington, Ontario

Commission Public Hearing

January 25-26, 2023

À l’égard de

Ontario Power Generation Inc.

Demande de renouvellement du permis d’installation de déchets de catégorie IB pour Ontario Power Generation à Darlington (Ontario)

Audience publique de la Commission

25-26 janvier 2023

Canada

Original

CNSC Commission Member Document (CMD)

CMD: 23-H9.1

Date Submitted: 28 October 2022

Reference CMDs: None

Ontario Power Generation

One-Day Public Hearing

Scheduled for: January 25, 2023

Request for a Licensing Decision Regarding:

The Renewal of Darlington Waste Management Facility Waste Facility Operating Licence WFOL-W4-355.01/2023

Submitted by: Ontario Power Generation

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Executive Summary

The purpose of this submission is to request Canadian Nuclear Safety Commission (the Commission) approval to renew Waste Facility Operating Licence for Darlington Waste Management Facility (DWMF), WFOL-W4- 355.01/2023, for another ten-year term from May 1, 2023 to April 30, 2033, as the current ten-year for the DWMF expires on April 30, 2023.

OPG requests the following changes to the WFOL-W4- 355.01/2023 operating licence:

1. A ten-year licence term to April 30, 2033 for the Darlington Waste Management Facility waste facility operating licence
2. A change in the name of the facility from the Darlington Waste Management Facility (DWMF) into Nuclear Sustainability Services – Darlington (NSS-D).
3. The inclusion of the construction and operation of additional Used Fuel Dry Storage Buildings (UFDSBs) #3 and #4 and a name change from UFDSBs to Used Fuel Dry Storage Structures (UFDSSs).
4. A change in the total capacity of UFDSSs #3 and #4 from 1,000 DSCs to 1,200 DSCs.

NSS-D (formerly DWMF) has been operating safely since it was established in 2007. The additional changes requested would not alter the basic purpose and activities associated with the NSS-D. The ongoing operation of the NSS-D will enable Darlington Nuclear Generating Station (DNGS) to continue operating as planned under its Power Reactor Operating Licence.

This submission presents information on the performance of NSS-D in the areas related to the fourteen Safety and Control Areas. During the current licensing period NSS-D has operated safely and reliably to protect the public, the workers, and the environment. OPG is proud of its excellent record in conventional and radiological worker safety, and is well positioned for the continued operation of NSS-D.

OPG is committed to innovative and responsible solutions for managing radioactive materials safely, efficiently and cost effectively, and making investments for the continued safe operation of NSS-D.

OPG has built a healthy safety culture that permeates the organization, and demonstrates a focus to improve organizational effectiveness through the use of best practices, enhanced behaviours, and learning.

1.0 Introduction

1.1 Background

Ontario Power Generation Inc. (OPG) is an Ontario-based electricity generation company whose principal business is the genera and sale of electricity in the province of Ontario. More than half of the OPG produces electricity comes from nuclear power, a low-cost and low-carbon source of energy; these benefits of nuclear energy go hand-in-hand with good stewardship of the nuclear waste. OPG is committed to the safe, responsible, and comprehensive management of all its radioactive waste, which is stored at the waste facilities at the Bruce, Pickering, and Darlington nuclear sites.

OPG will appear before the Commission during the January 25, 2023 public hearing on the matter of the renewal of the Waste Facility operating Licence WFOL-W4-355.01/2023, for Darlington Waste Management Facility (DWMF). The current operating licence for the DWMF expires on April 30, 2023. OPG is requesting a renewal of the operating licence for another ten (10) years from May 1, 2023 to April 30, 2033. The renewal would allow OPG to continue with the safe interim processing and storage of used fuel from the Darlington Nuclear Generating Station (DNGS) and the safe storage of Intermediate Level Waste (ILW) from DNGS's refurbishment activities.

This submission is in support of WFOL-W4- 355.01/2023 renewal application for the DWMF, located on the Darlington nuclear site within the Municipality of Clarington, Ontario, and demonstrates that:

(1) OPG is qualified to operate the DWMF; and,

(2) OPG has and will continue to make adequate provision for the protection of the environment, the health and safety of public, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

The DWMF is licensed by the Commission under section 24(2) of the *Nuclear Safety and Control Act*. It is a Class IB nuclear facility as defined in the *Class 1 Nuclear Facilities Regulations,* to provide for the safe handling, management, and the interim storage of radioactive wastes, including ILW from the refurbishment of the DNGS reactor units, and used fuel produced by the DNGS. The DWMF site has been developed in stages since 2007 to accommodate waste produced during reactor operation and refurbishment.

In 2016, OPG began refurbishing the DNGS. This has resulted in ongoing shipments of ILW to the DWMF and an increase the number of used fuel bundles that require interim storage in dry storage containers at the DWMF.

OPG renamed its Nuclear Waste Management (NWM) division to Nuclear Sustainability Services (NSS) in Q4 2021. NSS safely accepts, transports, processes, and stores nuclear by-products, while embracing the three Rs – reduce, reuse, and recycle. A new five-year strategic plan for NSS emphasizes minimizing waste volumes at source, and reducing volumes for interim storage and permanent disposal –to reduce costs and to reduce OPG's environmental footprint.

"Nuclear waste" is a phrase with negative associations in the public perception; and the term is inaccurate when describing all the nuclear materials OPG handles, including materials that are clean, recyclable, and valuable – from copper and steel to heavy water and to important medical isotopes. Nuclear Sustainability Services is a name that is both true and inspirational, aligned with OPG's Climate Change Plan. In both name and deed, NSS demonstrates that nuclear energy is clean energy and vital to net-zero climate action. With a focus on safety and protection of public and the environment, NSS demonstrates good stewardship of nuclear by-products, while developing lasting solutions for disposal, and ensuring public peace of mind.

In this submission, Nuclear Waste Management (NWM) division will be replaced with Nuclear Sustainability Services (NSS) and the Darlington Waste Management Facility (DWMF) will be replaced with Nuclear Sustainability Services – Darlington (NSS-D).

1.1.1 Land Acknowledgement

Ontario Power Generation respectfully acknowledges that the NSS-D facility is located in the treaty and traditional territory of the Michi Saagiig and Chippewa Nations, collectively known as the Williams Treaties First Nations.

Ontario Power Generation respectfully acknowledges that the peoples of the Williams Treaties First Nations are the original stewards and caretakers of these lands and that they continue to maintain this responsibility to ensure their health and integrity for future generations.

As a company, OPG remains committed to developing positive and mutually beneficial relationships with the Williams Treaties First Nations and Indigenous communities across Ontario.

1.1.2 Nuclear Sustainability Services – Darlington Structures

Used fuel, generated by the operation of DNGS's four reactor units, initially stored under water in the two DNGS Irradiated Fuel Bays for a period of approximately 10 years. Afterward, this used fuel is transferred to NSS-D.

NSS-D was designed and constructed to provide for the safe handling, management, and the interim storage of radioactive waste produced by the DNGS, until an alternative long-term waste management facility becomes available. NSS- D accommodates irradiated fuel produced by the DNGS reactor operation and the Intermediate Level Waste (ILW) from the Darlington Refurbishment Project at the DNGS Units 1 to 4.

NSS-D received its waste facility operating licence in 2007 as the DWMF, and received its first Dry Storage Container (DSC) loaded with fuel from the DNGS in 2008.

NSS-D is located within the larger Darlington nuclear site boundary and to the east of the DNGS (Figures 1 and 2). The facility consists of the DSC Processing Building and Used Fuel Dry Storage Buildings (UFDSB) #1 and #2, and the Retube Waste Storage Building (RWSB). The DSC Processing Building is used to prepare DSCs for safe storage. UFDSB #1 & #2 are used to store DSCs. The RWSB is used to store the intermediate level waste from the Darlington Refurbishment Project. Photos of the current buildings are shown in Figures 3 to 6.

Two additional storage structures are planned to be built in the next licensing period, Used Fuel Dry Storage Structure (UFDSS) #3 and UFDSS #4. Figure 2 shows their potential locations.

UFDSB #1 became operational in 2007 and has a nominal storage capacity of 500 DSCs. UFDSB1 is located adjacent to the DSC Processing Building.

UFDSB #2 was placed into service in March 2016. The building has a nominal storage capacity of 500 DSCs.

The Retube Waste Storage Building (RWSB) was approved for service on September 30, 2017, is an above ground concrete warehouse type building housing Retube Waste Containers (RWCs). They are stored inside another package referred to as the Darlington Storage Overpack (DSO) for shielding purposes. The RWSB has reinforced concrete floors and overlapping concrete wall panels with room to store 490 RWCs, which is sufficient storage capacity for the retubing of the four Darlington units.

With the exception of the RWSB, the NSS-D is contained within its own protected area, which is separate from the protected area of DNGS but within the boundary of the Darlington nuclear site. The RWSB is also located within the boundary of the Darlington Nuclear site but not within a protected area.

NSS-D has been operating safely since it was first became operational and continued to operate safely throughout the pandemic period.

Note: The blue dotted line in this figure is the DNGS exclusion zone.

Figure 1: Darlington Site

Figure 2: Nuclear Sustainability Services - Darlington

Figure 3: DSC Processing Building

Figure 4: Used fuel Dry Storage Building #1

Figure 5: Used fuel Dry Storage Building #2

Figure 6: Retube Waste Storage Building

1.1.3 Management of High Level (Used Fuel) Waste

The NSS-D provides safe interim storage for the used fuel discharged from the DNGS units and cooled for a period of approximately 10 years in the Irradiated Fuel Bays. The storage capacity of the operational storage buildings is limited to 1,000 DSCs.

The fuel bundles are assemblies of 37 cylindrical fuel elements, arranged in concentric rings of 18, 12, and 6 elements around a central element (Figure 7).

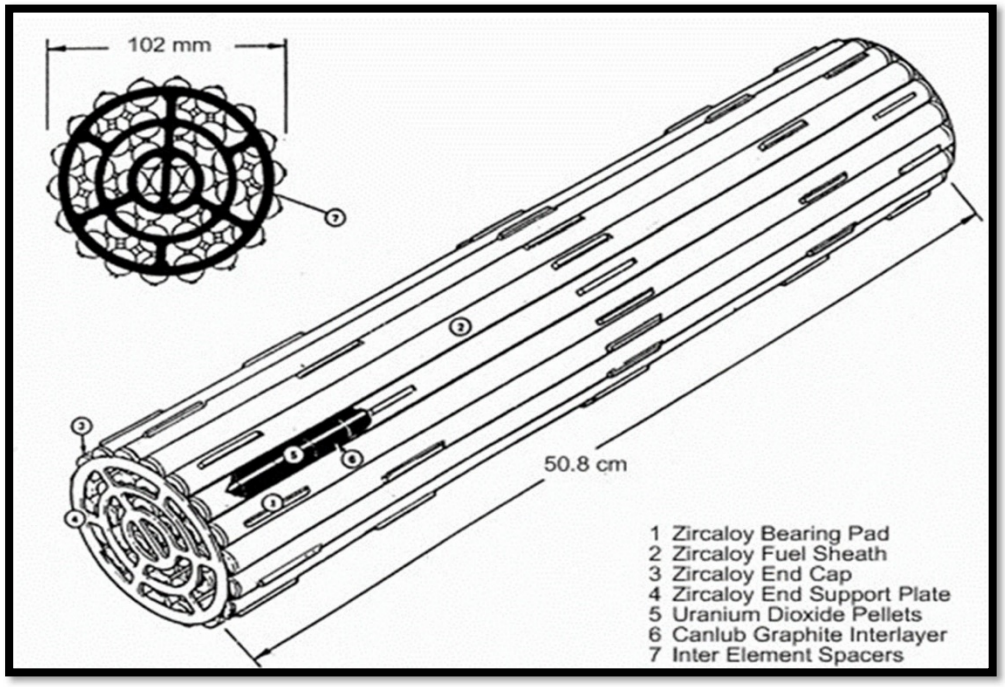


Figure 7: Fuel Bundle

1.1.3.1 Dry Storage Containers

A Dry Storage Container (DSC) is a freestanding reinforced concrete container, with an inner carbon- steel liner and an outer carbon-steel shell, for the storage, on-site transfer, and off-site transportation (with an outer packaging) of used CANDU fuel. It is made of two sub-assemblies, and a lid and a base. (Figure 8) The DSC is a double-shell rectangular container, with outside dimensions of 2.121 m x 2.419 m by 3.557 m in height (including the lid), and an inside cavity of 1.046 m x 1.322 m by 2.520 m in height. The thickness of each carbon-steel shell is 13 mm.

The reinforced high-density concrete provides radiation shielding while maintaining adequate used fuel decay heat dissipation. The concrete has a nominal density of 3.5 tonnes/m^3. The maximum total mass (including the lid) is approximately 60 tonnes when empty and approximately 70 tonnes when loaded with four modules (384 used fuel bundles). Lifting plates are designed to safely lift the DSC with the dedicated lifting beam or the transporter vehicle. The DSC is designed with provision for installing safeguard seals.

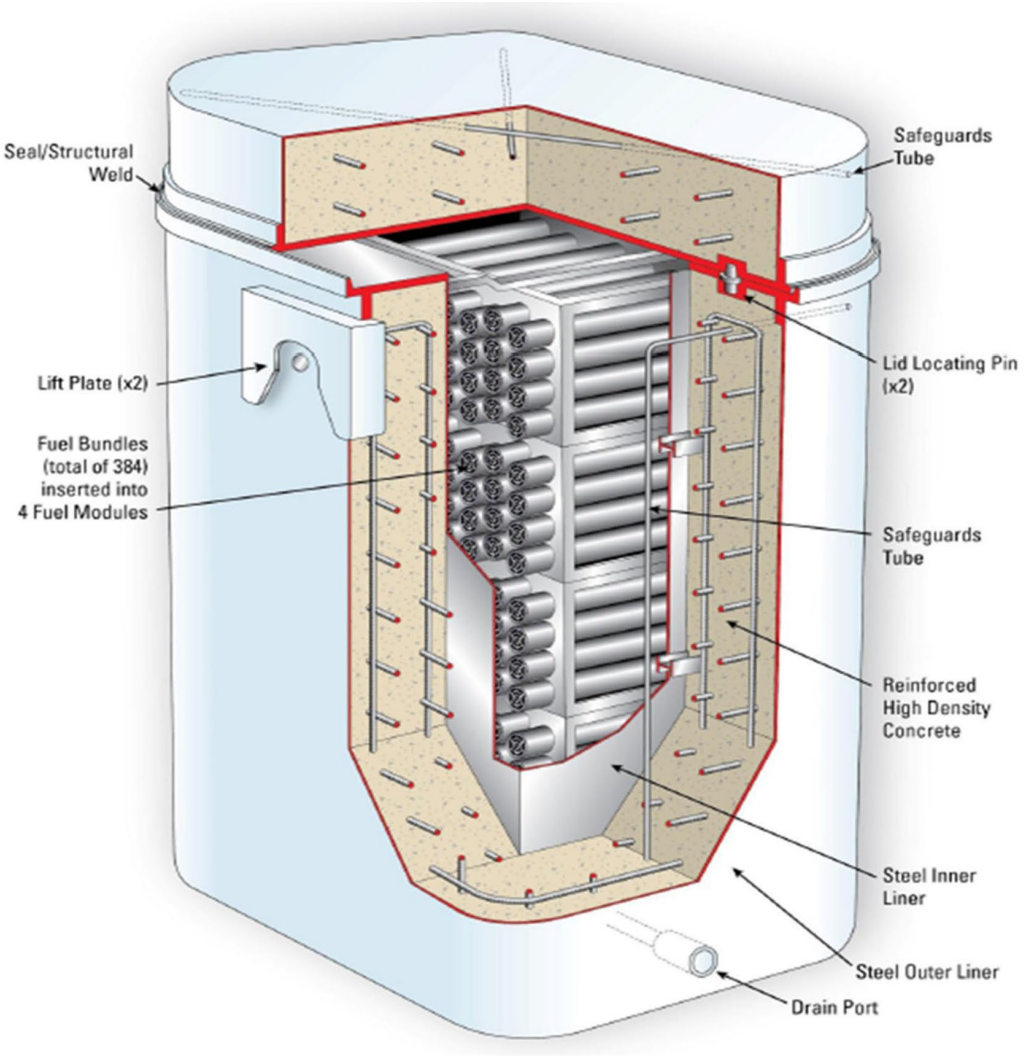


Figure 8: Dry Storage Container

1.1.3.2 Used Fuel Dry Storage Processing

The processing of a DSC begins with the preparation of new DSCs at the DSC Processing Building and ends with the storage of loaded, hermetically sealed DSCs in the UFDSBs/UFDSSs. The main steps in processing DSCs for storage are summarized in Figures 9 and 11.

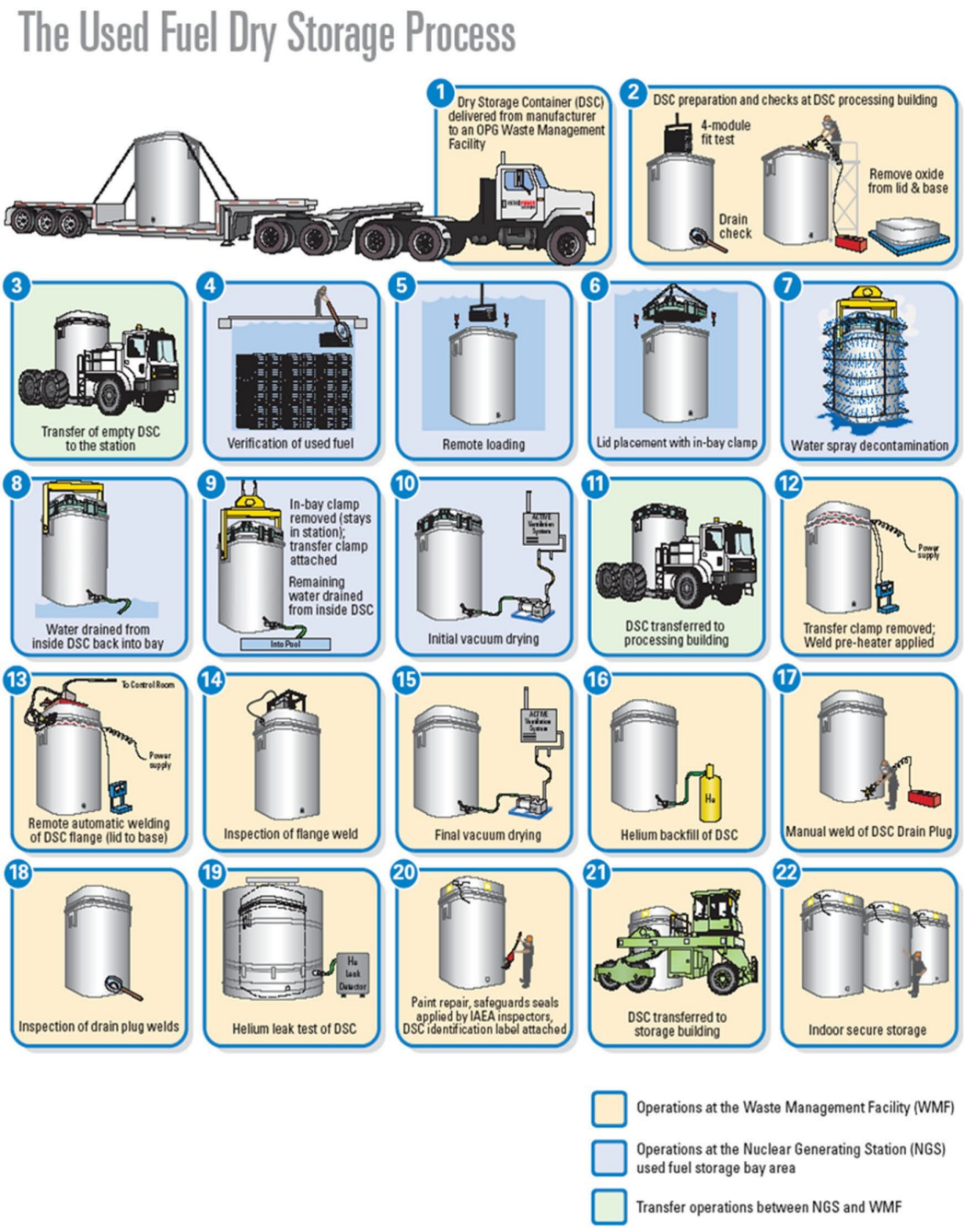


Figure 9: Used Fuel Dry Storage Process

Steps 1 - 3: Preparing and Transferring Empty DSCs

New, empty DSCs are received at NSS-D from the manufacturers. The DSCs are prepared and then transferred to the DNGS for subsequent loading of used fuel.

The DSC Transporter is used to transfer both new (empty) and loaded DSCs between NSS-D and the DNGS.

Steps 4 - 10: Loading a DSC at Darlington NGS

The processes of loading, decontaminating, draining, and initial drying are completed at the DNGS under the Power Reactor operating licence. At the DNGS, fuel bundles are loaded under water into storage modules (Figure 10). After a storage module has been loaded, it is transferred under water to a DSC. Each DSC is designed to hold four storage modules, for a total capacity of 384 bundles per loaded DSC.

While the loaded DSC is still submerged in water in the loading bay, the in-bay clamp is used to secure the DSC lid to the container. The DSC is lifted out of the water, drained and then the DSC exterior is decontaminated. The in-bay clamp is replaced with the transfer clamp, and the DSC interior cavity is vacuum-dried in preparation for on-site transfer to NSS-D.

Prior to leaving the DNGS, the DSC is surveyed, and the entire exterior surface of the loaded DSC and its components are decontaminated including lid flange, drain housings, and the transfer clamp to ensure there is no detectable loose contamination.

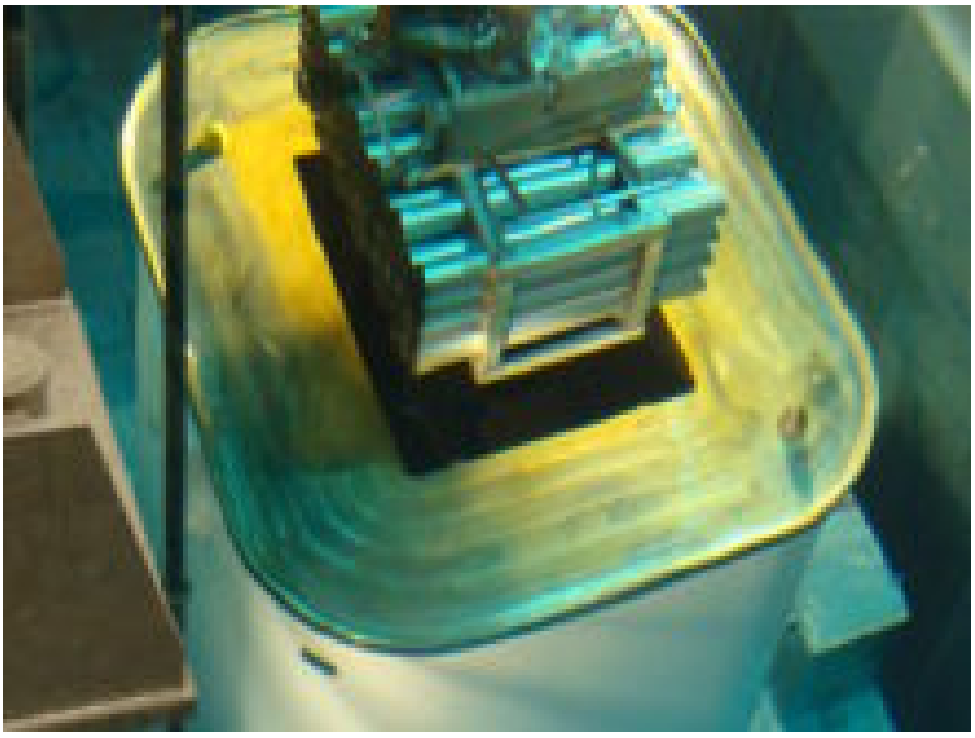


Figure 10: Loading a DSC with Used Fuel Underwater in the Irradiated Fuel Bay

Step 11: DSC transfer between the DNGS and the DSC Processing Building at NSS-D

The DSC transporter picks up a loaded DSC from the DNGS after confirmation that it meets NSS-D's waste acceptance criteria. Both the vehicle and the DSC are monitored for contamination and decontaminated, as required, before leaving the station.

The transporter with a loaded DSC then leaves the station and travels along the DNGS site roads to NSS-D for further processing in accordance with security and safeguards requirements for on-site transportation. The maximum lift height required during loading or unloading of a DSC is about 0.60 m, which is well within the safety envelope of 2.4 m. When traveling with a DSC, the DSC transporter operates at low speed and has a short stopping distance where stopping is essentially instantaneous. The vehicle is always operated by a trained vehicle operator.

Steps 12 - 20: Processing a DSC at NSS-D

The loaded DSC is transferred on the DNGS site roads to NSS-D, where it is off-loaded at the DSC Processing Building for further processing, as follows:

- **Receiving a Loaded DSC (Step 12) -** After the loaded DSC is received at the DSC Processing Building, movement of the DSC within the DSC Processing Building is performed using the workshop overhead crane and lifting beam.
- **DSC Lid Seal Welding (Step 13) -** The DSC is moved to a welding station where the DSC drain port transfer plug, transfer clamp and seal are removed, and the weld pre-heater is installed. The pre-heater is used to heat the DSC weld flange to a prescribed temperature. The weld between the lid and base of the DSC is performed with a prescribed number of passes of the welding machine. At the conclusion of lid welding, the weld machine is removed, and the DSC is allowed to cool.
- **Welding Inspections (Step 14) -** The Phased Array Ultrasonic Testing (PAUT) system is used for the inspection of the DSC lid-to-base seal weld. The scanner is mounted on the DSC base's top flange and is held in place by three magnetic wheels. A loading ramp is used to minimize the force required by the operator when engaging and disengaging the scanner. The inspection covers 100% of the weld as well as the Heat Affected Zone.
- **Final Vacuum Drying, Helium Backfill, and Drain Port Seal Welding (Steps 15 – 18) -** After successful completion of the weld inspection, the DSC is lifted into another workstation for final vacuum drying and helium backfilling. The lifting beam is removed, and the vacuum drying/helium backfilling system connected. Following helium backfill, the drain port is welded and inspected via visual and dye penetrant techniques.
- **Helium Leak Testing (Step 19) -** Helium leak testing is carried out using a vacuum chamber (bell jar). The lid of the bell jar is removed, and the seal-welded DSC is lifted into the lower half of the bell jar. The bell jar lid is craned over the DSC and sealed onto the base of the bell jar. Using the

vacuum skid, air is first removed from the bell jar and then the helium leak detector is activated. If a leak is detected, the vacuum equipment is removed, and remedial work is carried out. A follow-up leak test is then performed. After completion of the lid weld inspection, partially processed DSCs may be transferred to a designated area inside either the DSC Processing Building or the International Atomic Energy Agency (IAEA) surveillance and laydown area in UFDSB #1 and temporarily stored for up to one year from the time of loading.

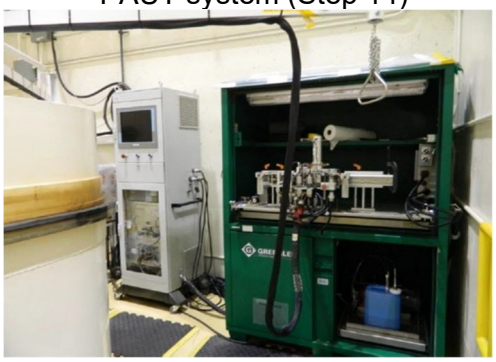
- **Paint Touch Up and Safeguards Seals (Step 20) -** Areas affected by the welding are cleaned and painted. Touch-up paint is also applied to scrapes or scuffs on the DSC that may have resulted from handling. Painting is typically carried out in the paint bays. Documentation and identification labelling are completed and permanent safeguards seals are installed in a designated IAEA surveillance area.

Steps 21 - 22: Storage of DSC at NSS-D

- **DSC Placement and Storage (Steps 21 and 22) -** The DSC is moved, using the transporter, to a storage location (Figure 12). In the UFDSB/UFDSS, the transporter unloads the DSC in a designated storage location.

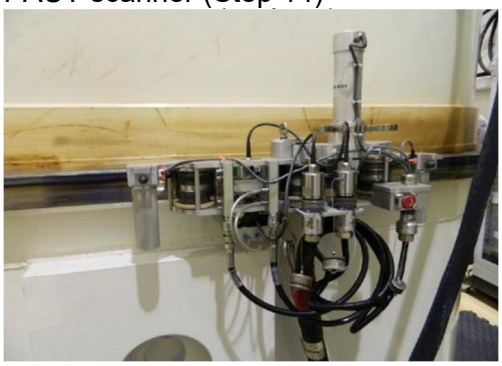
New empty DSC (Step1)

PAUT system (Step 14)



DSC Transfer Clamp (Step 4)

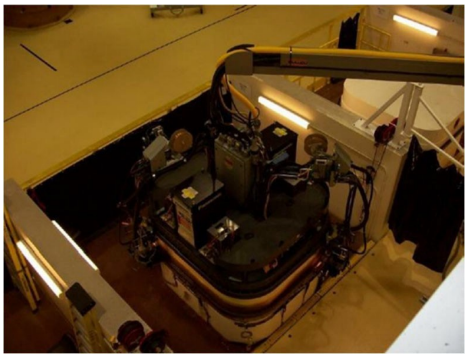
PAUT scanner (Step 14)



Overhead Crane (Step 12)

Drain Port Connection (Step 15)

Welding Machine (Step 13)



Helium Leak Test Vacuum Chamber (Step 19)

Figure 11: DSC Processing Steps

1.1.3.3 DSC Processing Building

The DSC Processing Building is an industrial-type conventional steel, concrete block, and concrete structure. The building floor is a concrete slab on grade. Occupancy, snow, wind, crane loads, and seismic limits meet the requirements of the National Building Code of Canada (NBCC), which governs the design of the building framing, while the reinforced concrete floor slab is designed for heavy wheel load traffic, i.e., the transporter and the weight of loaded DSCs.

Amenities Area

The DSC Processing Building amenities area has two stories for the office and utility areas. The first-floor utility area accommodates rooms for electrical equipment, a mechanical room with active ventilation, and Heating Ventilation and Air Conditioning equipment, an operations room, janitor's room, a store room, men's and women's washrooms and locker rooms, a security area with a security observation post, a radiation monitoring area, and first aid room. The lobby has an elevator to provide barrier-free access to the second-floor office area. The second-floor office space includes general offices, an IAEA equipment room, washrooms, a janitor's room, a conference room, a lunchroom, a records room, and an electrical room.

Receiving Bay / Preparation Area

The DSC Processing Building consists of a truck bay area for receiving the empty DSC delivery truck from the manufacturer, and the DSC transporter. This area also provides space for storage of new DSCs and for preparation of DSCs for transfers to the DNGS.

The length of the truck bay is designed to enclose the empty DSC delivery vehicle. The location and configuration of the truck bay is designed to enable the receipt or transfer of a DSC out of the facility without interrupting the processing of loaded DSCs. Vehicular access is via an electrical vertical roll-up type door sized with sufficient clearances for passage of the DSC delivery truck, and the DSC transporter.

Loaded DSCs are moved into the workshop promptly upon receipt from the DNGS to facilitate safeguards monitoring. The overhead crane has access to the receiving bay in order to move the DSCs.

Main Processing Area

The main processing area contains the following dedicated systems for DSC processing:

- Lid welding and welding-related systems.
- Welding inspection system.
- Vacuum drying system.

- Helium backfilling system.
- Helium leak detection system; and
- Paint bays.

In addition, there is an area for transporter maintenance, several utility rooms, areas for paint storage and weld gas storage, and an electrical room. The second floor has a storage area and the control centers for welding and weld inspection. A mezzanine area is also provided to give access for crane maintenance and is the primary location for mechanical units such as air handling equipment, High Efficiency Particulate Air filters, and exhaust stack.

1.1.3.4 Used Fuel Dry Storage Buildings

The UFDSBs contain the DSCs, which are stored in a pattern that allows retrieval, if needed, of any DSC. Layout of the storage areas permits placement of DSCs using the transporter to achieve the desired storage capacity. A designated IAEA surveillance area is provided inside UFDSB #1.

UFDSB #1 & #2 are unheated except for a janitor's closet in UFDSB #2. The only services in the two buildings are lighting, public address, telephone, and fire detection. Safeguards video surveillance systems are available in UFDSB #1. The buildings are equipped with a passive ventilation system, which consists of horizontal louvers in the east and west perimeter walls, and roof-mounted turbine ventilators designed to dissipate decay heat from the used fuel in storage. Covered louvers are also installed at each end of the north and south walls of UFDSB #2 to protect them from snow, ice and rain penetrating during the winter. The east and west louvers have manual control capabilities to allow isolation of ventilation during winter (and / or severe weather conditions), and to minimize the ingress of wind driven snow and rain. Inactive floor drains are provided to collect any rain or melted snow that may penetrate the passive ventilation system.

1.1.3.5 On-Site Transfer of DSCs

OPG DSC transporters are specially designed multi-wheeled vehicles for the transfer of DSCs between the DNGS and the DSC Processing Building, and from the DSC Processing Building to storage (Figure 12).

The DSC transporters are self-loading and self-powered by a diesel engine and do not require the assistance of a crane when picking up or depositing a DSC. The DSC is lifted and transferred via lifting trunnions mounted on the upper frame of the machines. The DSC is carried at a low lift height (about 20 cm) during transfer. Locking arrangements prevent the DSC from being inadvertently lowered to the ground upon hydraulic failure. The tires on the transporters are designed not to deflate if punctured.

When travelling with a DSC, the transporters operate at low speed and have a short stopping distance. When travelling at minimal speeds (e.g., when moving DSCs within the DSC Processing Building and UFDSBs/UFDSSs), stopping is essentially instantaneous.

The transporters are capable of forward and reverse motion and have a tight turning radius. Vehicle lighting is provided for nighttime operation, if necessary. The DSC transporter at NSS-D can travel up to a maximum of 4 km/hr.

Figure 12: DSC Transporter Carrying a DSC

1.1.4 Management of Intermediate Level Waste (Retube Components)

The Retube Waste Storage Building (RWSB) is designed to provide interim storage for irradiated reactor components from the Darlington Refurbishment Project until a permanent disposal facility becomes operational. These components consist mainly of pressure tubes, end fittings, annulus spacers, calandria tubes and calandria tube inserts.

The inner container is referred to as the Retube Waste Container (RWC). The outer container is referred to as the Darlington Storage Overpack (DSO). These containers can be seen in Figures 13 and 14.

The RWC/DSOs are designed for a minimum fifty-year life. The design of the RWC and the DSO preclude the need for periodic inspections to ensure their integrity over the design life. No maintenance on the RWCs and DSOs is required at this time and RWC/DSOs are in good condition.

1.1.4.1 Retube Waste Containers (RWC)

The RWC is cylindrical and constructed of heavy concrete and lined internally and externally with steel. The RWC has an opening at the top, which is closed with a lid made of steel.

The RWC was designed to provide the primary containment and shielding from the retube waste. The RWC has a maximum mass of 24 tonnes including its maximum payload. To minimize the mass of the RWC and to facilitate off-site transport, the RWC shielding thickness has been established so that after storage at NSS-D (approximately 20-30 years), the container meets the 100 µSv/h (10 mrem/h) dose rate acceptance criterion at one metre.

The maximum weight of a loaded RWC/DSO does not exceed 45 tonnes including the maximum payload. The external surfaces of the RWC and DSO clearly identify the internal configuration and waste type, for example, Pressure Tube/Calandria Tube, Calandria Tube Inserts, or End Fitting, to ensure correct usage.

1.1.4.2 Darlington Storage Overpack (DSO)

The DSO is a cylindrical container made of thick steel with a single lid fastened on top, designed to hold a single RWC. The principal function of the DSO is to supplement the shielding provided by the RWC during the storage period at the NSS-D. See Figure 13.

The lid of the DSO is attached securely to the body. The design of these fasteners is such that they cannot become loose and or be released unintentionally due to accelerations or vibrations during handling and transportation. The closure joint design precludes the ingress of moisture or debris and provides supplementary contamination control.

Figure 13: DSO with RWC (inside)

The fully loaded RWC/DSO is designed to be stacked two-high for storage at RWSB, see Figure 14.

Figure 14: RWC/DSOs Stacked Two-high in the RWSB

1.1.4.3 Retube Waste Storage Building

The RWSB provides storage capacity for RWC/DSOs from the retubing of the Darlington reactor units. The retube waste arrives at the RWSB in shielded containers (RWC/DSOs). The RWSB has a nominal capacity for 490 containers, which is sufficient for storage of the retube waste from all four Darlington units.

The RWSB floor plan design is approximately 106 m by 41 m. The concrete wall panels are joined in an overlapping configuration to prevent radiation streaming between the panels. The RWSB floor is constructed of reinforced concrete. The interior height accommodates the movement and placement of containers stacked two high.

The RWSB is an unheated building; however, the design includes the following services:

- Fire Protection
- Ventilation
- Lighting
- Internal Drainage
- Public Address speakers and Telephone

1.1.4.4 On-Site Transfer of RWC/DSO

A truck with a flatbed trailer is used to transport RWC/DSOs from the DNGS to the RWSB, as shown in Figure 15.

Figure 15: RWC/DSO Transporter

1.1.5 Maximum Quantity of Radioactive Waste (Nuclear Substances) at NSS-D

The maximum quantity of High-Level Waste is interpreted as the maximum amount of used fuel bundles that can be stored on site, in DSCs.

The maximum quantity of ILW is interpreted as the maximum amount of non-fuel radioactive waste that can be stored at the RWSB on site, in RWC/DSOs. Table 1 contains the maximum quantity of nuclear substances at NSS-D.

Table 1: Maximum Quantity of Radioactive Waste (Nuclear Substances) at NSS-D

Nuclear Substance	Form / Location	Maximum Quantity
High Level Waste as Irradiated Fuel	Total used fuel storage capacity: • UFDSB #1 • UFDSB #2 • UFDSS #3 and #4 (UFDSS #3 and #4 to be constructed in the future)	844,800 bundles: • 500 DSCs • 500 DSCs • 1,200 DSCs (maximum 384 bundles per DSC)
Intermediate Level Waste	Retube components in DSO / RWC	490 RWC/DSOs (Design Capacity)

1.1.6 Management of Non-Nuclear Hazardous Materials

NSS-D contains a small amount of a variety of non-radiological hazardous materials, which are typically found in industrial buildings, including the following:

- **Paint**: Touch-up paint is applied to areas on the DSC that have been affected by the scrapes or scuffs that may have resulted from handling. The total amount of paint stored at NSS-D in "purpose-built" storage lockers is approximately 100 litres.
- **Consumables for maintenance**: These include items such as adhesives, abrasives, various solvents, lubricants for operations and maintenance equipment, as required, and janitorial and cleaning supplies. The total amount of these materials that may be stored onsite in "purpose-built" storage lockers is approximately 400 litres, primarily janitorial cleaning supplies. Flammable materials are stored in appropriate cabinet.
- **Fuel**: A small amount of fuel for snow blowers and maintenance equipment is stored on-site. The quantity stored on-site in flammable material storage cabinets is less than 20 litres.

1.2 Highlights

The purpose of this application is to request a 10-year licence renewal of the Darlington Waste Management Facility waste facility operating licence WFOL-W4-355.01/2023.

The licence application was submitted to the Commission's Secretariat (now called the Registrar) on December 16, 2021.

The DWMF has been licensed to operate under a Waste Facility Operating Licence since 2007.

DNGS Units 1 to 4 were commissioned between 1989 and 1992 and are currently in the process of being refurbished so that they can operate for another approximately 30 years. The current operational storage capacity of NSS-D is nominally 1,000 DSCs.

In the current operating licence, there is a provision and authorization for the construction of two (2) additional UFDSBs at NSS-D, for storage of DSCs.

OPG is optimizing the DSC storage capacity of UFDSSs #3 and #4 from 1,000 to 1,200 to avoid the need for a fifth storage building.

Current plans include the construction of Structure #3 with an anticipated in-service date of 2025/2026; and Structure #4 with an anticipated in-service date of 2031 or later, to support continued operations at the DNGS.

With the construction of UFDSS #3 and #4 at NSS-D, there will be adequate DSC storage capacity until 2043, when a Deep Geologic Repository is expected to be constructed and operational.

The RWSB was constructed to include contingency, therefore additional storage capacity for ILW will not be necessary.

1.2.1 Changes to Licensed Activity

The current Waste Facility Operating Licence WFOL-W4-355.01/2023 authorize the licensee to:

(i) operate the Darlington Waste Management Facility ("the facility") located at the Darlington Nuclear Generating Station, Township of Darlington, Municipality of Clarington, Regional Municipality of Durham, Province of Ontario;

(ii) possess, transfer, use, process, package, manage, and store nuclear substances that are required for, associated with or arise from the activities described in (i);

(iii) transport Category II nuclear materials that are associated with the activities described in (i) on the site of the Darlington Nuclear Generating Station;

(iv) carry out the site preparation, construction, or construction modifications at the facility associated with the authorized additional storage buildings, when on completion will result in a total of no more than 4 used fuel dry storage buildings and no more than 1 intermediate level radioactive waste storage building; and,

(v) possess and use prescribed equipment and prescribed information that are required for, associated with or arise from the activities described in (i), (ii), (iii), and (iv).

OPG is changing the name of the storage facility from the Darlington Waste Management Facility (DWMF) to Nuclear Sustainability Services – Darlington (NSS-D). Therefore, OPG requests a change to the name of the licence, including the description of the facilities listed in Part IV – (i) of the WFOL to include this new name.

OPG is also changing the nomenclature of the structures for the storage of the DSCs. Therefore, OPG requests a change to the description of the facilities listed in Part IV - (iv) of the WFOL to Used Fuel Dry Storage Structures (UFDSS).

Thus, OPG request that the licensed activities be re-worded to the following (changes marked in bold):

(i) operate the **Nuclear Sustainability Services - Darlington** ("the facility") located at the Darlington Nuclear Generating Station, Township of Darlington, Municipality of Clarington, Regional Municipality of Durham, Province of Ontario;

(iv) carry out the site preparation, construction, or construction modifications at the facility associated with the authorized additional storage buildings, when on completion will result in a total of no more than **2 used fuel dry storage buildings and 2 used fuel dry storage structures**, no more than 1 intermediate level radioactive waste storage building;

In addition, currently the storage structures are identified as having a nominal capacity of 500 DSCs each. Storage Structures #3 and #4 will have a larger total capacity (1,200 DSCs instead of 1,000 DSCs) to remove the need for a fifth storage structure. Storage Structures #3 and #4 may incorporate more flexible designs, and will meet all applicable regulatory requirements and licence conditions.

As required, OPG will submit an environmental management plan, a construction verification plan, and the project design requirements to CNSC staff prior to the commencement of construction activities as authorized in licence condition 15.1 of the current operating licence.

1.2.2 Implemented Improvements and Planned Improvements

During the current WFOL-W4- 355.01/2023 licence, OPG has made many improvements and achieved many safety records, as follows:

- Nuclear Safety and Security Culture Assessments are now carried out once every three years at the NSS facilities.
- Transitioned to compliance with many CNSC Regulatory Documents (REGDOCs) and Canadian Standards Association (CSA) Standard requirements.
- Worker led pre-job briefings are found to be very successful, due to increased employee interaction and adherence to the required procedures.
- No lost time accidents or medically treated injury during its entire 14-year operational period.
- Serious Incidence Injury Rate has been zero. and there have been zero safety events and zero High Maximum Reasonable Potential for Harm events at NSS-D during the current licensing period.
- No environmental or radiation protection action levels were exceeded during the current licensing period.
- All measured worker and public dose rates have been below target.
- The DSC shielding analysis methodology was updated to incorporate the use of the Monte Carlo N-Particle transport code for dose rate calculations.

During the next licensing period, OPG targets to implement the following improvements:

- Ongoing use of OPG’s Fleetview Program Health and Performance Reporting to assist with overall program effectiveness.
- A next generation DSC welding machine is in the process of being developed and procured. This new welding machine will increase efficiency and overcome obsolescence challenges of the current machines.
- Two new DSC Transporters are being procured, which will ensure the continued reliability for transportation of DSCs between DNGS and NSS-D.

- A new project has been initiated to replace the current Phased Array Ultrasonic Testing system for DSC lid-to-base welds.

2.0 Business Plan

The renewal of the NSS-D waste facility operating licence will provide support to the DNGS operations for the next 30 years. The DNGS is currently undergoing the refurbishment of its four reactors. As a result of this refurbishment, the ILW is packaged and stored at the Retube Waste Storage Building at NSS-D and the 30 more years of used fuel will be processed and stored in the UFDSB/UFDSSs at NSS-D or stored directly in a permanent disposal facility.

The nomenclature change from UFDSB to UFDSS for #3 and #4 will provide flexibility in design for the storage of used fuel, while still meeting all applicable regulatory requirements and licence conditions.

Once the permanent waste disposal facilities become operational, used fuel and ILW will be transported to them for permanent disposal. The permanent disposal facilities for used fuel and ILW are expected to be in service by 2043. NSS-D will be decommissioned after all of the used fuel and ILW at NSS-D is transferred to a permanent waste disposal facility.

3.0 Safety and Control Areas

3.1 Management system

The Management System establishes the processes and programs required to ensure an organization achieves its safety objectives, continuously monitors its performance against the objectives and fosters a healthy safety culture.

3.1.1 Relevance and management

The OPG Nuclear Management System defines the organizational structure, roles and responsibilities, applicable programs, and the interfaces amongst them. It applies to all OPG Nuclear facilities, including the NSS, which includes NSS-D, NSS-Pickering and NSS-Western.

The Nuclear Management System establishes the required programs and processes to ensure that all OPG Nuclear facilities define the necessary safety objectives, continuously monitor performance against these objectives, and foster a healthy Nuclear Safety and Security Culture.

Nuclear Safety and Security Policy

The Nuclear Management System receives its direction from the policies set by the OPG Board of Directors.

OPG's Nuclear Safety & Security Policy was established in recognition that nuclear power poses unique hazards due to the enormous energy in the reactor core, radioactive material and decay heat produced by the fuel.

Nuclear Safety is the protection of workers, public and the environment from these hazards. Nuclear Security is aimed at preventing intentional acts that might harm the facility or result in the theft of nuclear materials. The policy's goal is to protect the public, workers, and the environment from these hazards.

The policy's objective is to ensure that Nuclear Safety and Security culture is the overriding priority in all activities performed in support of OPG Nuclear facilities. Nuclear Safety shall have clear priority over schedule, cost, and production. To meet these objectives, OPG Board of Directors established that everyone shall demonstrate respect for nuclear safety and security and exhibit the following traits of a healthy nuclear safety and security culture:

- Personal Accountability
- Questioning Attitude
- Effective Safety Communication
- Leadership Safety Values and Actions
- Conservative Decision-Making
- Respectful Work Environment
- Continuous Learning

- Problem Identification and Resolution
- Environment for Raising Concerns
- Work Processes
- Vigilance

These traits are continuously reinforced, promoted, and applied by staff in all work performed. Many of the daily meetings that occur at NSS-D involve a discussion of the nuclear safety and nuclear security traits and sharing of good practice respecting the application of these traits or an experience where application of these traits could have been better utilized.

Nuclear Safety and Nuclear Security will continue to be the top priority at OPG, NSS and NSS-D.

Nuclear Management System Charter

The OPG Nuclear Safety & Security policy is implemented through a series of governing documents, which together form the Nuclear Management System. The highest management system governing document is the Nuclear Management System Charter (the Charter). The Charter establishes the programs that support the day-to-day, safe, reliable operation of the OPG Nuclear facilities. The Charter defines the organization responsibilities, interfaces, and applicable programs to satisfy all legal and regulatory requirements to achieve planned results.

The effectiveness of the Nuclear Management System implementation is monitored through a series of activities, including external and internal audits; performance metrics designed to capture the key outcomes of the programs; management assessments; corrective action and continuous improvement processes, including benchmarking of industry best practices. All of these activities allow OPG to identify continuous improvement opportunities to improve performance and make its operations safer and more reliable.

Change Management

Within NSS, Change Management is being applied as per the intent of OPG's Standard on Managing Change. Key decisions and change initiatives are tabled at the monthly Senior Management Board meetings. If Change Management plans are required, the Senior Management Board ensures that risk, impact, and integration of changes that pose a higher risk to the organization are prioritized and receive continual oversight.

Nuclear Safety Culture

OPG routinely monitors the health of its Nuclear Safety Culture through Nuclear Safety and Security Culture Monitoring Panels. These panels were established based on nuclear industry best practices. The OPG Nuclear Safety Culture Monitoring Panels examine information from a variety of the programs and processes that have been implemented, such as the:

- Corrective Action Program
- Human Performance Program
- Audits and Self-Assessments
- External inspections (such as CNSC inspections)
- Industry evaluations
- Employee concerns
- Business performance monitoring

This information is evaluated against the Traits of a Healthy Nuclear Safety Culture to identify strengths and areas for focused attention within the organization. The panel is composed of the managers and senior leadership within Nuclear Sustainability Services. The panel evaluates the information, approves initiatives, and reinforces communications as needed, to maintain and improve Nuclear Safety Culture.

In 2018 a Nuclear Safety Culture Assessment was performed, based on information from a review of Station Condition Records and other documents, an extensive survey sent to all NWM division personnel, along with interviews and field observations. The assessment found that NWM division has a strong and healthy Nuclear Safety Culture, respect for nuclear safety and does not allow nuclear safety to be compromised by production priorities.

Areas for further improvement include timeliness of problem resolution, the use of the change-management process, and maintaining up-to-date documentation.

Other nuclear safety culture assessment findings were addressed by:

- Increasing communications to front line staff around issue resolution.
- Creating a change management committee.
- Integrating change management practices into existing meetings and processes.
- Establishing metrics and actions to monitor and track the ongoing health of the documentation status.

NSS Nuclear Safety and Security Culture is currently undergoing a divisional assessment in October 2022 in accordance with OPG's Nuclear Safety and Security Assessment procedure and the results will be shared with applicable stakeholders. The assessment is conducted every five (5) years in accordance with regulatory requirements REGDOC -2.1.2, *Safety Culture*.

The NSS Waste Review Board, now called the NSS Nuclear Safety Review Board, conducted an assessment visit in April of 2022. The Nuclear Safety Review Board identified five (5) findings and three (3) insights as part of their assessment. A response and action plan were created as an output to the assessment. These actions are currently on track.

Business Continuity Program

The purpose of the business continuity program is to define the key program elements, objectives, roles, and responsibilities, with the overall goal to ensure OPG has strategies in place to prepare for, respond to, and recover from emergencies that have the potential to impact operations or the public and the environment. Approved strategies are intended to:

- Protect employee and public health and safety.
- Limit significant impacts to the environment, as well as to OPG's assets, reputation, and operational continuity.
- Maintain financial viability.

To ensure OPG's business continuity, OPG performs business impact analyses and develops business continuity plans as required, in response to the analysis. This involves conducting a risk analysis of the impacts that a temporary disruption of a process would have on the company. Business continuity plans are established to mitigate the identified risks, if necessary.

Pursuant to this process, NSS conducted a business impact analysis. This analysis shows that if NSS processes were unavailable for several weeks, there would be no notable consequences to operations or the public. As the activities were assessed to be low risk, specific business continuity plans were not developed for NSS-D.

Management of Contractors

OPG has extensive experience in the use of contractors to engineer, procure, and construct new facilities or to implement design improvements to OPG's existing facilities. The process for oversight of contractors has been proven effective, as demonstrated through the Darlington Refurbishment Project for Units, 1, 2 and 3.

Contractors are qualified by OPG Supply Chain Quality Services, under a process that ensures each contractor has developed and implemented a management system that meets the applicable requirements outlined in CSA N286-12. The contractors are assessed by OPG for capability of working at OPG Nuclear facilities. This is completed by OPG through an audit of the contractor processes, to ensure they can perform the necessary work, with OPG oversight as the licensee at each stage. Once OPG is assured of their capabilities, contractors are placed on OPG's approved suppliers list, as approved contractors.

The contractors that OPG uses have experience with the nuclear industry and with OPG. They have proven capability to meet the quality standards necessary for a nuclear facility, such as NSS-D. OPG's Items and Services Management program includes provisions for extending applicable quality requirements to sub-contractors. OPG requires that all sub-contractors work under the contractor's quality program, to ensure there is an assurance that the agreed upon quality standards and expectations will be met, regardless of who is performing the work in the field. Field surveillance and verification activities are performed by OPG personnel to ensure that the quality program requirements are being achieved.

Where possible, OPG will temporarily turn the contractor work area over to the contractor, as a Construction Island where the contractor assumes the role of "*Constructor*" as defined in the *Ontario Occupation Health and Safety Act*. As Constructor, the contractor assumes responsibility and liability for conventional safety and environmental safety associated with the contractor work. The contractor produces a site-specific Health and Safety Plan and Environmental Safety Plan, which is accepted by OPG prior to the contractor work start. Radiation protection remains the responsibility of OPG.

Where a construction island is not feasible, OPG maintains the role of Constructor and provides oversight to the contractor. In this case, all contractor work will be carried out in accordance with OPG processes and procedures. OPG maintains responsibility and liability for conventional safety, environmental safety, and radiation protection of the contractor work.

OPG retains the responsibility that the facility remains compliant with the operating licence. As such, OPG is accountable to the CNSC to provide the required assurances that the health, safety, and security of the public, workers, and environment are protected. This accountability cannot be delegated through contractual arrangements.

Organizational Chart

The Vice-President, Nuclear Sustainability Services has the authority to act for OPG in dealings with the CNSC and is responsible for the management and control of licensed activities at NSS-D. The day-to-day operations and management of NSS-D is the responsibility of the Darlington Used Fuel Operations Manager, who reports to the Director of Eastern Operations & Deep Geologic Repository. Only those persons authorized by the Darlington Used Fuel Operations Manager supervise operations at NSS- D.

NSS-D receives direct support from the central functions, such as Conventional Safety, Radiation Safety, Environment, Security, Regulatory Affairs, and others.

OPG submits updates to CNSC on persons authorized to act on behalf of OPG in dealings with the CNSC, as required per Subsection 15(c) of the *General Nuclear and Safety Control Regulations*. The organization chart for NSS-D and supporting center-led organizations is provided in Addendum A.

3.1.2 Past performance

During the current licence period, NSS-D continued to improve the Nuclear Management System, to make it more effective and efficient by becoming compliant with the requirements of CSA N286-12, *Management System Requirements for Nuclear Facilitie*s.

OPG has made the following improvements to the Corrective Action Plan Process, which includes problem identification, resolution, and trending:

- Regular Management Review Meeting pre-screening, Management Review Meeting and Corrective Action Review Board meetings.
- Creation and implementation of pre-screening, Management Review Meeting and Corrective Action Review Board expectations specific to NSS.
- Development of a pre-job briefing for all pre-screening and Management Review Meeting members to sign to ensure participants understand their roles and accountability.
- Execution of Learning Pauses and education campaigns with regard to Station Condition Records/Corrective Action Plans.
- Development of new trend codes and Line Management Codes specific to NSS.
- Implementation of the Trend Watch List and Validation of Trends for items that are identified as emerging or cognitive trends.
- Use of OneNote for pre-screening, Management Review Meeting and Corrective Action Review Board packages allows members to review the package before the meeting and add any comments or challenges making the meeting more efficient.
- Workshops on Station Condition Record dispositioning/timelines.
- Review of Power BI at pre-screening/ Management Review Meeting to review Station Condition Record assignments and other milestones coming due in real-time.

Fleetview Program Health and Performance Reporting

Fleetview Program Health and Performance Reporting (or simply Fleetview) is a Management System review process, created to monitor and routinely report on the effectiveness of each program defined within the Nuclear Management System Charter, for all nuclear power generating stations and nuclear waste management facilities.

Each program executing the Nuclear Management System is reviewed in accordance with management system principles in three defined areas including oversight and leadership, execution performance, and program action plan. This review is conducted by the Nuclear Executive Committee on a pre-established review schedule, and enhancements or new initiatives are identified based on performance.

The annual Fleetview process includes OPG's Nuclear Sustainability Services facilities (including NSS-D) and nuclear power plants, as applicable.

Change Management

In 2021, the NWM division became NSS. Simultaneously, NSS changed the name of their three facilities: formerly Pickering Waste Management Facility, Darlington Waste Management Facility and Western Waste Management Facility, now Nuclear Sustainability Services – Pickering, Darlington and Western. NSS has developed a change management plan that includes all the changes to the Nuclear Management system required to rename the division and three facilities. Per OPG's Organizational Design Change procedure the change management plan will ensure the risks related to these changes are managed and the regulatory requirements met. The changes are being implemented and will be evaluated for effectiveness, in alignment with OPG's Standard on Managing Change. The change management plan is being tracked as an initiative within the NSS Strategic Plan Portfolio. NSS expects to satisfy the initiative's actions and meet the overall intent of the change management plan by Q4 2028.

3.1.3 Future plans

NSS-D will continue to make incremental improvements in work processes and program implementation through the:

- Continued adoption of OPG Nuclear governance as appropriate,
- Ongoing use of OPG's Fleetview Program Health and Performance Reporting to assist with overall program effectiveness,
- Management of the business to ensure a focus on long-term sustainable performance excellence, and
- Development of leadership and management capability at all levels of the organization with a focus toward teaching and learning moments.

OPG does not foresee, during the next licensing period, any significant changes to the Nuclear Management System.

3.1.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.1.5 Requests

OPG is requesting a name change from the DWMF to NSS-D. OPG has developed and implemented a change management plan that will ensure that the name change is reflected in governance documents and other procedures for NSS-D.

3.2 Human performance management

Human performance covers activities that enable the development and implementation of processes that ensure that staff is sufficient in number in all relevant job areas and have the necessary knowledge, skills, procedures, and tools in place to safely carry out their duties. The objective of a Human Performance Program is to promote, reward and improve behaviours throughout the organization that support safe and reliable facility operations.

The management of human performance enables a proactive approach to event reduction through examination of error precursors, flawed defenses and latent organizational weaknesses and fosters a learning organizational culture whereby consequential events are reduced by understanding the reasons mistakes occur as well as learning from success.

NSSs' goal is to reduce human performance events by managing our defences in pursuit of zero events of consequence.

3.2.1 Relevance and management

NSS, and hence NSS-D, follow the OPG Nuclear Human Performance program. OPG's goal is to continually reduce the frequency and severity of events through the systematic reduction of human error and the management of defences in pursuit of zero events of consequence. The key principles that are the foundation for the OPG Nuclear Human Performance program are:

- People are fallible.
- Error-likely situations are predictable, manageable, and preventable.
- Individual behaviour is influenced by organizational processes and values.
- People achieve high levels of performance based largely on the encouragement and reinforcement received from supervisors, peers, and subordinates, and
- All events are preventable.

The Human Performance program includes tools that have been developed to reduce error, to establish and maintain defences, to identify and resolve latent organizational weaknesses, for early identification and response to precursors, and to identify and implement necessary improvements. Through systematic identification and resolution of error-likely situations, reduction of organizational vulnerability to errors and events and enhancement of defenses, NSS-D continually improves organizational effectiveness as best practices are implemented with respect to enhancing behaviours and learning.

The program objective of the Human Performance program is to continually reduce the frequency and severity of events through the systematic reduction of human error and the management of defenses in pursuit of zero events of consequence.

The program includes the behavioural expectations that guide worker activities, the supervisory activities that are applied to observe, recognize, and improve behaviours, and the reporting and evaluation activities that are used to assess performance and identify needed improvement initiatives.

The key program elements are:

- Pre-Job Brief/Safe Work Plan and Post-Job Debriefing
- Procedural Use and Adherence
- Communications
- Self-Check
- Conservative Decision-Making
- Second Party Verification
- Event Free Challenge Process
- Human Performance Event Communication and Analysis
- Site and Department Level Event Free Day Resets
- Observation and Coaching
- Benchmarking Activities

NSS-D complies with REGDOC-2.2.2, *Personnel Training* and OPG's Nuclear Training program as it develops and maintains competent personnel to safely operate, maintain, and improve plant performance, and drives human performance improvements in a cost-effective manner.

Operations, maintenance, and support staff are trained and qualified under OPG's Nuclear Training program. The staff training and qualifications includes initial training, on-the-job training, and evaluation. This training is then maintained by periodic re- qualification and refresher training as appropriate.

A training plan is developed for each occupation using a systematic approach to training, which identifies the training needed to meet the skill and knowledge requirements of the position. Specialized training is provided where appropriate. The employees' training status is maintained in a Training Information Management System.

The Training program is closely linked to the Human Performance program. Enhanced or focused training is often utilized in the effort to improve safety and reduce errors at NSS-D. The human performance expectations are built into the training courses; for example, the nuclear general employee training that is taken annually by all employees contains human performance content.

Leadership Training

OPG has very robust leadership training programs to systematically develop and maintain competent leaders to safely operate, maintain, and improve plant performance, and to drive continuous improvements in human performance.

A committee of senior nuclear leaders ensures nuclear leadership initiatives are implemented and managed to develop the core accountabilities of nuclear supervisors. This includes the processes for the selection, training, orientation, induction, and development of supervisors to achieve the desired attributes, behaviors, and performance.

The OPG initial leadership training programs recently underwent modifications to consolidate the curricula to a single fleet approach. Training content is tightly aligned with OPG's values and behaviours. Safety Culture remains an essential element in the nuclear supervisor curriculum. The initial leadership training syllabus incorporates a blended approach to learning, pairing classroom training with on-the-job learning periods. Managers are selected to serve as classroom mentors to reinforce standards and expectations using real life experiences. Trainees attend an entire classroom program in cohorts, which contributes to effective teamwork and cohesion for in-class work and on-the-job application. Subsequent to initial training, the leadership continuing training program is run annually, reinforcing safety and leadership skills refreshment.

All managers participate in a one-day workshop on Nuclear Safety Culture for Managers. Structured, level-specific Job Familiarization Guides are utilized to support leaders taking on new roles the Nuclear organization. The purpose of these guides is to provide supervisors with a suggested approach to better understand how their role relates and interacts with relevant stakeholders to execute work, develop strong relationships with stakeholders, broaden understanding of the scope of their role, and achieve excellent performance earlier in role. This process results in a consistent approach to building leaders, enhancing leadership capability, and qualifying new managers.

Fitness for Duty

OPG became compliant with the requirements in REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue* during this licensing period. OPG's Hours of Work Limits and Managing Worker Fatigue procedure describes provincial and CNSC expectations to manage worker fatigue which is applicable to all of Nuclear including NSS-D.

Under this procedure, supervisors are required to ensure that their employees are aware of their prescribed limits and are also responsible for monitoring their employees' hours of work. The process requires that employees are aware of their time limitations, track work hours and promptly notify the first line manager in advance of a potential violation.

OPG also became compliant with the requirements in REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use*, with the exception of paragraphs 5.1 and 5.5 for pre-placement testing and random testing, during this licensing period. OPG's Fitness for Duty: Policy on Managing Alcohol and Drug Use policy, sets out specific requirements for all workers to address alcohol and drug use and possession at all times while workers are engaged in company business, when on company premises and worksites, and/or when operating vehicles and equipment in the course of their duties for the company. This Policy includes alcohol and drug testing for certain categories of workers, including the regulatory requirements in REGDOC-2.2.4, Volume II, *Fitness for Duty:*

Managing Alcohol and Drug Use. The REGDOC includes random and pre-placement testing for certain workers, but these two types of testing are currently on hold, following an Order from the Federal Court of Canada that the implementation of paragraphs 5.1 (pre-placement testing) and 5.5 (random testing) of the REGDOC be stayed pending final disposition of the employee unions' Application for Judicial Review. This Policy forms one part of our overall approach to managing Fitness for Duty.

In addition, OPG has in place a Continuous Behaviour Observation Program which trains supervisors and managers to monitor workers for signs of fatigue or other factors which could adversely impact worker performance.

OPG Security monitors all personnel entering the protected area for indications of persons being unfit for duty or under the influence of intoxicants. If they suspect a worker is unfit, they deny their access to the facility. OPG is using periodic canine drug monitoring at security entry points as an additional barrier to ensure the fitness for duty of all staff entering the protected area.

Performance Monitoring

Industry standard performance measures are used to monitor human performance. In addition, coding is applied to station condition records created as part of the corrective action program that supports monitoring human performance related trends.

The overall effectiveness of the Human Performance program is measured through the analysis of events that occur to determine whether the event free operations "clock" should be re-set. The resets are divided into Site and Department levels based on their consequence. The more significant events, that have high consequences in terms of safety or production, are identified as Site Event Free Day Resets. Less significant events, that are potential precursors to site level events, are considered to be Department Event Free Day Resets. Each reset triggers an analysis process to identify any systemic, organizational, or behavioral deficiencies that contributed to the event as well as communication within the organization for awareness and lessons learned in effort to reduce occurrence. In addition, human performance events that do not meet Department Event Free Day Reset criteria and scrutinized for analysis and communication where appropriate and captured as Crew Learnings. Crew Learnings facilitate application of learnings from lessor consequence events in efforts to help reduce the potential for those of greater significance.

Events that are not Event Free Day Resets are assigned human performance codes in the Station Condition Record process and trended to identify patterns of systematic, organizational, or behavioural error precursors or flawed defenses. If there is an ongoing or adverse trend, this is analyzed and appropriate actions are taken to address the adverse condition.

Each year, for the resets that have occurred, the results of the review of the trend codes are assessed, and the responding initiatives are developed.

3.2.2 Past performance

NSS-D Event Free Day Resets

During the current licensing period, there was one reportable Event Free Day Reset at NSS-D in 2018. During the performance of maintenance on power supplies, the IAEA and the CNSC were incorrectly informed that the safeguards equipment would be powered through normal power supplies.

Instead, the normal power supply was isolated and the safeguard equipment had to use the equipment's built-in back up battery power. Normal power was returned when the power supplies were restored the next day.

An incorrect assumption was made that work protection that was used for this work was similar to one used for previous maintenance. Instead, the work protection that was used isolated the safeguards equipment from the normal power supply.

OPG Fleetwide Strategic Plan

An OPG fleetwide strategic plan is developed each year in response to Human Performance trends and events noted in the previous year. The strategic plan is also influenced by industry developments and emerging best practices in sustaining high levels of Human Performance. The strategic plan can focus on improving human performance at the level of individual performance, supervisory performance, or on improving an aspect to enhance organizational effectiveness.

3.2.3 Future plans

The Human Performance Program includes an ongoing aspect of reviewing performance and identifying the areas for improvement that would benefit from planned enhancements. Best practices from the nuclear industry will also continue to be evaluated and incorporated into the programs where there is an identified benefit.

3.2.4 Challenges

Human performance is a process of continued improvement and builds on experience. Annual self assessments of Human Performance are being completed to determine any gaps and provide actions driven by the corrective action program.

3.2.5 Requests

OPG requests that the random and pre-placement testing as required under REGDOC-2.2.4, Volume II *Fitness for Duty: Managing Alcohol and Drug Use* be noted as TBD in the Licence Conditions Handbook, based on the Federal Court of Canada's order that the implementation of paragraphs 5.1 (pre- placement testing) and 5.5 (random testing) of the REGDOC is stayed pending final disposition of the employee unions' Application for Judicial Review.

3.3 Operating performance

The Operating Performance Safety and Control Area includes an overall review of the conduct of the licensed activities and the activities that enable effective performance.

3.3.1 Relevance and management

Operating Performance is supported by three OPG programs: Operating Policies and Principles, Conduct of Regulatory Affairs program, and the Performance Improvement program.

Performance Improvement Program

The purpose of the Performance Improvement program is to define the key program elements, objectives, roles, and responsibilities, with the overall goal to ensure that problems are corrected or dispositioned with a level of rigor and formality commensurate with their risk significance.

The program objectives are to establish the processes that support the conduct of performance improvement and, by extension, employ the principles of problem prevention, detection, and correction at OPG Nuclear. The implementing processes described by this program allow for the proactive identification and resolution of potential issues, or opportunities for improvement, as well as the prompt identification of adverse conditions. This includes non-conformances, deficiencies, or conditions that adversely impact – or may adversely impact – plant operations, personnel, nuclear safety, the environment or equipment and component reliability.

For those problems deemed to be of a high level of significance or systemic in nature, these processes ensure appropriate levels of management are notified, causes identified, actions taken to minimize or prevent recurrence and lessons learned communicated. Actions taken to address the identified causes of significant or systemic problems are verified to be complete and effective.

Independent Assessment Program

The Nuclear Oversight organization audits the nuclear management system as required by CSA N286-12 and in accordance with OPG's independent assessment program. Nuclear Oversight has implemented a risk-based auditing process for the nuclear management system that ensures the highest risk programs and activities receive a higher frequency of oversight. The Nuclear Oversight organization's five-year audit plan identifies the audits to be conducted in any given year.

Findings from the independent audits are resolved through OPG's corrective action program. The results of all audits are reported directly to the Chief Nuclear Officer and OPG Board of Directors.

Self-Assessment and Benchmarking

The self-assessment and benchmarking process is part of Performance Improvement program. The purpose of this process is to ensure continuous improvement and comparison with industry best practices. The self-assessments are carried out internally to a division or department, to assess its performance for efficiency, safety, or to investigate events for purposes of improvement.

The self-assessment and benchmarking process requires that OPG Nuclear management plan divisional and departmental level benchmark objectives and schedule self-assessments against these objectives, for each upcoming year.

OPG participates in a number of industry peer groups, facilitating good opportunities to benchmark OPG Nuclear programs and processes with other utilities. Similarly, peers from other utilities visit OPG facilities to gain insights. These relationships are important to ensure OPG continues to gain insight into industry best practices.

Event Reporting

For events at NSS-D that are determined to be reportable to the CNSC, OPG follows the requirements in REGDOC-3.1.2*, Reporting Requirements, Volume I: Non-Power Reactor Class I Facilities and Uranium Mines and Mills.* Preliminary reports are submitted within five (5) days after verbal notification to the CNSC, followed by a full report which is submitted within twenty-one (21) days after verbal notification to the CNSC.

During the current licensing period, since 2013, there were thirty-three (33) CNSC reportable events at NSS-D. OPG reportable events are also posted on OPG's public website at www.opg.com.

3.3.2 Past performance

NSS-D Operating History

During the current licence period, between 2013 and June 30, 2022, the number of DSCs received, processed, and safely stored each year at NSS-D in UFDSB #1 and UFDSB #2 is presented in Table 2 and the number of RWC/DSOs received and safely stored each year at NSS-D in the RWSB is presented in Table 3.

During the current licence period, as of June 30, 2022, there are 93 RWC/DSOs from DNGS Unit 2 refurbishment and 89 RWC/DSOs from DNGS Unit 3, which are now complete. Also stored at the RWSB are three RWC/DSOs containing contaminated tooling. From Unit 2 to Unit 3 refurbishment, efficiencies were gained to reduce the number of RWC/DSOs to store refurbishment waste.

Empty DSCs and those loaded with used fuel are transferred between the DNGS and NSS-D. As of June 30, 2022, during the current licensing period, 568 DSCs have been transferred between the DNGS and NSS-D without incident. During the entire operational period of NSS-D (since 2007), 821 DSCs have been

transferred between the DNGS and NSS-D.

The RWSB has been in service since 2017. As of June 30, 2022, 185 RWC/DSOs have been safely transferred to the RWSB at NSS-D from the DNGS.

Table 2: Loaded DSCs Received at NSS-D between Quarter 1, 2013 and Quarter 2, 2022

Year	Number of DSCs
2013	60
2014	60
2015	63
2016	65
2017	63
2018	57
2019	59
2020	59
2021	58
2022 (end of Q2, June 30th)	24
TOTAL	568

Table 3: Loaded RWC/DSOs Received at NSS-D between Quarter 1, 2013 and Quarter 2, 2022

Year	Number of RWC/DSOs
2013	0
2014	0
2015	0
2016	0
2017	29
2018	64
2019	0
2020	0
2021	92*
2022 (end of Q2, June 30th)	0
TOTAL	185

* Three RWC/DSOs contain contaminated tooling.

DSC Reverse Loading

In the current licence period, OPG demonstrated that all the required DSC reverse loading steps, to safely return fuel to the irradiated fuel bay, can be performed should it be required. This is a precautionary step, to ensure flexibility and safety in reverse-operations and removing fuel, if necessary.

This demonstration included full weld removal using a combination of arc gouging, chipping, and grinding. Full weld removal was confirmed by performing a freedom of movement check using a feeler gauge to confirm that the DSC lid was separated from the base. Removal of used fuel from a DSC was performed where a partially loaded DSC was submerged in the irradiated fuel bay and one of the used fuel modules (containing 96 fuel bundles) was removed. The remaining steps in the reverse loading process include craning and transfer of the DSC, which are routine operations performed regularly at NSS-D.

DSC Spare Weld Head

A spare weld head for the DSC welding system was procured and commissioned in October 2016. The spare weld head increases the reliability of the DSC lid to base welding program and is available to support the operational requirements across the NSS fleet.

Operations Reports

NSS-D submits Quarterly Operations Reports and Annual Compliance Reports to the CNSC. All reports have been submitted to the CNSC on time and comply with the NSS-D licence conditions handbook and REGDOC-3.1.2 requirements.

3.3.3 Future Plans

The following future improvements are planned for NSS-D:

- Construction of UFDSS #3, with an anticipated in-service date of 2025/2026, to support continued operations at the DNGS.
- Construction of UFDSS #4, with an anticipated in-service date of 2031 or later, to support continued operations at the DNGS.
- DSC lid to base welding process is anticipated to gain efficiencies. NSS-D will plan to implement in alignment with NSS.
- Development and procurement of a next generation DSC welding machine, to assist with efficiencies and overcome obsolescence challenges of the current machines. This welding machine is anticipated to be available in 2024.
- Procurement of two new DSC Transporters has been initiated, which will ensure continued reliability for transportation of DSCs between the DNGS and NSS-D.

3.3.4 Challenges

NSS continually pursues efficiencies within the DSC production processes in order to meet future DSC loading targets without compromising safety.

3.3.5 Requests

There are no changes being requested at this time with respect to operating licence conditions associated with this safety and control area.

3.4 Safety analysis

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 objective of the Safety Analysis is to evaluate the risk and consequences of normal operations as well as credible abnormal events to ensure that the facility does not pose an unacceptable risk to workers or the public. The results of the Safety Analysis are used in the development of the operating limits and conditions for a facility.

3.4.1 Relevance and management

To assess the overall safety of the operation of NSS-D storage buildings and structures, safety analyses are completed. Safety analyses and assessments of structures, systems, components, or facilities are carried out to determine the radiological doses to workers and to the public as a result of normal operations as well as credible abnormal events and to ensure that the doses are maintained within acceptable limits. Computational tools are used for the dose consequence calculations when required. Bounding (worst-case) accident scenarios are conservatively identified, and the results of off-site dose calculations are compared against acceptance criteria. Safety assessments are presented in each nuclear waste facility safety report, which also provides an overview of the facility design and operations.

The Nuclear Waste specific safety analysis process was adopted by the OPG Reactor Safety program effective March 31, 2015. The objective of the Reactor Safety program is to define the organizational responsibilities and key program elements for the management of issues related to nuclear safety analysis. Specifically, as it relates to nuclear waste management, the program provides a basis for the performance of nuclear safety analysis and outlines the governing documents that define the processes associated with maintaining the safety analysis and safety reports supporting the operation of nuclear waste facilities.

3.4.2 Past performance

The NSS-D safety report is reviewed every five years and updated as required to reflect changes in site layout, operational experience and information supporting the assumptions made in the assessments. The safety report update process encompasses the systematic identification of safety issues, their prioritization, their resolution, and the physical updates of the safety report. The safety report is updated in accordance with the NSS-D waste facility operating licence, Licence Condition 4.1.

OPG submitted the current version of the NSS-D safety report to the CNSC in 2016 and it was issued in 2017 after CNSC comments were addressed. There is also a safety report annex describing the refurbishment waste storage activities in the RWSB, which was updated and issued in 2017 after CNSC comments were addressed.

These safety reports demonstrate that dose rates and emissions from the NSS-D under normal conditions as well as for credible abnormal events do not result in unacceptable radiation doses to the public or to workers.

The NSS-D safety report was updated in 2021 and sent to the CNSC for comment. The updated safety report combines the safety report with the safety report annex.

Safety Analysis Methodology

The methodology for performing safety assessments is routinely assessed and updated. The DSC dose rate analysis methodology has been updated to incorporate the use of the Monte Carlo N-Particle (MCNP™) transport code. Figure 16 provides an example of an MCNP dose rate plot of radioactive waste in a container. DSC models (including fuel) and RWC/DSOs have been updated to better represent actual geometries, and analysis assumptions continue to be reviewed to ensure reasonable conservatisms exist. This demonstrates OPG's goal of continuous improvement. These improvements are reflected in the safety report updates when they are completed.

CSA N286.7-16, *Quality Assurance of Analytical Scientific, and Design Computer Programs* was implemented at NSS-D during the licensing period. Software programs used in support of safety analysis are compliant with CSA N286.7-16.

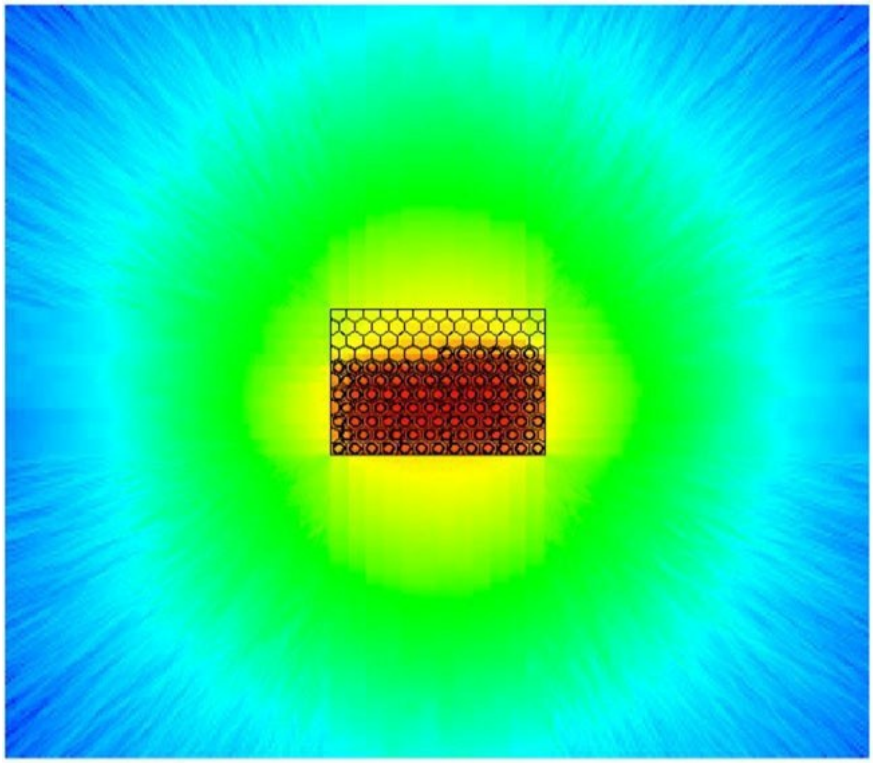


Figure 16: Example of an MCNP Dose Rate Plot of Radioactive Waste in a Container

Used Fuel Dry Storage Safety Analysis - Normal Operating Conditions

Dose rate analysis is performed to calculate dose rates from DSCs, both inside and outside of storage structures. Dose rates external to the structures are calculated for workers on-site and for members of the public off-site. In all cases, predicted dose rates inside NSS-D, at the site boundary and for the nearest public populations are estimated to result in doses well below the CNSC regulatory dose limit for a Nuclear Energy Worker (50 mSv/year) and well below the regulatory public dose limit (1 mSv/year).

Used Fuel Dry Storage - Safety Assessment of Credible Abnormal Events

The assessment of credible abnormal events considers the following main stages of the out-of-station used fuel dry storage operations:

- On-site transfer operations.
- Operations inside the DSC processing building; and
- DSC storage.

Each potential event was screened to determine if it could result in any radiological impact to the public and/or workers. Common mode incidents such as seismic events, tornados, etc. were considered. Design provisions and procedural measures that could prevent the event or mitigate its consequences were also evaluated.

Although considered very unlikely, for the on-site transfer, processing, and storage of DSCs (e.g., welding, inspecting, testing, sealing, and moving to storage), the bounding event was identified to be a drop of the DSC, with subsequent 100% fuel sheath failures and associated release of volatile nuclides to the environment. This is a very conservative scenario that results in calculated doses to both the public at the Darlington Nuclear site boundary and to workers on site being well below the regulatory dose limits.

Criticality

Criticality assessments have been completed for the used fuel stored in DSCs for NSS-D. Consistent with expectations for irradiated natural uranium fuel, the analyses and assessments have yielded adequate sub-criticality margin and have demonstrated that there can be no criticality of used CANDU fuel stored in DSCs.

Used fuel stored in DSCs cannot achieve criticality under normal conditions or under any postulated accident scenario at NSS-D.

Retube Waste Storage Building – Normal Operating Conditions

The RWSB has been designed and constructed such that OPG’s dose rate targets at the facility fence and at site boundaries are achieved. Dose rates in the RWSB area are routinely monitored and are shown to be within facility targets which results in worker and public doses remaining well below regulatory limits.

OPG commenced storing RWC/DSOs containing combined pressure tube and calandria tube waste at the RWSB in 2021. It has been a long-standing practice to remove pressure and calandria tubes individually during refurbishment. However, while planning for Darlington Unit 3 refurbishment, the process was adapted to withdraw the pressure tube and calandria tube at the same time. By removing both tubes simultaneously and containing the annulus spacers, the estimated amount of dose for personnel performing the work was greatly reduced. Also significantly reduced was the number of lifts required to transport the flasks for on-site volume reduction and waste processing.

A safety assessment for the storage of RWCs containing both pressure tube and calandria tube waste in the RWSB at NSS-D was completed and the results show that there will be no unacceptable impact on the health and safety of workers and the public as a result of storing this new waste configuration.

Retube Waste Storage Building – Credible Abnormal Events

Potential exposures from the RWSB as a result of credible abnormal events have been assessed and the bounding event was determined to be a drop of a container resulting in a release of radioactive material. Conservative estimates of the resulting public and occupational doses are well below regulatory limits.

3.4.3 Future plans

Support for Additional Structures

In the current NSS-D waste facility operating licence, there is provision and authorization for two (2) additional buildings to be built at the NSS-D site. OPG is requesting that “buildings” be replaced with “structures” in the new operating licence.

Prior to construction, safety assessments will be performed for these new structures, once additional design and specific location information is available. This is to ensure that the designs are adequate and that all radiological safety requirements provided in the *Nuclear Safety and Control Act* and its regulations, and the safety report are met. While designs of these structures are not currently finalized, OPG will ensure that the addition of these structures will not result in any doses to workers or the public that exceed regulatory limits.

Safety Analysis Update

Safety analyses are reviewed and updated as necessary prior to construction and prior to safety report updates, to confirm that the most up-to-date information is being used for the safety analysis, and to reaffirm that facility operations will not result in any unacceptable radiological consequences to the health and safety of the workers and the public, under normal operations and credible abnormal events.

Safety Report

The NSS-D safety report is updated and submitted to the CNSC every 5 years. The safety report was updated in 2021 and sent to the CNSC for review. The next revision is scheduled for 2026.

3.4.4 Challenges

OPG is continuously striving to use the most up-to-date methodologies for calculating dose to the public and to workers from normal operations as well as from credible abnormal events.

3.4.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

3.5 Physical design

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

NSS has robust processes to ensure that the physical design of NSS-D complies with the current safety basis and that all changes are authorized and performed in a controlled manner, and in accordance with the NSS-D waste facility operating licence.

3.5.1 Relevance and management

Design Management Program

NSS-D has a Design program that ensures the ability of systems, structures, and components to meet and maintain their design basis function. The Design program at OPG implements a series of processes, standards, and procedures for performing engineering work in a consistent manner across OPG Nuclear.

The Design Management program specifies requirements for:

- Management of prescribed activities appropriate for execution and control of required design, design support, and documentation for nuclear facilities and organizations owned by OPG Nuclear.
- Processes for creating or modifying documentation that requires controlling design basis and design outputs.
- Minimum set of documentation that identifies and describes design basis, design output, and design process.
- Procurement Engineering processes ensuring implementation and maintenance of the physical facilities meet the design basis requirements.

Engineering Change Control Program

All design changes are prepared and executed in accordance with the OPG Engineering Change Control process. The OPG programs and procedures have been written to ensure the Engineering Change Control process complies with CSA N286.0, *Overall Quality Assurance Program Requirements for Nuclear Power Plants*, and all relevant legal and regulatory requirements.

The objectives of this program are to provide guidance to ensure that all modifications to OPG Nuclear systems, structures, or components, including software and engineered tooling, are planned, designed, installed, commissioned, placed into service, or removed from service within the Safe Operating Envelope or Safety & Design Envelope, design basis, and licensing conditions.

Pressure Boundary Program

The Pressure Boundary program defines the managed process to control the quality of all pressure boundary activities at OPG Nuclear. It provides the requirements and defines the responsibilities for compliance with and maintenance of the Pressure Boundary Quality Assurance program and, provides the governance framework for the execution of field work activities. This is to ensure:

- OPG Nuclear retains the Pressure Boundary Certificates of Authorization necessary to perform Pressure Boundary activities.
- OPG Nuclear remains compliant with the nuclear station Power Reactor operating licences, Waste Facility operating licences, and applicable CSA Standards.

This program covers activities related to Pressure Boundary quality at nuclear facilities and support facilities. It is applicable to the following:

- Pressure-retaining systems, components, storage tanks and supports that are registered or eligible for registration with an Authorized Inspection Agency.
- OPG also actively participates in CSA N285.0/ B51 Technical Committees and the American Society of Mechanical Engineers Committees to support development of the Codes and Standards.

3.5.2 Past performance

Governance Alignment

In the previous licence application, NWM division committed to aligning its governance with OPG Nuclear governance by February 28, 2013. That commitment has been met and the Nuclear Waste specific programs for physical design have been superseded by the nuclear programs. The transition from legacy NWM division governance was accomplished through a managed process of governance management records that ensured a controlled and thorough adoption process. Under the Physical Design safety and control area in the current Licence Conditions Handbook, all references to Waste-specific OPG governance were removed and only Nuclear-wide OPG governance is listed.

Pressure Boundary Code Classification

Immediately prior to issuance of the current licence, NSS improved its pressure boundary related activities by completing code classification for all pressure-retaining systems at NSS-D. All work on classified pressure-retaining systems since then, including modifications, were completed under the Nuclear Pressure Boundary program. The Nuclear Pressure Boundary program is in compliance with the requirements of CSA N285.0 (2008 and Updates No. 1 and 2; and Annex N of N285.0-12 and Update No.1)

Projects

Various modifications have been executed with no impact on NSS-D's ability to operate within its safety envelope. These modifications have been undertaken to improve the overall performance of NSS-D and to improve safety in design and operations. Some of the significant modifications that were completed during the current licensing period are:

- The RWSB was designed, constructed and place in-service to facilitate the interim storage of primarily ILW resulting from the Darlington Refurbishment Project.
- The storage of ILW in the RWSB is achieved using RWC/DSOs to store the removed Pressure Tubes, Calandria Tubes, and associated hardware. These containers were designed, and many were constructed and placed in-service. Additional RWC/ DSOs will be constructed in preparation for waste from future units in the Darlington Refurbishment Project.
- UFDSB #2 was designed, constructed, and placed in-service to facilitate additional interim storage of used fuel on site. This building is similar in design to the existing UFDSB #1 and includes tie-ins to existing services.

All design changes during the current licence period have been in accordance with the *National Fire Code of Canada* (NFCC) 2010 and transitioned to 2015, the *National Building Code of Canada* (NBCC) 2010 and transitioned to 2015 and CSA N393-13, *Fire Protection for Facilities that Process, Store and Handle Nuclear Substances*.

Metrics

NSS has adopted the standard OPG Nuclear fleet metrics for physical design. The current suite of metrics includes measures of the health of the Engineering Change Control process within NSS. The quality of design products is monitored using recorded verification results and cold-body design review boards within NSS. A monthly report card is used to record and track performance and to ensure that corrective actions are being taken to address any weaknesses or deficiencies that are observed.

3.5.3 Future plans

Compliance

NSS-D follows the OPG Nuclear governance for pressure boundary. OPG Nuclear has an agreement with the CNSC that freezes the code effective dates of applicable pressure boundary codes and standards throughout the duration of the DNGS Refurbishment project. These frozen code effective dates are in place for NSS-D as well. Once the DNGS Refurbishment project is completed, the new code effective dates for applicable pressure boundary codes are to be accepted by CNSC staff and will be incorporated into OPG Nuclear governance. The NSS-D Licence Conditions Handbook will reflect the new code effective dates, as necessary, after that time.

New Structures

UFDSS #3 is currently in the preliminary design stage, with an anticipated in-service date of 2025/2026. It will be constructed in compliance with the waste facility operating licence and will follow OPG procedures and processes, including those in the Design Engineering program, Engineering Change Control program, and Pressure Boundary program.

UFDSS #4 design will be initiated in the future. The current planned in-service date is 2031.

3.5.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.5.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

3.6 Fitness for service

Fitness for Service covers activities that impact the physical condition of systems, components, and structures to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended design function when called upon to do so.

3.6.1 Relevance and management

Fitness for Service ensures the safety of the public and site personnel, protects the environment, and ensures that equipment reliability is maintained at high operating performance standards.

OPG is committed to maintaining NSS-D systems, structures, components, and equipment that are critical to the safe, reliable, and economic transportation, processing, and storage of nuclear waste in a fit-for-service state. The implementation of OPG's Equipment Reliability program and Integrated Aging Management program ensures the ongoing fitness-for-service of these systems.

The Equipment Reliability program looks after systems and components at NSS-D. The Aging Management program looks after structures (DSC Processing Building, UFDSB #1 and UFDSB #2) and specific equipment (DSCs and RWC/DSOs) at NSS-D.

Equipment Reliability

The purpose of the Equipment Reliability program is to define the key program elements, objectives, and roles and responsibilities, with the overall goal to ensure ongoing high levels of reliable performance of components important to nuclear safety, production, and environment protection.

The program objectives are to ensure there are very low numbers of component failures, degraded equipment condition is minimized, and redundancy is maintained on key systems.

Integrated Aging Management Program

The objective of the Integrated Aging Management program is to ensure that the condition of critical nuclear facility equipment is understood and that required activities are in place to ensure the health of these components and systems while the plant ages. This is accomplished by establishing an integrated set of programs and activities to ensure that the performance requirements of all critical station equipment are met on an ongoing basis.

3.6.2 Past performance

NSS-D is currently in compliance with the requirements in REGDOC-2.6.3, *Aging Management*.

System Performance Monitoring

Under OPG's Equipment Reliability program, system performance monitoring is performed on critical NSS-D systems to ensure the ongoing reliable operation.

System performance monitoring involves the trending of system performance and initiation of investigations or maintenance activities before failures occur. Process parameters, field observations, maintenance work order backlogs, Station Condition Records, inspection results and spare parts status are some of the typical sources of data for performance monitoring. Where appropriate, equipment critical to system reliability are identified and maintenance strategies for this equipment are prepared. Actions to maintain or improve system health are also prepared.

Meetings with facility management, including representation from key stakeholders, are routinely held to review system health status, maintenance strategies and improvement plans, and ensure alignment between these work

groups for the implementation of improvement plans. There are currently ten (10) systems at NSS-D that are included in the system performance monitoring plan. Ongoing management oversight of these plans provides assurance that the plans are being implemented and the improvements are being achieved.

Preventive Maintenance

Under OPG's Equipment Reliability program at NSS-D, recurring preventive maintenance activities are planned, scheduled, and executed according to the Preventive Maintenance program. The management and scheduling of preventive maintenance activities are completed using OPG's enterprise software system "Asset Suite", which also retains records of all maintenance tasks completed. Feedback inputs from maintenance staff and changes to preventive maintenance activities are managed through this software.

Non-routine maintenance (corrective maintenance) activities are requested, planned, and executed using the same software system. Significant corrective maintenance issues are identified and tracked to completion.

As part of system performance monitoring, the status of the maintenance program is routinely assessed and reported to facility management for their review. Metrics for the completion of preventive and corrective maintenance activities are presented, and Station Condition Records are initiated to address adverse conditions related to equipment health or the execution of maintenance activities. Corrective actions to address maintenance issues are provided for management approval and are monitored to completion.

DSC Aging Management

The DSC aging management plan addresses aging mechanisms, such as corrosion, which could potentially affect DSCs. Current aging management activities include:

- General visual check of the condition of the protective coating on the exterior of the DSC, with emphasis on the condition of the coating on containment welds.
- Periodic inspection and re-inspection of the base plates of a baseline population of DSCs.
- Monitoring of chloride levels, which have the potential to accelerate corrosion.

With the ongoing implementation of this Aging Management program, OPG is confident of DSC integrity throughout and beyond the next licence period. Specific results of the aging management activities are as follows:

- Condition of the coating on the containment welds and the DSCs themselves remain in good-to-excellent condition.
- No changes have been observed in the condition of the base plates between the time of their initial inspection and re-inspection.
- Measured chloride levels to date have a negligible effect on the potential corrosion of the DSC external surfaces.

RWC/DSO Aging Management

RWCs and DSOs have been included in the aging management screening process because of their susceptibility to aging degradation and the risk from an economic and environmental perspective. One DSO contains one RWC, and together they are referred to as RWC/DSO. These RWC/DSOs are safely stored in the RWSB, which has been in operation since 2017, at NSS- D.

During the interim storage, only DSOs will be inspected, since all RWCs are contained within DSOs. After an interim period, when dose rates have reduced and the DSOs have been removed, only the RWC will be inspected.

Field Engineering will conduct visual inspections every 5 years to check for rust marks, mechanical damage to paint, paint deterioration, and rust marks or evidence of water on the building floor. Chloride samples will be taken from top and sidewalls of RWC/DSOs and adjacent floor locations to determine chloride concentration every 5 years.

Structural Integrity Aging Management

OPG conducts various activities to ensure the structural integrity of the NSS- D storage structures, to protect the health and safety of persons and the environment. Activities include weld bay walls inspections and floor slab inspections.

Additionally, OPG conducts Phased Array Ultrasonic Testing (PAUT) to verify the integrity of the lid closure-weld on each loaded DSC received from Darlington Nuclear Generating Station.

Concrete Floor Slab Aging Management

NSS-D concrete floor slabs are inspected annually to monitor the structural integrity. Existing cracks that are greater than the acceptable criteria are monitored for growth. Any new cracks are identified and documented for corrective actions. The concrete slabs are in good condition and they are expected to remain so in the foreseeable future.

3.6.3 Future plans

OPG has planned a number of initiatives to address aging, obsolescence and to ensure ongoing Fitness for Service of critical systems, structures, and components through the next licence period. Some examples of future initiatives are as follows:

- A DSC transporter was refurbished and commissioned in June 2022. The DSC transporter is expected to be in service until December 2051.
- Procurement of two new DSC transporters has been initiated, which will ensure continued reliability for transportation of DSCs between Darlington Nuclear Generating Station and NSS-D.
- Periodic roof replacement will be undertaken at NSS-D starting with the DSC Processing Building and UFDSB #1.

- All six air conditioning units are expected to be replaced in 2023.
- New generation welding machines are expected to be commissioned starting 2024.
- A new project has been initiated to replace of the current Phased Array Ultrasonic Testing system by 2025.

3.6.4 Challenges

To address aging, obsolescence and to ensure ongoing fitness for service of critical structures, systems, and components, OPG has planned a number of initiatives outlined in section 3.6.3 in upcoming years.

3.6.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

3.7 Radiation protection

The over-riding objective of the Radiation Protection program at NSS-D is the control of occupational and public exposure to radiation. For the purposes of controlling doses to workers, this program has four implementing objectives:

- Keeping individual doses below regulatory limits.
- Preventing unplanned exposures.
- Keeping individual risk from lifetime radiation exposure to an acceptable level.
- Keeping collective doses As Low As Reasonably Achievable (ALARA), social and economic factors taken into account.

In terms of protecting the public, the Radiation Protection program prevents the uncontrolled release of contamination or radioactive materials from the site by controls and monitoring of people and materials.

These objectives are achieved through a rigorous approach to facility design and operation, with the intent that exposure to radiation is minimized through effective engineering barriers first and foremost, followed by administrative controls and worker training and personal protective equipment.

3.7.1 Relevance and management

Management Control over Worker Practices for Dose and Contamination Control

Performing radioactive work within NSS-D requires a systematic approach and is managed via the OPG Radiation Protection program, which includes the following processes:

- Limiting individual worker dose.

- Managing dose as a resource, in terms of constraints on work activities.
- Establishing facility design consistent with ALARA principles.
- Assessing hazards for planning and maintaining knowledge of conditions.
- Controlling the use of licensed radioactive devices and equipment.
- Planning all radioactive work, taking into account personnel, hardware, procedures, supervision, and the physical environment of the job.
- Facility access and working rights controlled through comprehensive training and qualification program.

The planning process includes the anticipation and evaluation of radiation hazards and the selection of appropriate protective measures and dosimetry. The degree of formalization of the planning process and the approval levels for a job are proportional to the potential for exposure. Plans include back-out conditions and contingencies. Radiation protection planning decisions are documented in a radiation exposure permit.

Radioactive contamination controls are in place to reduce occupational and public exposure, and to minimize the release of radioactive materials to the environment. The objectives are to prevent a loss of radioactive contamination control, to minimize the area affected if contamination occurs, and to restore the condition to acceptable levels as soon as possible. Figure 17 shows personnel contamination monitoring equipment used at NSS-D.

The NSS-D safely stores spent irradiated fuel and reactor core components from the DNGS's day-to-day operations and refurbishment activities. Through robust shielding and equipment design, the collective and individual doses to staff remain well below regulatory limits.

Figure 17: NSS-D Personnel Contamination Monitoring equipment

Radiation Protection Program Monitoring and Oversight at NSS-D

Performance indicators at NSS-D include measures commonly used in the nuclear industry and OPG defined indicators established for the purpose of monitoring particular program elements. These are captured in OPG's Electronic Performance Reporting systems as well as NSS scorecards and radiation protection indices. Specific measures include personnel contamination incidents, regulatory infractions, as well as dose performance versus dose targets. In addition to Fleetview reporting and assessments, the design and execution of the Radiation Protection program is subject to ongoing monitoring through mechanisms including but not limited to:

- Management review and assessment which includes:
  - Joint Committee on Radiation Protection, and
  - Monthly Management Oversight Meetings.
- Exceptional dosimetry and dose control device measurement results.
- Dose trends.
- Annual review of ALARA targets.
- Radiation Protection program self-assessments and independent audits.
- Investigation of events in which an Action Level has been exceeded, trending, benchmarking, and review of industry operating experience.
- Observation and Coaching and Human Performance monitoring of worker behaviours.

3.7.2 Past performance

Dose and Contamination Control

During the reporting period there have been no action level exceedances related to worker dose at NSS-D or any loss of contamination control events in excess of NSS-D's contamination control action levels.

The current action levels for dose to workers and for contamination control are shown in Table 4 and are documented in N-REP-03420-10011 *Occupational Radiation Protection Action Levels for Nuclear Waste Management Facilities*.

Table 4: Radiological Action Levels for NSS-D

Application	Action Level	Observations
A person receives an external whole body dose that equals or exceeds 0.5 mSv (50 mrem) above the Electronic Personal Dosimeter (EPD) dose alarm set point in a shift	0.5 mSv (50 mrem)	The Action Level is exceeded if a person receives an external whole body radiation dose of greater than 0.5 mSv above the planned dose per shift.
Total (fixed and loose) surface contamination levels greater than 37 kBq/m^2 (1 µCi/m^2) (beta-gamma) or 3.7 kBq/m^2 (0.1 µCi/m^2) (alpha) are found in Zone 1.	3.7 x 10^4 Bq/m^2 (1 µCi/m^2) [beta/gamma] 3.7x10^3 Bq/m^2 (0.1 µCi/m^2) [alpha]	The Action Level is exceeded if total contamination (fixed and loose) is found in excess of the corresponding values for beta/gamma or alpha radiological contamination.
A person receives a single intake of tritium oxide (tritiated water) in which the unplanned component of the initial concentration immediately after intake is estimated to equal or exceed 600 kBq/L (16 µCi/L) (representing a nominal unplanned exposure of 0.5 mSv [50 mrem]).	Single intake of tritium oxide of unplanned component of 600 kBq/L (16 µCi/L)	The Action Level is exceeded if a person receives a single intake of tritium oxide (tritiated water) in which the unplanned concentration immediately after intake is estimated to equal or exceed 600 kBq/L (16 µCi/L) which would represent a nominal unplanned exposure of 0.5 mSv or 50 mrem
A person receives an intake of a radionuclide other than tritium (in the form of tritium oxide) attributable to a single event that equals or exceeds 0.025 of an Annual Limit of Intake (ALI) as defined in International Commission on Radiation Protection (ICRP) 68 Dose Coefficients for Intakes of Radionuclides by Workers (representing a nominal unplanned exposure of 0.5 mSv [50 mrem])	Intake of a radionuclide (other than tritium oxide) do due to a single event that equals or exceeds 0.025 of an ALI (Annual Limit of Intake)	The Action Level is exceeded if a person receives an intake of a radionuclide other than tritium oxide due to a single event that results in a nominal exposure of 0.5 mSv or 50 mrem. The recommendations of CNSC staff with regards to ICRP-68 references will be updated in the next regular update of licensee document N-REP-03420-10011. This technical alignment will not impact the 0.5 mSv or 50 mrem Action Level.

Collective Dose and Maximum Individual Dose per Year for Nuclear Energy Workers (NEW)

OPG's administrative limits include two control levels for exposure:

(1) the Exposure Control Level of 10 mSv/year (1 rem), and

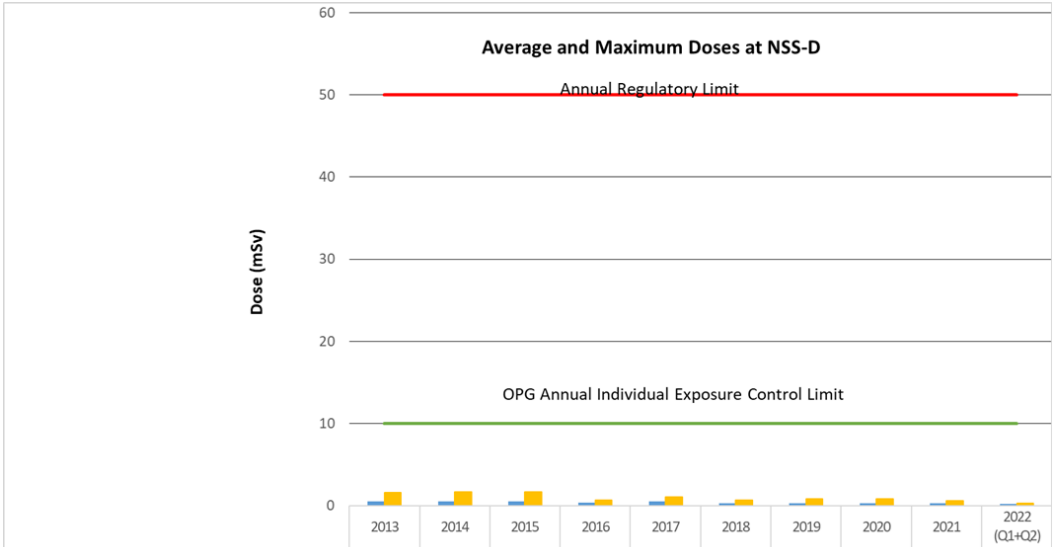
(2) the Administrative Dose Limit of 20 mSv/year (2 rem).

Exposure control levels are set below administrative control levels, which are in turn below the regulatory limits. Graph 1 shows the OPG individual exposure control level of 10 mSv (1 rem) per calendar year is 20% of the single year regulatory limit of 50 mSv (5 rem) in a year, and significantly below the five-year regulatory limit of 100 mSv (10 rem) over five years for a NEW.

Doses are maintained ALARA (As Low as Reasonable Achievable, socio and economic factors considered) through the use of engineered barriers, work planning and use of exposure control levels for Nuclear Energy Workers. Dose rates are sufficiently low at NSS-D such that public tours are regularly carried out in both the storage and processing buildings.

OPG's contamination control program continues to be in full compliance with regulatory requirements. Facility targets are set annually, based on DSC throughput and other operations, and communicated in Quarterly Operations Reports to the CNSC.

Graph 1: Average and Maximum Dose at NSS-D



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022 (Q1+Q2)
Average (non-Zero NEWs) Individual Effective Dose (mSv)	0.5	0.5	0.5	0.4	0.5	0.3	0.3	0.3	0.3	0.2
Maximum Individual Effective Dose (mSv)	1.6	1.7	1.7	0.7	1.1	0.7	0.8	0.8	0.6	0.3
Regulatory Individual Limit (mSv)	50	50	50	50	50	50	50	50	50	50
OPG Individual Exposure Control Level (mSv)	10	10	10	10	10	10	10	10	10	10

Table 5 outlines the key dose statistics for NSS-D. Worker doses were maintained consistently below OPG Individual Exposure Control Levels and well below regulatory limits in the *Radiation Protection Regulations* over the current licensing period.

Table 5: Key Dose Statistics for NSS-D

Year	Total Number of Staff Monitored	Total Number of NEW's Monitored	Collective Dose	Average (total) Individual Effective Dose	Average (non-Zero NEW's) Individual Effective Dose	Maximum Individual Effective Dose	Regulatory Individual Limit	OPG Individual Exposure Control Level	DSCs Loaded per Year
	#	#	Person-mSv	mSv	mSv	mSv	mSv	mSv	#
2013	47	44	12.9	0.3	0.5	1.6	50	10	60
2014	45	44	15.0	0.3	0.5	1.7	50	10	60
2015	40	40	8.8	0.2	0.5	1.7	50	10	63
2016	35	35	5.1	0.2	0.4	0.7	50	10	65
2017	37	37	6.1	0.2	0.5	1.1	50	10	63
2018	42	42	4.7	0.1	0.3	0.7	50	10	57
2019	42	42	6.5	0.2	0.3	0.8	50	10	59
2020	43	42	5.2	0.1	0.3	0.8	50	10	59
2021	39	39	6.4	0.2	0.3	0.6	50	10	58
2022 (Q1& Q2)	36	36	2.8	0.08	0.2	0.3	50	10	24

NSS-D Perimeter Dose Monitoring (non-NEW and Public)

Environmental Thermoluminescent Dosimeters are mounted on the perimeter fence of the NSS-D on Figure 18 and Figure 19 and are changed and analyzed quarterly. The Thermoluminescent Dosimeters are located on the perimeter fence, demarking the conservative limit of approach for a non-NEW. Data is reported to the CNSC in the NSS-D Quarterly Operations report. Target Dose Rates for these locations is to be less than 0.5 µGy/h (air kerma rate). For practical purposes in this case, 0.5 µGy/h can be considered equivalent to 0.5 µSv/h.

A dose rate of 0.5 µSv/h for 2,000 hours of exposure would result in a dose to the public of 1 mSv, the regulatory annual limit. The average actual perimeter dose rate at the NSS-D has consistently been 12 to 18% of the 0.5 µSv/h target dose rate, with an overall average of 0.09 µSv/h around the NSS-D main facility and 0.06 µSv/h around the RWSB which is very close to ambient background radiation levels.

The maximum potential dose at the site boundary over the course of a year to a member of the public is well below the regulatory annual dose limit of 1 mSv.

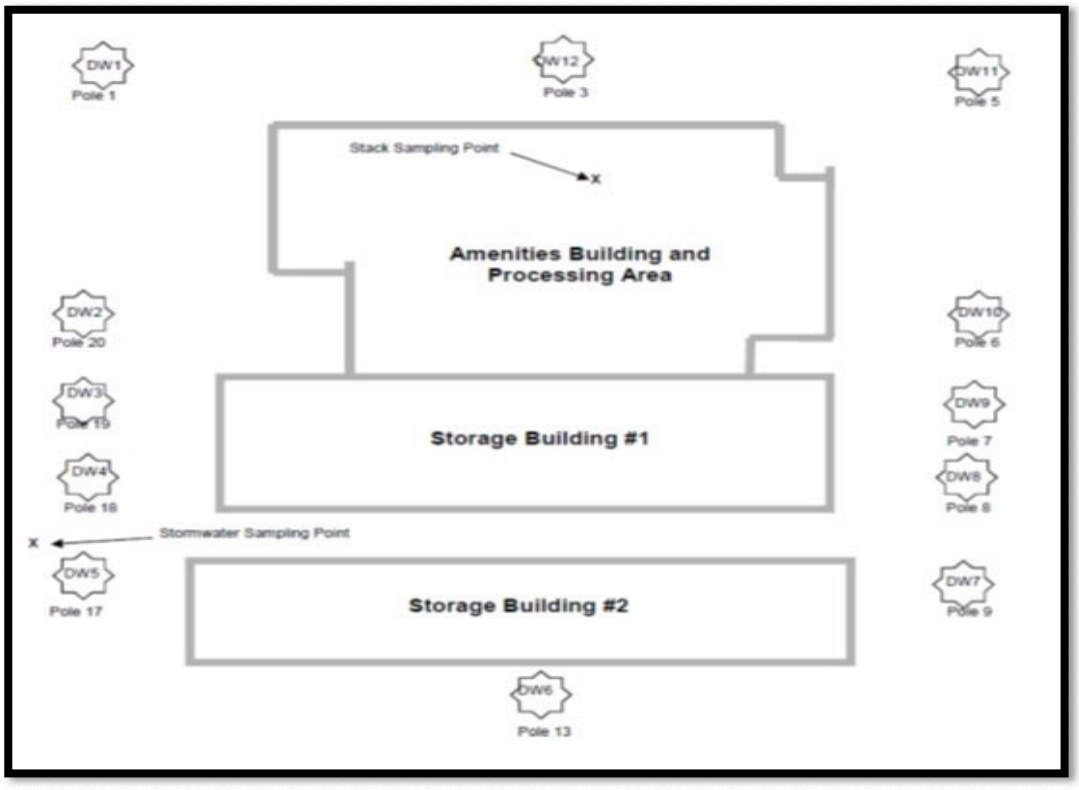


Figure 18: Thermoluminescent Dosimeter Locations around the DSC Processing Building and Storage Buildings #1 and #2

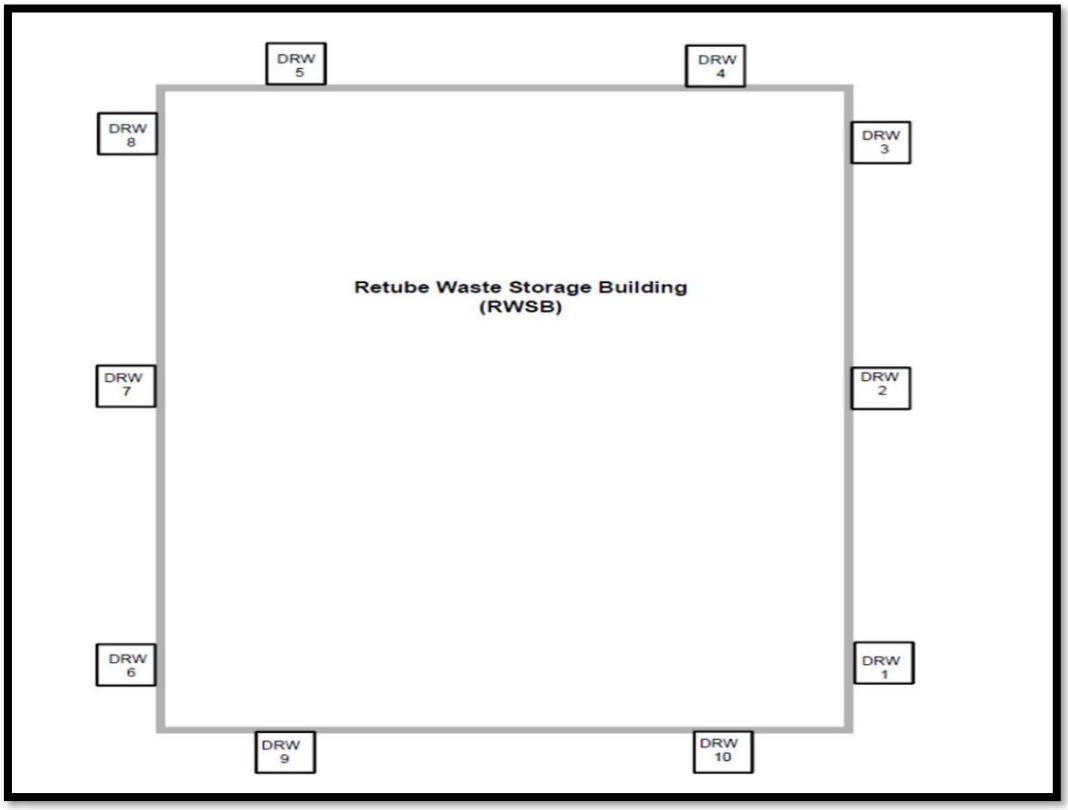


Figure 19: Thermoluminescent Dosimeter Locations around the RWSB

3.7.3 Future plans

The action levels associated with NSS-D will be revised and submitted to the CNSC for acceptance by end of 2022 as part of its routine review cycle.

The radiation protection section has simplified the routine constancy check process for fixed Radiation Protection instrumentation at the NSS-D. This improvement will simplify the execution of the work activities by staff.

In addition, new fixed Instrumentation has been deployed to assist with the execution of likely clean waste minimization efforts, and the installation of new gamma portal monitors are underway.

3.7.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.7.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

3.8 Conventional health and safety

The goal of OPG's Conventional Safety program is to ensure a healthy and injury-free workplace by managing risks resulting from the activities, products, and services associated with OPG's nuclear waste facilities operations. Risk reduction is primarily achieved through compliance, by competent workers, to operational controls, developed through risk assessment and safe work planning. OPG's Conventional Safety program ensures alignment with a number of internal and external specifications or standards such as OPG's Health and Safety policy and ISO 45001 Occupational Health and Safety Management. OPG's health and safety management system is structured in accordance with the requirements of the ISO 45001 standard and is documented in the Environment, Health and Safety program document.

3.8.1 Relevance and management

Employee Health and Safety Policy

The Employee Health and Safety policy commits to the prevention of workplace injuries and ill health, and to continuous improvement of its employee health and safety performance.

The objectives of the OPG Health and Safety policy are:

- Meet or exceed all applicable health and safety legislative requirements, as well as other associated health and safety standards to which OPG subscribes. OPG shall require that its contractors maintain a level of safety equivalent to that of OPG employees while at OPG workplaces.
- Ensure that employees are involved in decisions that have an impact on their health and safety, either individually, as a group, or through their employee representative groups.
- Ensure that work is planned and performed to protect workers. It shall provide its employees with the information, training, tools, procedures, and support required to do their jobs safely; and
- Set health and safety targets as part of its annual business planning process. Health and safety performance against these targets shall be regularly measured and evaluated to ensure the effectiveness of OPG's health and safety systems.

The objective of the Conventional Health & Safety section of the Environment Health and Safety Managed Systems program is to ensure the safety and well-being of its workers. This is achieved by ensuring that safety is a core value and by managing conventional risks in the workplace associated with NSS-D's operations. This program is designed to be an integrated system with OPG Nuclear business managed processes, where appropriate, and considers the current organizational structure.

Additionally, the Internal Responsibility System is a system applied consistently throughout OPG Nuclear, where everyone has personal and shared responsibility for working together co-operatively, to prevent occupational injuries and illnesses. The duties for a healthy and safe workplace fall on every individual, to the degree they have:

- Authority to do so (based upon their position), and
- Ability to do so (based upon their expertise and qualifications).

Each person is expected to take the initiative on health and safety issues, work to solve problems, and make improvements on an on-going basis. The Internal Responsibility System is based on the principle that employees themselves are in the best position to identify health and safety problems and identify solutions. The Internal Responsibility System outlines the appropriate resolution level for timely corrections.

3.8.2 Past performance

The NSS-D demonstrates its commitment to safety by working without a lost time accident or medically treated injury for its entire operational period. This period has lasted 14 years.

To ensure that the overall objective of managing occupational hazards is met, OPG monitors the following performance indicators / elements:

- Total Recordable Injury Frequency
- Accident Severity Rate
- Serious Injury Incidence Rate
- Timely Completion of Safety Corrective Actions
- High Maximum Reasonable Potential for Harm Events

The Total Recordable Injury Frequency and Accident Severity Rate are inclusive for the entirety of NSS (which the NSS-D is part of). There were zero (0) safety events that occurred at the NSS-D that impacted the Total Recordable Injury Frequency and Accident Severity Rate for the reporting period.

Total Recordable Injury Frequency

The Total Recordable Injury Frequency is defined as the number of fatalities, lost-time injuries, restricted work, and medically treated injuries divided by exposure hours and multiplied by 200,000. In 2018, the decision was made to change the safety performance indicator from Accident Severity Rate to Total Recordable Injury Frequency.

During the licence period up to Q2 2022, there were zero safety events that occurred at the NSS-D that impacted the Total Recordable Injury Frequency for the reporting period.

Accident Severity Rate

The Accident Severity Rate is defined as the total number of calendar days lost due to a work-related injury multiplied by 200,000 person-hours, divided by the total exposure hours worked. OPG made the decision in 2014 to no longer set a target for Accident Severity Rate.

NSS Accident Severity Rate remained at zero (0) from 2013 through Q2 2022, as there were zero lost time injuries experienced in the reporting period. Specifically, at NSS-D, to date, there have not been any lost time safety events. This shows a strong commitment to safety with an exceptional performance of 14 years without a lost time event at NSS-D.

Serious Injury Incidence Rate

Serious Injury Incidence Rate is defined as the number of work-related accidents for all OPG employees that result in serious injuries or fatalities, per 200,000 person-hours worked. This metric focuses on more serious injuries, assists in maintaining attention on high-consequence hazards, and accounts for the actual injury instead of the type of medical treatment.

NSS-D Serious Injury Incidence Rate has remained at zero (0) since the introduction of the new safety performance metric in 2020 up to Q2 2022.

Timely Completion of Safety Corrective Actions

Timely Completion of Safety Corrective Actions aims to prioritize completion of safety related actions in a timely manner. Timely Completion of Safety Corrective Actions is the percentage of corrective actions, arising from safety events, that are completed on or before the initial due date (zero extensions).

Strong Timely Completion of Safety Corrective Actions performance has been observed for NSS-D since the introduction of the metric in 2019 with 100% completion rate, which is better than the target of 96%.

High Maximum Reasonable Potential for Harm Events

Maximum Reasonable Potential for Harm is an OPG rating system used to classify incidents, and to determine the potential severity of safety incidents. These are incidents with potential for injury to personnel; however, no actual injury may have occurred. High Maximum Reasonable Potential for Harm incident investigations offer learning opportunities for continued improvement in safety performance.

During the current licensing period up to Q2 2022, there were zero (0) High Maximum Reasonable Potential for Harm events that occurred at NSS-D.

Safety Enhancements

During the current licensing period, a number of safety enhancements have been made to equipment and systems at the NSS-D, some examples are:

- Fan 10 located in the Standby Generator room was moved from Class IV to Class III power to allow the fan to exhaust the hot room when the Standby Generator is running. This keeps the room cooler and prevents the engine from overheating.
- A barrier was installed in front of 600V electrical equipment to prevent contact with objects and equipment incidents in high traffic area.
- Outriggers were installed on the IAEA rolling inspection ladder to increase stability.

3.8.3 Future plans

A number of health and safety improvement initiatives have been identified for the NSS-D as part of the continuous improvement cycle of the health and safety management system, which include:

- Implementation of Fail-Safe Culture Change initiatives to build strong defences/barriers into the planning of work, creating a learning organization, recognizing our workers are the solutions, avoiding blaming the worker, and other key Fail-safe concepts.
- Continue to maintain the iCare Safety Culture initiatives in areas of Communications, Recognition, Risk Management, Human Performance & Coaching, and Total Health Strategies. The initiatives focus on how safety messages are presented and transition the tone from “do this because we are required” to “do this because you care and don’t want an injury”.
- Implementation of a “Total Health Initiative” supporting employees and their families in their efforts to achieve an optimal level of health and functioning, primarily through health education, health promotion, disease and injury prevention, and crisis intervention. There is a continued focus on mental health and Musculoskeletal Disorder prevention with campaigns to raise awareness in these areas.
- The leading indicator safety performance metric, Timely Completion of Safety Corrective Actions will continue to be reinforced to focus on completing safety related actions in a timely manner. Focusing on safety related actions to ensure completion builds on the iCare safety culture.
- Industry leading Serious Injury Incidence Rate metric will continue to be reinforced to focus on prevention of serious injuries that have life-altering consequences.

3.8.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.8.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

3.9 Environmental protection

Environmental Protection includes activities that identify, control, and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as a result of licensed activities.
Specifically, NSS-D will continue to:

- Maintain environmental management systems registered to ISO 14001 Environmental Management specification.
- Meet all legislative requirements and voluntary environmental commitments, with the objective of exceeding compliance obligations where it makes business sense.
- Monitor to ensure radiological emissions to air and water are compliant with regulatory limits.
- Monitor the concentrations of radionuclides in the offsite environment (air, water, and foodstuffs) to confirm compliance with CNSC public dose limits.
- Monitor the concentrations of non-radioactive emissions to the environment to confirm compliance to environmental regulatory limits and Environmental Compliance Approval performance measures.
- Formally assess any potential environmental risks resulting from operations and act to mitigate or control risks as required.
- Integrate environmental and social factors into our planning, decision-making and business practices; and
- Educate, encourage, and empower employees to conduct their activities in an environmentally responsible and sustainable manner.

3.9.1 Relevance and management

Environmental Policy

OPG's Environmental Policy statement is as follows:

- OPG shall meet compliance obligations, including any environmental commitments that it makes, with the objective of exceeding these compliance obligations where it makes business sense.

The requirements of the Environmental Policy are that OPG shall:

- Establish an environmental management system and maintain registration for this system to the ISO 14001 Environmental Management System standard.

- Work to prevent or mitigate adverse impacts on the environment, with a long-term objective of continual improvement in its environmental management system and its environmental performance.
- Execute its Climate Change Plan and strive to achieve the milestones and goals therein.
- Manage its sites in a manner that strives to maintain, or enhance where it makes business sense, significant natural areas, and associated species of concern. OPG will work with its community partners to support regional ecosystems and biodiversity through science-based habitat stewardship. Where disruption is required, OPG shall take reasonable steps to manage the residual impact to these areas and species.
- Set environmental objectives as part of its annual business planning process. Performance against these environmental objectives will be monitored and associated documented information will be maintained.
- Communicate its environmental performance to employees, governments, local communities, and other stakeholders.

Environmental Management System

The OPG Environmental Management System program implements the requirements of the Environmental Policy. The program defines procedures and supporting documents, which execute the policy. This program is implemented at NSS-D.

The Environmental Management System uses a risk-based approach to identify and assess areas of concern with respect to environmental management. Elements of OPG's activities, products, and services, including those at NSS-D, that interact or can interact with the environment are considered environmental aspects.

Significant Environmental Aspects, as determined by assessing risks and opportunities, are environmental aspects that have or can have a significant environmental impact. Identified aspects, including Significant Environmental Aspects, are managed as appropriate, through operational controls at the relevant sites.

Identification of the significant environmental aspects which apply to NSS-D allows for more focus on areas where there is the potential to have a negative (or positive) impact on the environment. The Significant Environmental Aspects that have been identified for NSS-D include the following:

- Wildlife Habitat (Enhancement or Disruption)
- Spills

Performance measures are established to ensure the controls perform as designed and are corrected and/or improved under the Environmental Management System framework. For example, spill and compliance targets have

been established and were tracked during the licence period. Since that time, OPG has consistently met or surpassed these targets. Since 2012, there have been no reportable spills and no environmental infractions at NSS-D.
OPG is committed to maintaining registration of the ISO 14001 Standard. Verification that the Environmental Management System is effectively maintained is completed through annual internal and compliance audits.

3.9.2 Past performance

OPG has established monitoring programs in support of its nuclear facility operations to ensure compliance with the NSS-D licence, the *Nuclear Safety and Control Act* and its regulations, applicable federal and provincial legislation and OPG requirements.

The programs are administered on a site-wide basis and encompass all nuclear facilities at the Darlington site, including NSS-D. These programs include effluent monitoring, groundwater monitoring, environmental monitoring, and environmental risk assessments.

Derived Release Limits (Radiological)

Derived Release Limits are derived using CSA N288.1-14, *Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities* and approved by the CNSC. Derived Release Limits are used to establish controls on the releases of radioactive materials. Derived Release Limits are calculated for radionuclides of potential dose significance in effluent streams, to facilitate the control, reporting, and regulation of radionuclide emissions.

The emissions from NSS-D have been consistently orders of magnitude below Derived Release Limit values. The Derived Release Limit values shown in Table 6 are for the Darlington Nuclear site, which includes both DNGS and NSS-D.

Table 6: Darlington Nuclear Site Derived Release Limits

Release Category	Radionuclide	Derived Release Limit (Becquerel/year)
Air	Tritium (HTO)	4.94×10^{16}
	Elemental Tritium (HT)	8.23×10^{17}
	Iodine (mixed fission products)	1.77×10^{12}
	Carbon-14	1.21×10^{15}
	Noble Gases[1]	3.80×10^{16}
	Particulate – Gross Beta-Gamma	6.06×10^{11}
	Particulate – Gross Alpha	1.08×10^{11}
Water	Tritium	6.43×10^{18}
	Carbon-14	6.97×10^{14}
	Gross Alpha	4.39×10^{11}
	Gross Beta-Gamma	3.47×10^{13}

[1] Noble gases Derived Release Limits are in units of Bq-MeV.
General Note: The NSS-D uses the Derived Release Limits established for the Darlington Nuclear site.

Environmental Action Levels (Radiological)

The *Radiation Protection Regulations* state that an "action level" 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". Environmental Action Levels are set at a fraction of the Derived Release Limit values to provide early detection of a potential loss of control and ensure appropriate action is taken to prevent an emission from approaching a Derived Release Limit. Exceeding an Environmental Action Level requires notification and reporting to the CNSC, investigation of the cause, and corrective action as required.

NSS-D does not have any specific Environmental Action Levels as the emissions from the facility have historically been an extremely small fraction of the DNGS emissions. The Environmental Action Levels in Table 7 are for the Darlington Nuclear site, which includes both DNGS and NSS-D.

Table 7: Darlington Nuclear Site Environmental Action Levels

Release Category	**Radionuclide**	**Environmental Action Level: Gaseous Releases (Becquerel/week)**
Air	Tritium (HTO)	9.88×10^{13}
	Elemental Tritium (HT)	1.65×10^{15}
	Iodine	3.53×10^{9}
	Carbon-14	2.42×10^{12}
	Noble Gases[1]	7.60×10^{13}
	Particulate – Gross Beta-Gamma	1.21×10^{9}
Release Category	**Radionuclide**	**Environmental Action Level: Liquid Releases (Becquerel/ month)**
Water	Tritium (HTO)	5.14×10^{16}
	Carbon-14	5.58×10^{12}
	Gross Beta-Gamma	2.77×10^{11}

[1] Noble gases Environmental Action Levels are in units of Bq-MeV.
General Note: NSS-D uses the Environmental Action Levels set for the Darlington Nuclear site.
General Note: Environmental Action Level for gross alpha is not specified since it is not a routinely monitored radionuclide group at DNGS or NSS-D because its activity is below the threshold value specified in the standard for radioactivity monitoring in effluents.

The CNSC recently approved the Environmental Action Levels Report for DNGS including the NSS-D consistent with the requirements of CSA N-288.8-17, *Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities*. OPG submitted an implementation plan to the CNSC in Q3 2022.

Airborne Emissions (Radiological)

Under normal operating conditions, no airborne emissions are expected from loaded DSCs during transfer from the DNGS to NSS-D. Airborne releases are also unlikely to arise under normal operating conditions during storage of seal welded DSCs. There is a small potential for airborne emissions resulting from

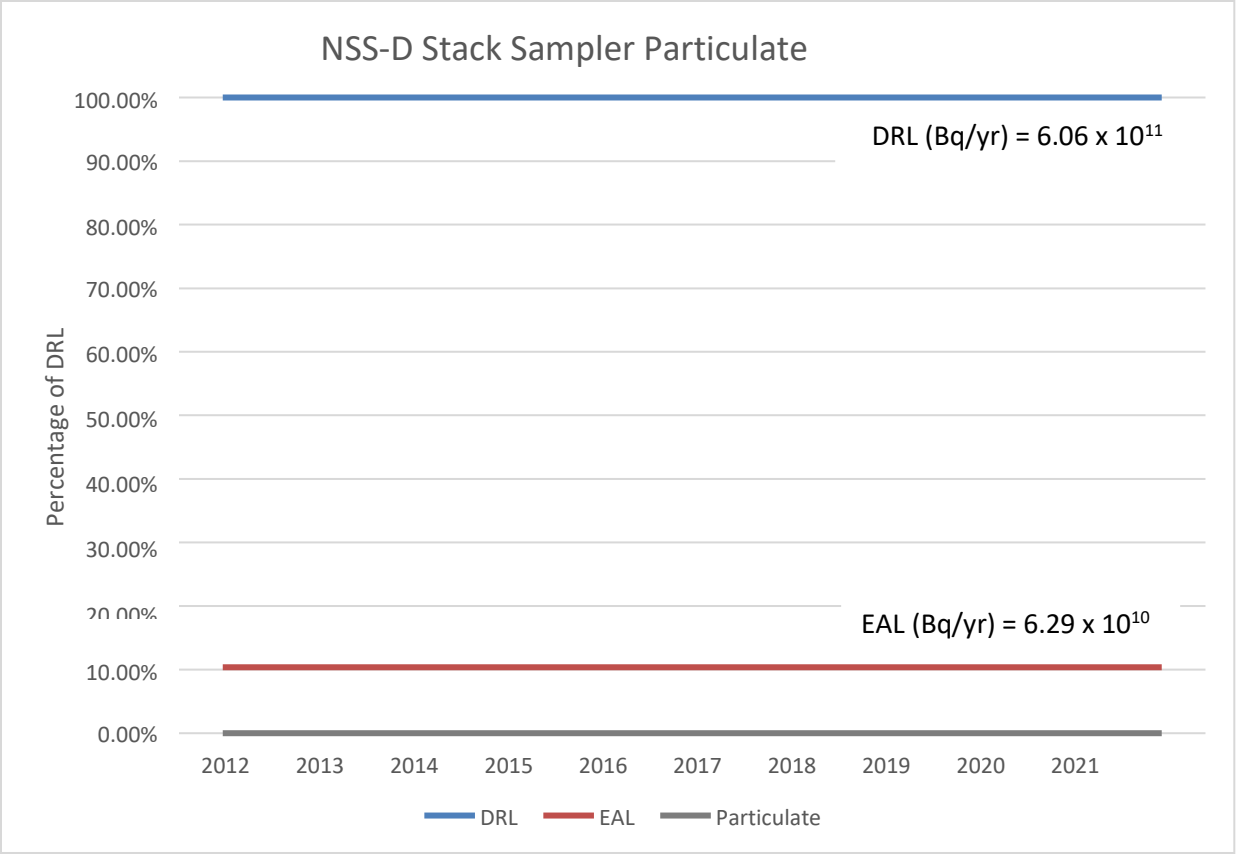
DSC processing operations such as welding and vacuum drying. Established radiation protection practices before, during and after DCS processing ensure minimal radioactive contamination to be present. The DSC processing building has a dedicated active ventilation system, currently monitored for radioactive particulates. A continuous emission sample is passed through a particulate filter that is replaced and analyzed on a weekly basis.

Although there are no significant particulate emissions expected from the exhaust at NSS-D, historical monitoring was voluntarily implemented as a precautionary measure.

All data is reported to the CNSC in the quarterly environmental emissions data for the Darlington Nuclear site, which includes NSS-D, and the reports are available to the public on the OPG website at www.opg.com.

Graph 2 shows a summary of the radiological airborne emissions from the DSC processing building stack exhaust. During the current licensing period, there have been no Derived Release Limit or Environmental Action Level exceedances for airborne particulates from the DSC Processing Building stack sampler. The emissions from NSS-D have been 0.00001% of the Derived Release Limit for the site. The overall trend has been stable.

Graph 2: Airborne Particulates from the DSC Processing Building Stack Sampler



General Note: Airborne particulate data (Bq/yr) was calculated by summing the reported airborne contamination (weekly average) into an annual total. 2022 data includes January through end of June.

A recent assessment of DSC processing building ventilation stack exhaust monitoring at NSS-D identified that routine monitoring is not required since the contribution of the stack exhaust is negligible and does not meet monitoring or reporting criteria as per CSA N288.5-11, *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*. Based on this assessment, OPG intends to discontinue the DSC processing building ventilation stack exhaust monitoring at NSS-D. The results of this assessment and notification of the planned program change have been provided to the CNSC.

Waterborne Emissions (Radiological)

There are no liquid emissions from the DSC during onsite transfer to the NSS-D. The DSCs are fully drained and vacuum dried after loading at the DNGS and the elastomeric seals and drain plugs are present during transfer. The DSCs are also decontaminated prior to transfer; and spot decontamination operations, which may be carried out in the DSC Processing Building, are not expected to generate liquids.

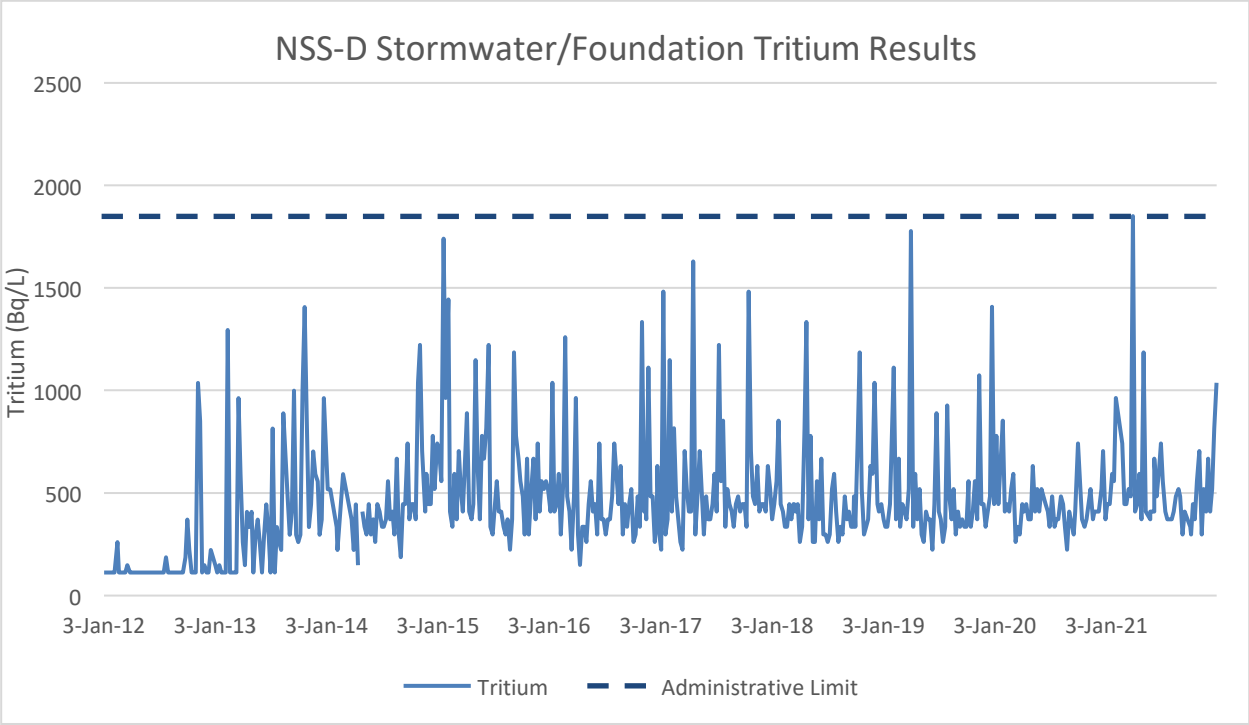
Stormwater and foundation drainage associated with the DSC processing building and the two UFDSBs was sampled weekly for tritium and gross gamma until December 31, 2021. This historical sampling was implemented voluntarily for confirmation purposes and provided verification that no impacts were associated with NSS-D. The facility Environmental Assessment also concluded no interaction of stormwater with radiation or radioactivity during construction and operations phases.

Graph 3 shows a summary of historical tritium monitoring from stormwater and foundation drainage. NSS-D has no source for tritium releases. Sample results were consistently below administrative limits and were attributable to external sources, particularly emissions from the DNGS, due to the close proximity of the stormwater sampling point to the station.

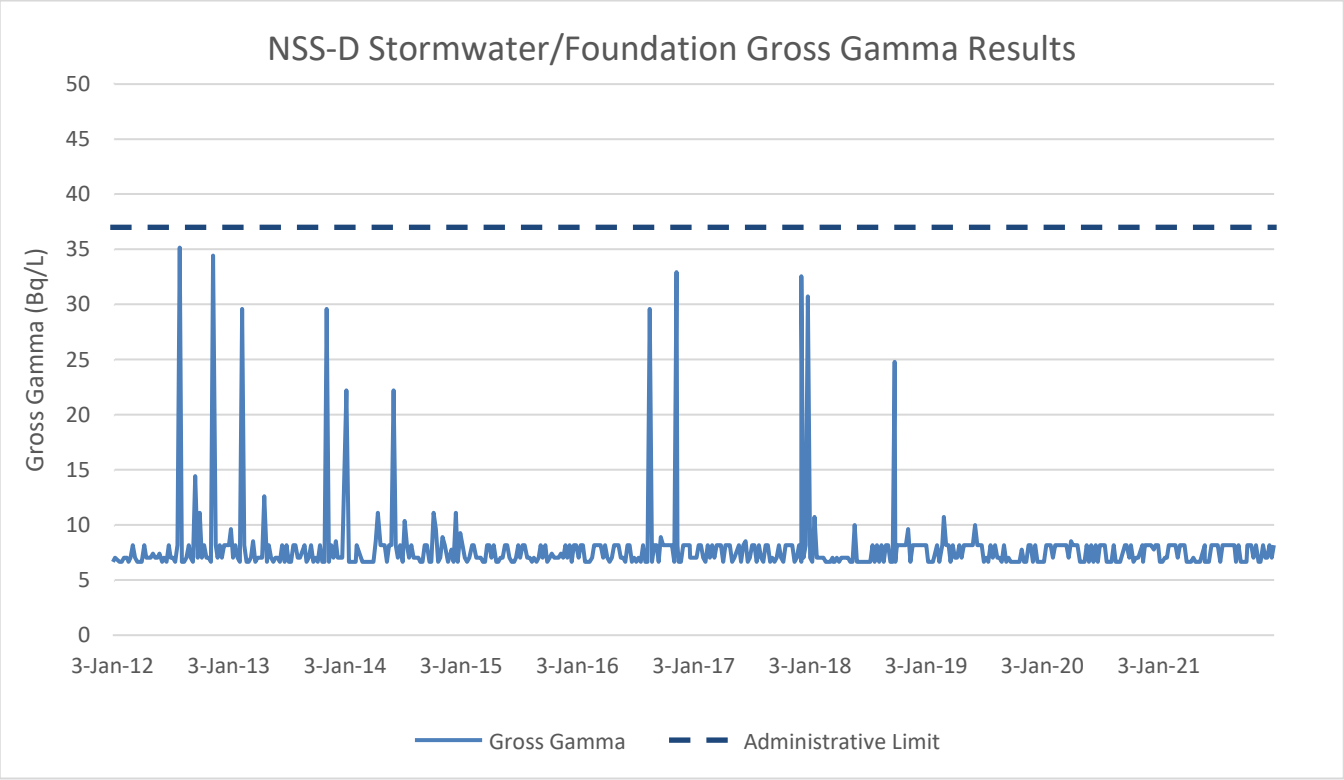
Graph 4 shows a summary of gross gamma monitoring from stormwater and foundation drainage. Sample results were typically below minimum detectable activity and consistently below administrative limits. Gross gamma detections were attributed to naturally occurring radionuclides present in the sediment run-off from the site.

An assessment of stormwater and foundation drainage monitoring at NSS-D, completed in 2021, identified that routine monitoring is not required per the CSA N288 series of standards. Based on this assessment, and notification of the planned program change to the CNSC, OPG discontinued routine stormwater and foundation drainage monitoring at the NSS-D in December 2021. Potential impacts to surface water and groundwater at the site will continue to be assessed through the Environmental Risk Assessment and Groundwater Protection programs.

Graph 3: Tritium from Stormwater/Foundation Drainage



Graph 4: Gross Gamma from Stormwater/Foundation Drainage



Groundwater Monitoring (Radiological)

As part of the Darlington Nuclear site, NSS-D groundwater monitoring has been integrated into the overall DNGS groundwater monitoring program.

This program is in place to address the following primary objectives:

- Confirm predominant on-site groundwater flow characteristics at the DNGS.
- Monitor changes to on-site groundwater quality to ensure timely detection of inadvertent releases to groundwater.
- Ensure that there are no adverse off-site impacts from the DNGS groundwater.

Groundwater flow interpretations for DNGS were first established in 2010. On an annual basis, a set of water levels is collected from specific groundwater monitoring wells to verify that interpretations have not changed, and that OPG continues to have a sound understanding of the groundwater flow patterns at the site.

Also on an annual basis, groundwater samples are collected for analysis as per the Sampling and Analysis plan developed for the site to allow for data evaluation to support monitoring of groundwater quality. Refer to Figure 20 for groundwater monitoring locations.

Samples collected for the groundwater monitoring program are predominantly analyzed for tritium. Selected samples are analyzed for petroleum hydrocarbons (PHCs) and benzene / toluene / ethylbenzene / xylenes (BTEX). Determination of sampling parameters and frequency is based on relevance to the groundwater sampling well areas, as determined by the Sampling and Analysis plan.

The groundwater monitoring well network and the data derived from monitoring concludes that there is no impact to groundwater associated with the operation of NSS-D and there is no significant off-site impact as observed in the data associated with the perimeter wells closest to NSS-D during the currently licensing period.

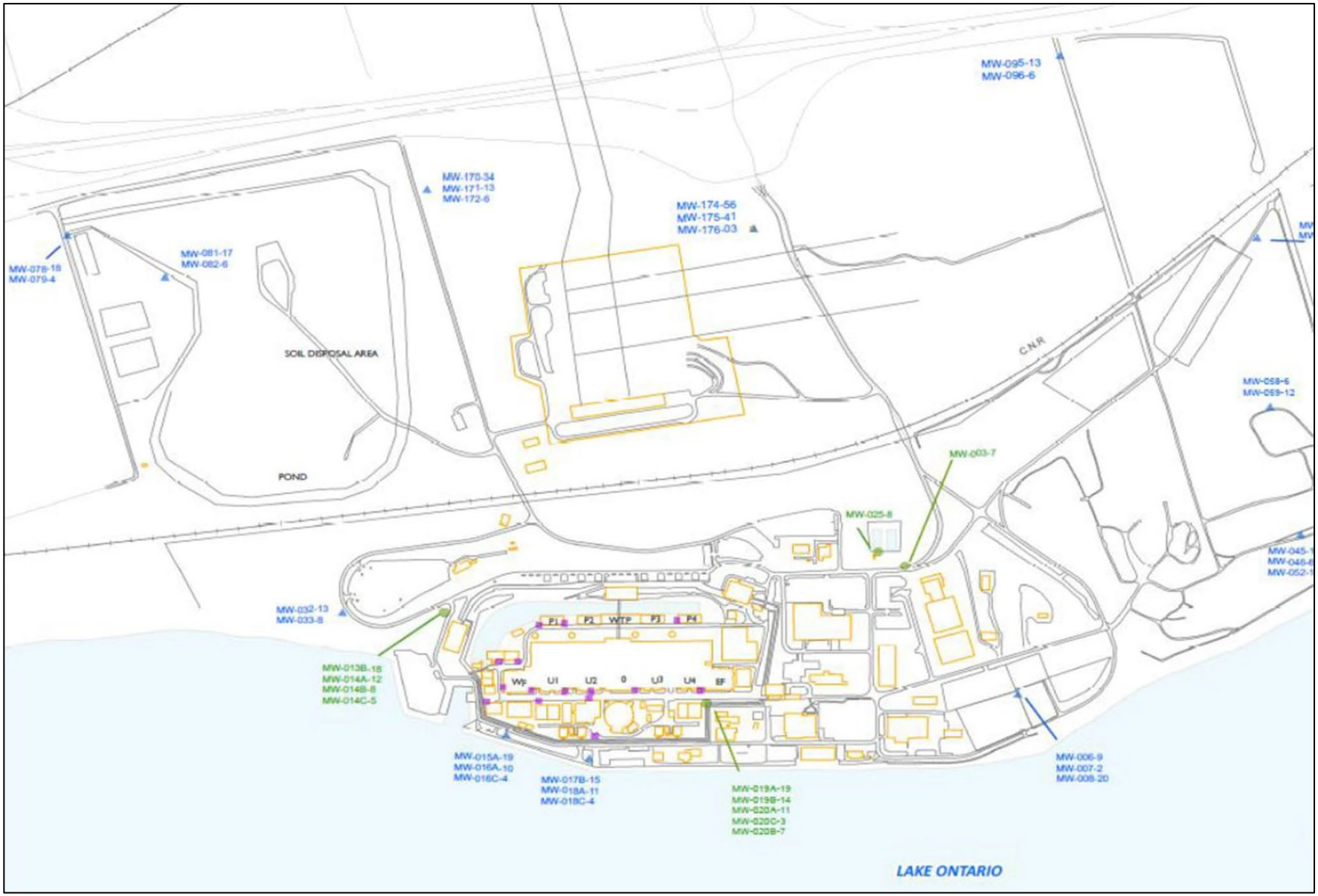


Figure 20: 2021 Darlington NGS Groundwater Monitoring Locations

Environmental Monitoring - Protection of the Public (Radiological)

Radiological emissions from NSS-D are an extremely small fraction of the overall emissions from the Darlington Nuclear site. OPG has a comprehensive Environmental Monitoring program that assesses the impact on human health and the environment of contaminants and physical stressors of concern resulting from the operation of the Darlington Nuclear site including NSS-D. Off-site radiological impacts from the operations of the Darlington Nuclear site, including NSS-D are monitored under the Darlington Nuclear Environmental Monitoring program, which is in compliance with CSA N288.4-10, *Environmental Monitoring Program at Class I Nuclear Facilities and Uranium Mines and Mills*.

The Darlington Nuclear Environmental Monitoring program monitors off-site air, water (municipal, well, lake/stream), aquatic samples (fish, sediment, sand), and terrestrial samples (animal feed, milk, soil, and vegetation). Data gathered from this program, along with emissions data, are used to assess the annual radiological dose to members of the public living or working in the vicinity of the Darlington Nuclear site.

Results of monitoring and public dose assessment are published in the annual Environmental Monitoring Program report, which is submitted to the CNSC and made available to the public on www.opg.com. Dose to the public from the operation of facilities on the Darlington Nuclear site, including NSS-D, is a very small fraction of the public dose limit.

Biodiversity Conservation

OPG has a very extensive and diverse biodiversity conservation program at the Darlington Nuclear site for over 20 years. Protecting biodiversity is a fundamental part of OPG's operations, and the DNGS conservation vision follows OPG's four R's:

- Retain what is significant.
- Restore habitats that have been degraded.
- Replace habitats that have been lost; and
- Recover species that are at risk.

As part of the DNGS operations, the NSS-D biodiversity plan has been integrated into the overall site biodiversity conservation plan. OPG has adapted to the natural changes on our site and created a biodiversity conservation plan that incorporates actions to achieve a Gold Certification from the Wildlife Habitat Council. The Wildlife Habitat Council certification adds value to conservation programs by providing third party credibility and an objective evaluation of conservation projects.

During the current licensing period, OPG has accomplished the following major initiatives corresponding to the Wildlife Habitat Council certification periods:

Accomplishments between 2013 and 2016:

- Ecological Land Classification Surveys & Vegetation Monitoring - initiated in 1998, subsequent surveys have been carried out in 2002, 2007 & 2013. Ecological land classification monitoring allows OPG to document changes in vegetation communities between survey years and allows for consideration when planning future works. The monitoring program is ongoing.
- Monitoring - amphibian, bat, breeding birds, bird nest boxes (tree swallow nest boxes), habitat structures (hibernaculum, bat boxes), butterfly and dragonfly inventory, vegetative and invasive plant communities, and species at risk.
- On-Site Habitat Enhancements – habitat restoration/replanting along Coot's Pond south berm.
- Partnerships - maintained with many local communities, conservation groups and government agencies, and school boards.

Accomplishments between 2017 and 2019:

- 2018 survey updates for ecological land classification monitoring
- Monitoring - amphibians, bees, bats, waterfowl, breeding birds, bird nest boxes (tree swallow nest boxes), habitat structures (hibernaculum, bat boxes), butterfly and dragonfly inventory, vegetative and invasive plant communities, and species at risk.
- On-Site Habitat Enhancements – nesting surveys and nest guards deployed around Coot's Pond to protect Snapping Turtle species, turtle basking structures were added, Darlington Pollinator program supports the increasing of the pollinator-friendly gardens and landscapes; the Darlington Energy Complex pollinator garden was established as a Monarch Waystation.
- Social and Community Outreach programs supported by DN site – Darlington Pollinator Partners, March Break Madness, Peregrine Falcon & Birds of Prey Elementary School Visits.
- Darlington Nuclear site received the Oshawa Chamber of Commerce Sustainability Award.

Accomplishments between 2020 and 2022:

- Species at risk, breeding bird, amphibian, reptile, and pollinator surveys (both flora and fauna across the Darlington Nuclear site).
- Assessed invasive *Phragmites* across the site. A three-year plan is being developed to remove the plant from sensitive ecological areas.
- Installed a Motus Wildlife Tracking System in partnership with Birds Canada.
- Community Outreach: Curb-side pickup of native trees and shrubs.
- Nest box program for Tree Swallows and Eastern Blue Birds.

OPG's ongoing Nuclear Biodiversity Conservation Plan continues to incorporate the restoration, retention, replacement, and recovery of multiple Significant Natural Areas and related species at risk. Darlington Nuclear site, including NSS-D, will be submitting their Wildlife Habitat Council Recertification application as the "OPG Nuclear Operations Biodiversity" application by December 1, 2022.

Non-Radiological Emissions

Non-radiological air emissions at NSS-D are negligible. DSC paint touch-up operations involve minimal paint quantities. Residual paint aerosols from the paint bays are removed through filters before exhausting to the active ventilation system. Due to small quantities, painting methods, and the use of appropriate filtration, no significant emissions of paint materials are expected. Welding fumes from DSC seal-welding operations are additionally exhausted through the High Efficiency Particulate Air filtered active ventilation system. The emissions from the welding operations are also considered negligible. Consequently, there is no monitoring program required for non-radiological emissions at NSS-D.

Stormwater management at industrial facilities is regulated by the Ministry of Environment, Conservation and Parks under the *Environmental Protection Act* and the *Ontario Water Resources Act*. The Darlington Nuclear site stormwater works are approved under the site Environmental Compliance Approval No. 4810-A78QUZ for industrial sewage works. The stormwater works are designed, approved, and maintained per the Environmental Compliance Approval process to ensure stormwater is properly managed to prevent erosion, flooding, and degradation of receiving water bodies. NSS-D employs stormwater management ponds for the treatment of stormwater.

Environmental Risk Assessment

Environmental Risk Assessments are prepared for the Darlington Nuclear site, which includes NSS-D, in accordance with the requirements of CSA N288.6-12, *Environmental Risk Assessment at Class I Nuclear Facilities and Uranium Mines and Mills*. The Environmental Risk Assessment characterizes the baseline environment and assesses the human health and ecological risks from operations of the facilities located on the Darlington Nuclear site. Environmental Risk Assessments are to be completed at a minimum of once every five years.

The Environmental Risk Assessment has the specific objectives:

- To evaluate the risk to relevant human and ecological receptors resulting from exposure to contaminants of potential concern and stressors related to the Darlington Nuclear site and its activities; and
- To recommend potential further monitoring or assessment as needed based on the results of the Environmental Risk Assessment.

The most recent Environmental Risk Assessment, completed in 2020, focused on monitoring activities that occurred on the Darlington Nuclear site during the 2016 to 2019 period. It encompassed normal operations at the Darlington Nuclear site during the operations and refurbishment phases of the facility. It was concluded that the Darlington Nuclear site, including NSS-D, is operating in a manner that is

protective of human and ecological receptors residing in the surrounding area. No follow-up monitoring was identified for NSS-D operations.

Prior to the 2020 Environmental Risk Assessment, the Environmental Risk Assessment completed in 2016, focused on activities that occurred during the 2011 to 2015 period. It encompassed normal operations at the Darlington Nuclear site and preparation for refurbishment phases of the facility. It was concluded that the Darlington Nuclear site, including NSS-D, is operating in a manner that is protective of human and ecological receptors residing in the surrounding area. No follow-up monitoring was identified for NSS-D operations.

3.9.3 Future plans

The ISO 14001 standard embodies the expectation of continual improvement of the Environmental Management System and, as a consequence, environmental performance. To this end, reviews of environmental performance and re-evaluation of objectives and achievement plans in key areas which may impact on the environment are performed regularly.

OPG will continue to implement best practices at NSS-D, which have been aimed at reducing the environmental and radiological risk associated with the handling, processing, and/or storage of used fuel and refurbishment waste. This is done by the continued adherence to procedures and protocols, training, and by following safe operating practices. NSS-D will continue to be included in the Darlington Nuclear site biodiversity conservation initiatives, which are continuously developing.

OPG is striving to be a global leader in climate change mitigation. With the 2020 launch of our Climate Change Plan (available on the OPG website at opg.com) OPG is committed to being a net-zero company by 2040 and create a net-zero economy by 2050. OPG's actions include reducing carbon emissions from our operations, ensuring our operations are resilient to impacts of a changing climate, developing and deploying new technologies to speed up Ontario's energy transformation, working with others to lead the decarbonization of Ontario's economy and share our lessons with the world. NSS-D operations play an important role in executing OPG's Climate Change Plan through our excellence in managing used fuel and refurbishment waste and continued strong environmental performance.

3.9.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.9.5 Requests

Consistent with OPG fleet plans and as part of continuous improvement, NSS-D will be transitioning to the following CSA Standard and Regulatory Document:

- By December 31, 2022, the DNGS site (including the NSS-D) will be compliant with the requirements of CSA Standard N288.7-15,

Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills.

- By December 31, 2022, NSS-D will be compliant with REGDOC 2.9.1, version 1.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*.

3.10 Emergency management and fire protection

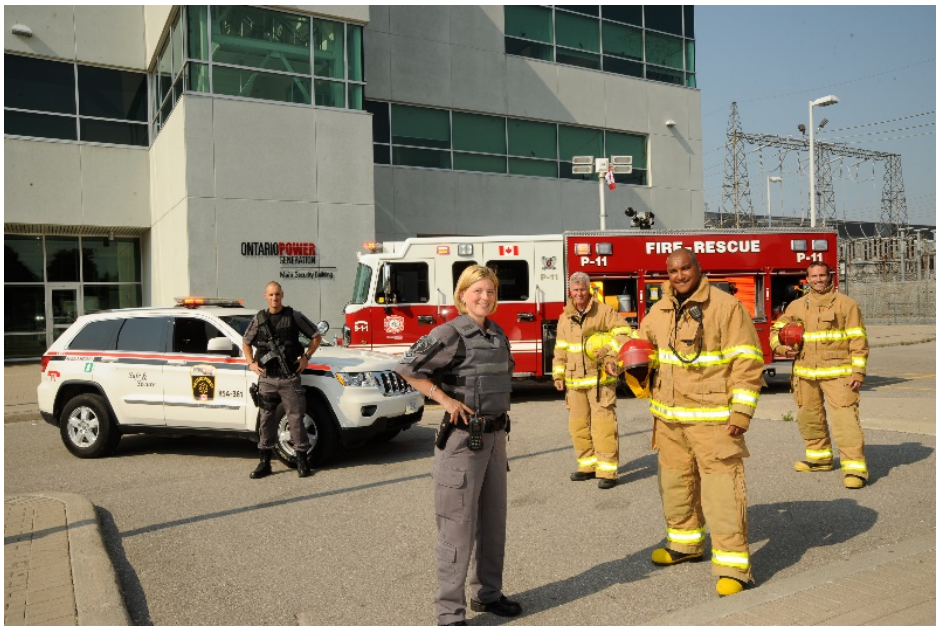
Emergency Management

NSS' goals for Emergency Preparedness at the NSS-D are to protect the health and safety of all people (employees, public, and responders) and limit the damage to OPG and third-party assets as well as the environment during emergencies and other non-routine conditions. Emergency Preparedness encompasses emergencies arising from both nuclear and conventional hazards.

Fire Protection

NSS's goals for Fire Protection at the NSS-D are to:

- minimize the risk of radiological releases that are a result of fire.
- protect facility occupants from death or injury due to fire.
- minimize economic loss resulting from fire damage to structures, equipment, and inventories.
- minimize the impact of radioactive or hazardous material on the environment as a result of fire.



3.10.1 Relevance and management

Emergency Management Program

The purpose of the Consolidated Nuclear Emergency plan is to define the key program elements, objectives, and roles and responsibilities to ensure OPG can effectively respond to nuclear emergencies, with the overall goal to protect the public, employees, and the environment.

The key program elements are:

- Basis for Emergency Planning
- Concept of Operations
- Emergency Response Organization structure
- Facilities
- Equipment
- Mutual Aid and Community Agreements
- Program Administration, Assessment and Maintenance

The Consolidated Nuclear Emergency plan documents the emergency response capabilities to a nuclear emergency at OPG's nuclear stations. The plan deals with nuclear emergency situations that have the potential to endanger the safety of the public, on-site staff, or the environment.

Fire Protection Program

The purpose of the Fire Protection program is to define the key program elements, objectives, and roles and responsibilities, with the overall goal to minimize the risks and consequences of fire to OPG Nuclear facilities.

The key program elements for NSS-D are:

- Fire Safety Plan
- Inspections, Testing, Maintenance
- Analysis, Assessments, Reviews, Audits
- Drills

3.10.2 Past performance

Emergency Management

Although potential event scenarios at NSS-D would not result in a radiological danger to the public, and therefore would not require protective actions as defined in the Provincial Nuclear Emergency Response plan, there may still be potential radiological danger to on-site staff or the environment. As a result, the procedures implemented under the Consolidated Nuclear Emergency plan would be utilized to support an NSS-D event, if it resulted in a station emergency being

declared or if support from the Emergency Response Organization was required.

NSS-D on-site staff participate in annual site wide emergency drills that involve assembly and accounting, and site evacuation of non-essential staff.

NSS-D is currently compliant with the requirements in REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response, version 2*.

NSS-D Fire Emergency Response

The OPG DNGS Emergency Response Team will support Clarington Emergency and Fire Services as the first responders to events at the NSS-D. The Emergency Response Team and Clarington Emergency and Fire Service will establish a unified incident command.

Hazardous Material Spill Drills

Hazardous Material spill drills are conducted annually at the Darlington Nuclear site that include consideration for NSS-D. Upon completion of each drill, a report is issued which captures lessons learned, corrective actions and valuable operating experience.

Fire Protection Governance

In 2017, the NSS facility specific Fire Protection program was incorporated into the OPG Nuclear corporate Fire Protection program to ensure a consistent approach to fire protection across all the nuclear sites and facilities. NSS fire protection procedures and other elements derive their authority from the OPG Nuclear Fire Protection program. A comprehensive program ensures adequate fire protection by minimizing both the probability of occurrence and the consequences of fire at the facilities.

The Fire Protection program outlines the scope and objectives of documentation that comprises the Fire Protection program and interfacing programs for OPG Nuclear. It describes the fire protection organization, interfacing organizations, and their fire protection accountabilities to minimize the risks and consequences of fire.

During the current licensing period, where applicable, NSS governance documents were reviewed and updated to better align with the power generating stations practices. This includes but not limited to Combustible Material Safety and Impairment planning.

Fire Safety Plan

The NSS-D Fire Safety plan provides direction with respect to fire prevention, fire protection, emergency procedures, training, and drills. The Fire Safety plan is reviewed and revised accordingly on an annual basis to ensure it reflects current field conditions and practices.

The NSS-D Fire Safety plan also provides a description of the fire protection initiatives currently in place at the facility.

The Fire Safety plan at NSS-D meets the requirements documented in OPG's Fire Protection program and in the NFCC.

Fire Drills

During the current licensing period, fire drills were performed in accordance with the CSA N393-13, *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances*, and NFCC (2010). Accordingly, during the current licensing period, fire drills were performed annually with the participation of Clarington Emergency and Fire Service.

Findings from drills have been satisfactory with no major findings. Minor procedure improvements have been recommended and are currently being implemented, as appropriate.

Inspection, Testing, Maintenance

During the current licensing period, in accordance with the NSS-D waste facility operating licence, the inspection, testing and maintenance of the fire detection and suppression system was performed at the required frequency, as stipulated in the NFCC (2010). The inspection and testing were performed by OPG and reviewed by a third party. During the current licensing period, independent third-party reviews were completed tri-annually, to confirm the NSS-D fire system has been operated, inspected, tested, and maintained in accordance with the NFCC (2010) and the standards listed therein.

The independent third-party reports received indicate that NSS-D is in general compliance with the CSA N393-13, and NFCC (2010) requirements. Corrective actions resulting from these reviews have been completed; examples included creating preventive maintenance identifications to:

- Perform the annual inspection of 10% of fire barriers.
- Ensure hose valves on Class II standpipe systems are tested every three years.
- Perform annual test for self-contained emergency lighting recharging capability.

Analysis, Assessments, Reviews, Audits

Since the completion of the NSS-D implementation plan for meeting the requirements of CSA N393-13, to maintain compliance with CSA N393-13, the following required third-party reviews, analysis, and audits have been completed within the intervals stipulated in CSA N393-13:

- Code Compliance Review
- Fire Response Needs Analysis
- Fire Protection Program Audit

- Annual Facility Condition Inspection
- Fire Hazard Assessment

The results of the compliance reviews have been submitted to the CNSC as required by the NSS-D waste facility operating licence and CSA N393-13.

Fire Protection Response

A *Memorandum of Understanding* between the Municipal of Clarington and OPG applies to the provision of fire protection services, including coordinated emergency response. In the event of an on-site incident, City of Clarington's Emergency and Fire Services will be called for assistance.

The initial response for extinguishing fires in the NSS-D rests with the Clarington Emergency and Fire Services, with support from the DNGS Emergency Response Team. Clarington Emergency and Fire Services has annual familiarization tours with NSS-D.

NSS Fire Impairment Manual

During the current NSS-D licensing period, OPG has updated its NSS Fire Impairment Manual, which describes how OPG manages impairments for OPG's NSS facilities, including NSS-D. This manual provides resource information to guide trained staff who are directly involved with planned and unplanned impairments to the fire protection system in evaluating, establishing, planning, controlling, and executing outages on fire systems. The manual also provides detailed compensatory measure information for impaired fire protection systems.

NSS Combustible Material Safety Instruction

OPG has issued its NSS Combustible Material Safety instruction to ensure that all transient combustible materials are minimized, properly assessed, analyzed, and authorized before being placed in the NSS facilities, including NSS-D. Combustible materials, combustible equipment, and ignition sources, other than that forming part of the approved facilities design that is located outside of designed storage areas, shall be eliminated. When elimination is not practical, combustibles shall be minimized, controlled, analyzed, and located in accordance with this instruction.

Engineering Change Control

All new structures and existing design modifications are reviewed for fire protection impact through the Engineering Change Control process.

3.10.3 Future plans

Remote / Online Drills and Exercises

Through 2022, OPG has maintained in-person drills and exercise programs using innovative remote evaluation initiatives, at a time when many in industry have moved to a tabletop drill structure because of COVID-19. This has allowed OPG to demonstrate that the Darlington Site Management Centre remains fully able to respond to any events requiring the support of the augmented Emergency Response Organization, including those at the NSS-D, if required. This response capability is additionally supported through the development of a new dashboard tool, to more effectively monitor the qualification status of the entire nuclear Emergency Response Organization.

Fire Protection Governance

Fire Protection governance will be frequently reviewed to maintain the alignment of NSS, including NSS-D, with OPG Nuclear.

Current / Existing Structures

Fire Protection - Detection System:

- Continue to perform inspections, testing, and maintenance of the fire detection system and supervised circuits as per the current preventive maintenance schedule. This includes replacement of fire system batteries after 3 years of service.
- Retrofit or replace current NSS-D system with a modern equivalent following obsolescence. Based on obsolescence, perform second replacement after 20 years of service with modern equivalent, which will allow reliable service until the end of facility operation.

Fire Protection - Suppression System:

- NSS-D will continue to perform inspection, testing, and maintenance as required by the applicable codes and standards.
- The current plan is to replace defective or deficient components, as required per regular maintenance.
- Major replacement of fire pump diesel engine will be done after 20 years of service and continue to be replaced every 20 years to ensure reliability.
- Replace system piping at 30-year intervals, the scope of which will be aligned with system condition.

Compliance

OPG is currently compliant with CSA N393-13, NCR NBCC (2010), NFCC (2010). OPG completed a Code over Code review of NBCC 2015 vs NBCC 2010 and NFCC 2015 vs NFCC 2010 where the facility will be in compliant with NFCC (2015) by December 1, 2022.

When the NSS-D licensed area is expanded, as proposed for UFDSS #3 and #4, the new structures within that area will comply with CSA N393-13, NBCC (2015), NFCC (2015), and applicable fire Codes & Standards.

Fire Protection of New Structures

When the design of the new structures is initiated by the design engineering team, the fire protection impact evaluation form will be prepared. This form will be sent to the fire protection team to perform a review and provide comments.

As required, fire protection will also provide support to the design engineering team, by providing interpretation of code and standard requirements, as well as reviewing the project Fire Hazard Assessment, Code Compliance Review and Third-Party Review reports.

3.10.4 Challenges

Emergency Management

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

Fire Protection

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.10.5 Requests

Emergency Management

There are no changes being requested with respect to licence conditions associated with this safety and control area.

Fire Protection

There are no changes being requested with respect to licence conditions associated with this safety and control area.

3.11 Waste management

Waste management covers the waste generated during the operations of the NSS-D. The NSS-D Waste Management program is aligned with and based on OPG Nuclear's Environmental Management program. The Nuclear Waste Management facilities work in collaboration with the OPG nuclear generating stations in order to implement strategies for waste minimization and waste management.

Waste management also covers decommissioning planning. The objective of decommissioning planning is to demonstrate the technical and financial feasibility of decommissioning NSS-D in a manner that will ensure the health, safety, and security of workers, the public and the environment.

3.11.1 Relevance and management

Nuclear Waste Management Program

The purpose of the Nuclear Waste Management program is to define the key program elements, objectives, and roles and responsibilities, with the overall goal to ensure safe and responsible management of radioactive waste.

The program objectives are to ensure activities are carried out in a safe and effective manner by qualified personnel.

Activities at NSS-D are performed in accordance with the same processes as other OPG nuclear facilities. However, there are also additional NSS-D specific procedural documents, to address the unique aspects associated with nuclear waste operations. Some examples of procedural documents specific for NSS-D are the work management and emergency response procedures. The Nuclear Waste Management program identifies the specific procedural documents, together with any necessary exceptions to the generally applicable Nuclear Management System procedures. Most of the specific procedural requirements apply to the handling of waste at the NSS-D, such as the handling and storage of the DSCs and RWC/DSOs.

As with all other programs that make up the OPG Nuclear Management System, implementation of the Nuclear Waste Management program for NSS-D is assessed on an on-going basis.

Decommissioning Program

The purpose of the Decommissioning program is to define the key program elements, objectives, and roles and responsibilities; with the overall goal to ensure that, when retiring a licensed nuclear facility permanently from service and rendering it to a predetermined end-state condition, actions are taken in the interest of health, safety, environment, security, quality, and economics.

The program objective is to describe the requirements and processes for decommissioning planning and conduct of decommissioning.

3.11.2 Past performance

Nuclear Waste Management Program

Employees at NSS-D use waste management procedures to ensure that waste generated at the facility is separated properly. Waste receptacles are located throughout the NSS-D for likely clean and active waste. Minimal radioactive waste is generated from activities conducted at the NSS-D. Low-level waste generated by NSS-D is typically restricted to floor sweepings that have a

potential to contain contamination from preparing and welding DSCs. Annual volumes amount to less than one drum and is sent to DNGS for segregation as necessary and eventual transportation to the NSS-Western. NSS-D does not generate intermediate or high-level waste.

NSS-D is currently compliant with the requirements of the following CSA Standards and Regulatory Document:

1. CSA N292.0-19, *General Principles for the Management of Radioactive Waste and Irradiated Fuel.*
2. CSA N292.2-13, *Interim Dry Storage of Irradiated Fuel*.
3. CSA N292.3-14, *Management of low- and Intermediate-Level Radioactive Waste.*
4. REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*, except for clause 10.5 which is to carry out the decommissioning of the radioactive waste storage facility in accordance with REGDOC-2.11.2, Decommissioning. OPG has a Regulatory Management Action Request in place to submit to CNSC staff a gap analysis and implementation plan for compliance with REGDOC- 2.11.2, *Decommissioning* at OPG's stations and waste management facilities, including NSS-D, by March 17, 2023.

Decommissioning Program

Planning for the eventual decommissioning of NSS-D is an ongoing process, taking place throughout each stage of the licensed facility lifecycle. A Preliminary Decommissioning Plan is prepared in accordance with relevant codes and standards, per the licence and Licence Conditions Handbook. The Preliminary Decommissioning Plan is updated and submitted as part of the financial guarantee submission every five years or when required by the Commission.

OPG's strategy for decommissioning its nuclear waste facilities, including NSS-D, is to dismantle the facilities once all the waste is removed and the facility is no longer required. Since all the wastes will be removed from the facility prior to decommissioning, little residual radioactivity is expected to be present at NSS-D and as such, there will be no radiation hazard driver for deferment of decommissioning. In some cases, however, decommissioning activities may be deferred to align with other decommissioning related activities on site.

Under the Nuclear Waste Management Organization's Adaptive Phased Management program, established by the federal government, the long-term facility for used fuel is expected to be in service no earlier than 2043, at which time used fuel will start to be transferred from the interim storage location at NSS-D to the Adaptive Phased Management facility.

The NSS-D Preliminary Decommissioning Plan describes the activities that will be required to decommission and restore the site for other OPG uses. It demonstrates that decommissioning is feasible with existing technologies, and it provides a basis for estimating the cost of decommissioning. The Preliminary Decommissioning Plan includes schedules and cost estimates based on the

assumptions that form the basis for the plan. OPG will update this plan as required to incorporate lessons learned, updates to regulatory requirements, and industry best practices.

OPG has updated the NSS-D Preliminary Decommissioning Plan in support of the 2023 to 2027 financial guarantee submission. This revision of the Preliminary Decommissioning Plan included the expansion of NSS-D UFDSS #3. The requirements of CSA N294-19, *Decommissioning of Facilities Containing Nuclear Substances* as well as any relevant domestic and international experience obtained in the previous five years were also incorporated into this revision.

3.11.3 Future plans

Nuclear Waste Management Program

The volume of low-level radioactive waste produced at NSS-D will remain minimal during the next licensing period with an expected slight variation proportional to the number of DSCs processed.

Decommissioning Program

The NSS-D Preliminary Decommissioning Plan is reviewed and updated every 5 years or as requested by the CNSC. The next update is planned in support of the 2028-2032 financial guarantee submission. This updated Preliminary Decommissioning Plan will include any facility expansion of NSS-D. The requirements of REGDOC-2.11.2, *Decommissioning* and CSA N294-19 as well as any relevant domestic and international experience obtained by the time of update will be incorporated into this revision.

OPG has a Regulatory Management Action Request in place to submit to CNSC staff a gap analysis and implementation plan for compliance with REGDOC-2.11.2, *Decommissioning* at OPG's stations and waste management facilities, including NSS-D, by March 17, 2023.

OPG continuously monitors and incorporates best practices from the industry and has a high degree of confidence that the current plans are appropriate and sufficient.

3.11.4 Challenges

Nuclear Waste Management Program

A At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

Decommissioning Program

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.11.5 Requests

A gap analysis and implementation plan for compliance with the requirements in REGDOC- 2.11.2, *Decommissioning* at OPG's stations and waste management facilities, including NSS-D, will be submitted to the CNSC by March 17, 2023.

3.12 Security

The Nuclear Security program supports OPG's need to protect nuclear materials, respond to threats, and comply with legislative requirements, while minimizing the adverse impact on legitimate staff and plant operations. The objective of the program is to establish a state of security readiness to ensure safe and secure operation of OPG nuclear facilities.

3.12.1 Relevance and management

The purpose of the Nuclear Security program is to define the key program elements, objectives, and roles and responsibilities; supporting OPG's need to manage residual risk to the public created by the operation of its facilities, protect assets, and respond to security events that impact operations and the public. Key elements of this program include response to threats and maintaining compliance with legislative requirements, while minimizing the adverse impact on legitimate staff and plant operations.

The overall goal of the program is to establish a state of security readiness to ensure safe and secure operation of OPG stations and facilities. OPG's security program includes measures to protect against unauthorized disclosure of prescribed information.

Cyber Security Program

OPG's Cyber Security program implements OPG's Corporate Cyber Security policy. Information technology and operational technology systems are managed in a secure, vigilant, and resilient manner that minimizes cyber risks to information assets and generation facilities.

The objective of the Nuclear Cyber Security portion of the cyber security program is to provide secure operations of computer systems and components important to nuclear safety, nuclear security, emergency preparedness, grid reliability and nuclear safeguards.

3.12.2 Past performance

The DSC Processing Building, UFDSB #1 and UFDSB #2 at NSS-D are contained within a separate protected area located on the DNGS controlled area site.

OPG's Nuclear Security program ensures the security of the NSS-D's assets through physical and administrative security measures utilizing equipment, personnel, and procedures. The Security program at the sites has continued to evolve to meet industry best practices and all regulatory requirements. The OPG Nuclear Security program includes the following:

- Security measures for NSS-D are evaluated against annual OPG threat and risk assessments to ensure credible threats are mitigated.
- Training programs are in place to enhance and sustain improved performance of OPG's Security Divisions.
- A comprehensive drill program is in place as a means of validating security practices, ensuring regulatory compliance, and identifying areas for improvement in security operations. CNSC evaluated force on force exercises, conducted at the nuclear generation sites, which provide performance testing of the Nuclear Security program. Lessons learned through OPG security drills and exercises are applied to enhance the program at NSS-D.
- OPG continues to participate in an Inter-Utility Security Working Group, which includes representation from all nuclear power operators in Canada. This group provides benchmarking opportunities to ensure that the program meets industry standards.
- OPG conducts regular meetings with CNSC staff to ensure open communication and that evolving security requirements are understood.
- Security requirements in accordance with the *Nuclear Security Regulations* are in effect at OPG's High Security Sites, including NSS-D.

NSS-D is compliant with the following REGDOCs:

- REGDOC-2.12.1, *High-Security Facilities*, Volume II: *Criteria for Nuclear Security Systems and Devices.*
- REGDOC-2.12.2, *Site Access Security Clearance*.
- REGDOC-2.2.4, *Fitness for Duty*, Volume III: *Nuclear Security Officer Medical, Physical and Psychological Fitness*.

OPG made regulatory commitment to CNSC staff to provide a gap analysis and implementation plan for REGDOC-2.12.1, *High Security Facilities*, Volume I: *Nuclear Response Force*, Version 2 for NSS, including NSS-D by February 28, 2023.

Security and Facility Interface

Interface meetings between NSS-D and Security Management and key staff are held on a quarterly basis.

CNSC Type II Security Compliance Inspections

CNSC regularly conducts Type II security compliance inspections at NSS-D. Since 2013, all Inspections have had either satisfactory or fully satisfactory outcomes. The last inspection was conducted in June of 2022.

Cyber Security

Cyber security related updates have been made to the Engineering Change Control process, employee training, and various maintenance and engineering instructions, guides, procedures, and standards in addition to OPG's corporate Cyber Security policy.

Engineering Change Control ensures all modifications to OPG nuclear systems, structures, and components, including software and engineered tooling, are planned, designed, installed, commissioned, placed into service, or removed from service within the licensing basis. Within the Engineering Change Control program, the modification process is followed for all changes to the OPG Nuclear design basis. Cyber Security is initially addressed during the design scoping phase of the modification process and cyber security controls are implemented in the design. Issues are tracked through to the in-service declaration.

Cyber Security employee training includes qualifications for Cyber Security Subject Matter Experts, and Cyber Security Single Point of Contact. Cyber security role-based training targeted to Design and System Engineers are also provided and taken for appropriate cyber security support. For individuals performing maintenance related work, a training course was created to reinforce expectations and requirements with regard to portable computing devices (e.g., laptops), removable media (e.g., USB keys), and malware detection.

OPG has been in compliance with *CSA N290.7-14, Cyber Security for Nuclear Power Plants and Small Reactor Facilities* since November 2019, and continues to maintain compliance, along with the commencement of work efforts towards

meeting the requirements identified in the recently issued *CSA N290.7-21, Cyber Security for Nuclear Facilities*.

3.12.3 Future plans

Security Report

Prior to construction of UFDSS #3, OPG will submit the proposed security arrangements and measures, and obtain acceptance from the CNSC.

Current NSS-D Structures

OPG is currently executing a project to modernize the existing security systems at UFDSB #1 and UFDSB #2 protected area in conjunction with the construction of UFDSS #3 and necessary expansion of the protected area.

Security at Future NSS-D Structures

UFDSS #3 is currently in the preliminary design phase, with an anticipated in-service date of 2025/2026. It will be located to the south of the UFDSB #1 and UFDSB #2, and the protected area will be expanded to accommodate the new structure.

Construction plans include consideration for:

- Expansion of the protected area boundary.
- Using leading technology for perimeter intrusion detection and assessment.
- The protected area barrier expansion and associated systems and devices for UFDSS #3 will be constructed to meet the requirements of the *Nuclear Security Regulations* and other CNSC requirements per the licence and Licence Conditions Handbook.
- Further expansion of the protected area boundary, to enclose the footprint of UFDSS #4, at a later date. The anticipated in-service date for UFDSS #4 is 2031.

Existing NSS-D Security Systems

Planned upgrades include:

- NSS-D integration into a Darlington Nuclear site entry control system upgrade,
- Updates to the Darlington Nuclear site security monitoring room infrastructure,
- Replacing existing intrusion detection and assessment systems with devices utilizing leading technology, and
- Upgrades to facility lighting.

Cyber Security

Along with Operating Experience and cyber security best practices, OPG is working on continuous improvement initiatives to enhance our cyber security posture, examples of such efforts are:

- Centralized Security Operations Centre,
- Operational Technology Security Information and Event Management, and,
- Operational Technology Passive Monitoring.

3.12.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.12.5 Requests

There are no changes being requested with respect to licence conditions associated with this safety and control area.

3.13 Safeguards and non-proliferation

The objective of OPG's Safeguards program is to support OPG compliance with the governing agreement made between the Government of Canada and the IAEA. This is done in connection with the Treaty on the Non-Proliferation of Nuclear Weapons and any arrangement between Canada and the IAEA made under that agreement. It also provides additional protocols to the agreement between States and the IAEA for the application of safeguards.

3.13.1 Relevance and management

The purpose of the Nuclear Safeguards program is to define the key program elements, objectives, roles, and responsibilities, with the overall goal to ensure OPG's compliance with the governing agreement made between the Government of Canada and the IAEA.

The program objectives are to meet the compliance requirements for the:

- *Treaty on the Non-Proliferation of Nuclear Weapons.*
- Arrangement between Government of Canada and the IAEA for the application of safeguards, in connection with the treaty.
- Additional protocol to the agreement between Government of Canada and IAEA for the application of safeguards, in connection with the treaty.

OPG's Nuclear Safeguards program includes the following elements:

- A communication protocol between the IAEA, CNSC and OPG.
- Obligations to meet applicable regulatory requirements and the requirements of safeguards agreements.
- Reporting to meet applicable regulatory requirements and the requirements of safeguards agreements.

3.13.2 Past performance

OPG Nuclear management stays current with the IAEA's safeguards requirements and is committed to meeting OPG's safeguards obligations in an efficient and timely manner.

IAEA Integrated Safeguard Protocol

As of February 2007, in accordance with the IAEA requirements, OPG has adopted the integrated safeguards protocol. Under the integrated safeguards protocol, all safeguards' commitments were met at the NSS-D, for the current licence period.

Self-Assessments

NSS-D also performs annual self-assessments to ensure adherence to the OPG Nuclear Safeguards and Nuclear Material Accountancy program.

IAEA Fuel Verification Program

The IAEA Fuel Verification Program includes material accounting, the IAEA monthly remote monitoring report, and the use of surveillance equipment such as cameras, portable verification equipment, and containment equipment.

NSS-D's compliance with the Fuel Verification Program is met through the following ongoing activities:

- Complying with the Safeguards Agreement and the Additional Protocol.
- Providing services and assistance for IAEA staff tasks and equipment operation.
- Disclosing any records to the IAEA upon request.
- Not interfering in any way with Safeguards equipment, samples, or seals.
- Making no changes to operations, equipment or procedures that would affect Safeguards implementation without prior written CNSC approval.
- Preparing and submitting nuclear inventory reports per CNSC Regulatory Document REGDOC 2.13.1, *Safeguards and Nuclear Material Accountancy*.

Physical Inventory Taking

NSS-D staff completes an annual physical inventory taking as part of licence conditions pursuant to the implementation of safeguards by the IAEA. This is a snapshot of the fuel physical inventory at any given time.

Physical Inventory Verification

Canadian facilities are selected at random by the IAEA for a physical inventory verification that follows the physical inventory taking. If a facility is not chosen for a physical inventory verification, then CNSC safeguards staff may perform limited confirmation activities following the annual physical inventory taking process. The IAEA completed the most recent physical inventory verification at NSS-D in October 2022.

These IAEA inspections are often attended by CNSC staff to review the facility's support for IAEA inspectors, including escorts and equipment; the provision of accountancy information and supporting documents; the facility compliance with safeguards licence conditions relevant to the inspection activity; and the IAEA's adherence to its rights and obligations relevant to the inspection. No significant compliance issues were identified.

Laser Mapping Container Verification System

In October of 2020, the NSS-D and IAEA completed full inventory scanning for DSCs in storage at the NSS-D. All new containers with full height welds will now only have the Cobra Seal (Figure 21) applied, and Laser Mapping Container Verification completed negating the requirement for the metallic seals. For containers that have the 5/8" weld, both Cobra and metallic seals will be applied until the Laser Mapping Container Verification tool can be modified by the IAEA to scan a 5/8" weld.

The Laser Mapping Container Verification system (Figure 22), designed by the IAEA, is a digital weld identification scanner created to verify and uniquely identify DSC in-situ, a powerful tool for acquiring and verifying the "weld fingerprint" of the DSC.

Figure 21: DSC in Storage showing IAEA Cobra Seals

Figure 22: Laser Mapping Container Verification System

NSS-D has met all safeguards conditions in its operating licence, and the terms of the agreement between Canada and the IAEA pursuant to the Treaty on Non-proliferation of Nuclear Weapons. NSS-D staff have fully co-operated with the IAEA and facilitated achievement of IAEA safeguards goals. All reports and information necessary for safeguards implementation and compliance continue to be provided on a timely basis. No compliance issues have been identified by IAEA or CNSC staff.

Compliance

OPG has implemented the plan for tracking of non-fuel nuclear material and now is fully compliant with CNSC REGDOC-2.13.1 (2018), *Safeguards and Nuclear Material Accountancy*.

3.13.3 Future plans

New Structures

The IAEA have been informed of NSS-D expansion plans for UFDSS #3 and #4 in the Additional Protocol annual report, which is electronically submitted to the CNSC and then forwarded to the IAEA. During the design phase of NSS-D expansion, OPG will request the IAEA to identify any measures required for the expansion. UFDSS #3 and #4 will be discussed in the Design Information Questionnaire for NSS-D, which will be submitted to the IAEA.

Training

Safeguards personnel will continue to be trained to OPG qualification requirements for safeguards. Safeguards governance will be updated, as required, to reflect any new regulatory standards or guides related to implementation of safeguards measures.

Self Assessments

OPG plans to continue to perform annual self-assessments at NSS-D to ensure adherence to the Nuclear Safeguards program. Findings will be addressed in a timely manner.

CANDU Owners Group Nuclear Safeguards Task Team

OPG participates in CANDU Owners Group (COG) meetings to discuss and ensure a consistent Safeguards approach is applied at all CANDU plants in Canada.

Trilateral Working Group

Trilateral Working Group meetings between the IAEA, CNSC Safeguards Division, and Industry have been initiated and continue to be held to discuss improvements and to address stakeholder issues.

3.13.4 Challenges

At this time, OPG does not foresee any challenges with respect to this safety and control area during the next licensing period.

3.13.5 Requests

There are no changes are being requested at this time with respect to licence conditions associated with this safety and control area.

3.14 Packaging and transport

Transportation to or from OPG's licensed facilities is performed in accordance with the OPG's Nuclear Radioactive Material Transportation program. This program is supported by the OPG Nuclear Radioactive Materials Transportation Emergency Response plan. OPG's Radioactive Materials Transportation program has a fleet of tractors, trailers, packagings, and Transportation of Dangerous Goods Class 7 Carriers (drivers). All OPG radioactive materials transportation packagings are compliant with the requirements of the *Packaging and Transport of Nuclear Substances Regulations.*

3.14.1 Relevance and management

OPG has implemented and maintains two programs, which cover this Packaging and Transportation Safety and Control Area. Transportation using public roads is covered under the Radioactive Material Transportation program, and transportation within the Darlington Nuclear site is covered under the Radiation Protection program. NSS- D is only affected by the Radiation Protection program, since transportation of DSCs from DNGS and RWC/DSOs from the Darlington Refurbishment Project to NSS-D occurs on Darlington Nuclear site, without the use of public roads.

Radioactive Material Transportation Program

The objective of this program is to ensure safe, compliant, and efficient transportation of radioactive material. This program establishes the procedures for radioactive material shipments and the radioactive material transportation records. However, this program does not apply to the on-site transfers of radioactive material, which is the case for NSS-D, which are controlled through the Radiation Protection program.

Radiation Protection Program

The CNSC *Packaging and Transport of Nuclear Substances Regulations* applies to off-site transfers using public roads and does not apply to the on-site transfer of DSCs and RWC/DSOs between DNGS and NSS-D. Nonetheless, in the absence of any specific regulations for on-site packaging and transport, OPG provides an equivalent degree of safety to workers, the general public and the environment as would have been achieved for off-site transportation using the Radiation Protection program.

3.14.2 Past performance

The on-site transfer of DSCs and RWC/DSOs, from the DNGS to NSS-D, is conducted on designated transfer routes, in accordance with OPG's procedures. As of June 30, 2021, OPG has safely transferred 821 loaded DSCs and 185 RWC/DSOs from the DNGS to NSS-D for processing and safe storage, without any events or incidents. DSC transporters are used to transfer DSCs between sites. Figure 23 shows a DSC transporter.

Figure 23: DSC Transporter Carrying a DSC

3.14.3 Future plans

The procurement of two new DSC transporters has been initiated, which will ensure continued reliability for transportation of DSCs between the DNGS and NSS-D.

3.14.4 Challenges

DNGS Refurbishment has and will continue to increase the amount of ILW shipped and stored at NSS-D. More drivers and Transportation Officers have been hired to accommodate the increase in waste shipments while ensuring that the program maintains safety as its primary focus.

3.14.5 Requests

There are no changes being requested at this time with respect to licence conditions associated with this safety and control area.

4.0 Indigenous consultation

4.1 Indigenous Relations Policy

OPG is committed to engaging with Indigenous Nations and communities about its nuclear operations, projects, and initiatives, including waste operations. OPG is directed by a corporate- wide Indigenous Relations policy that provides a framework for meaningful engagement with Indigenous Nations and communities and for the support of community programs and initiatives through its Corporate Citizenship Program.

The Indigenous Relations policy describes OPG's commitment to work with Indigenous Nations and communities and peoples proximate to OPG's present and future operations, and to develop positive and mutually beneficial relationships that will create social and economic benefits through partnership and collaboration. This policy governs OPG's engagement with Indigenous peoples with respect to the re-licensing of the NSS-D.

Licence Renewal and the Duty to Consult

The re-licensing of NSS-D does not create any new adverse impacts on Aboriginal and/or treaty rights held by local Indigenous Nations and communities. However, OPG has engaged local Indigenous Nations and communities regardless as part of its preferred practice and in light of their interest in OPG nuclear operations.

Engagement on NSS-D relicensing is focused on the Williams Treaties First Nations in whose treaty and traditional territory Darlington station is located. OPG also works to engage with the Mohawks of the Bay of Quinte; and Métis Nation of Ontario Region 8 on a regular basis in order to raise awareness about nuclear subjects, including NSS-D relicensing. Regular monthly meetings were established in 2021 with Curve Lake through a Framework Agreement, formed in mid-2021, which allowed meetings to occur between OPG and Curve Lake at a regular cadence with a focus on sharing information unrelated to Darlington New Nuclear Project, such as information and updates related to OPG's nuclear and renewable generation operations. OPG and the Mississaugas of Scugog Island First Nation are developing a Framework Agreement as well, which allows for regular interaction and engagement. This Framework Agreement is expected to be signed by the end of 2022.

With the Mohawks of the Bay of Quinte, meetings were held at least quarterly in 2021 and bi-annually in 2022 as a result of staff turnover within the Mohawks of the Bay of Quinte.

Engagement with the identified Indigenous Nations and communities during the re-licensing process included timely communication by e-mail, phone, meetings (virtual and/or in-person), community information sessions (pre-pandemic) and presentations.

OPG provided one tour of NSS-D to representatives of Curve Lake in December 2021 and two additional tours for Curve Lake in the first half of 2022. OPG provided one tour for a delegation of the Anishinabek Nation in late June 2022.

Outreach Activities for Licence Renewal

OPG is committed to engaging with Indigenous Nations and communities about its nuclear operations, environmental reporting, projects, and initiatives, including waste operations.

Outreach activities include sharing information about nuclear waste management, Pickering decommissioning, fish impingement and entrainment, project updates (Darlington New Nuclear Project, medical isotopes), site tours (when possible) and procurement and employment opportunities, e.g., Indigenous Opportunities Network regarding building trades and other jobs in the energy sector.

Indigenous Community Meetings

OPG holds regular meetings regarding OPG's nuclear operations, including waste operations and the transportation of low and intermediate waste to the Western Waste Management Facility with the identified Indigenous Nations and communities below. The purpose of these meetings is to share information, to identify issues and concerns for resolution, and to work collaboratively on areas of common interest.

OPG meets with the identified Indigenous Nations and communities who have an interest in OPG's nuclear operations, including the current NSS-D operations, to ensure that they are informed in a timely manner. The meetings also cover subjects such as current and future facility operations and the Darlington New Nuclear Project. In addition, areas of interest such as opportunities for procurement from Indigenous suppliers and skills training and employment via Indigenous Opportunities Network are included.

Based on work undertaken through Indigenous engagement, the following specific Indigenous Nations and communities continue to have a primary Aboriginal and/or treaty rights and/or interests with respect to OPG's waste operations at the NSS-D:

- Williams Treaties First Nations
- Mohawks of the Bay of Quinte
- Métis Nation of Ontario Region 8
- Six Nations
- Saugeen Ojibway Nation
- Historic Saugeen Métis
- Métis Nation of Ontario Region 7

Information on current operations, events of significance and the NSS-D operating licensing process will continue to be shared with the above communities and any others that identify an interest.

OPG has continued its engagement with Indigenous Nations and communities to raise awareness about its nuclear operations, environmental reporting and projects and their nature and scope.

Discussion of timing of the NSS-D operating licence renewal process, how to access the Participant Funding Program from the CNSC, and determination of a community's level of desired engagement was included in this engagement. Engagement with the identified Indigenous Nations and communities during the re-licensing process included timely communication by e-mail, phone, meetings (virtual and/or in-person), community information sessions as requested and presentations. Site tours to the NSS-D were offered as is practicable given Covid-19 protocols.

Meetings with CNSC

OPG meets on a monthly basis with CNSC staff to discuss the status of Indigenous engagement across all of its nuclear operations.

4.2 Program and Objectives

OPG has operated the Indigenous Opportunities Network since 2018. This program promotes Indigenous employment within the nuclear industry, with the Darlington Refurbishment project as the original catalyst. Since the program's start, over seventy-five (75) Indigenous candidates have been placed in various roles with OPG, vendors and unions. Most of these roles have been in the building trades, e.g., millwrights, electricians, boiler-makers, though placements have also been made in other roles such as civil maintainers, radiation technicians, engineers, corporate and project management staff. The Indigenous Opportunities Network will continue to serve OPG's various, ongoing nuclear projects and initiatives.

4.3 Current Operations and Results

OPG maintains a Public Information and Disclosure program to comply with the *Nuclear Safety and Control Act* and associated regulations. This program is in accordance with the NSS-D waste facility operating licence and Licence Conditions Handbook.

OPG's Indigenous engagement with the local Nations in 2021 was focused primarily on the Darlington New Nuclear Project with regular monthly meetings being held, supported by a formal Capacity Agreement with the Curve Lake First Nation and the Mississaugas of Scugog Island First Nation, and an accompanying capacity budget to support the required expertise for the Nations to participate in engagement activities with OPG. The Capacity Agreement is open to all Williams Treaty First Nations to participate. Additionally, regular monthly meetings were established with Curve Lake through a Framework Agreement, formed in mid-2021, which allowed meetings to occur between OPG

and Curve Lake at a regular cadence with a focus on sharing information unrelated to the Darlington New Nuclear Project – such as, information and updates related to OPG's nuclear and renewable generation operations. OPG and the Mississaugas of Scugog Island First Nation are developing a Framework Agreement as well which allow for regular interaction and engagement. This Framework Agreement is expected to be signed by end of 2022.

Regular interfaces with the other Williams Treaties First Nations, Mohawks of the Bay of Quinte and Métis Nation of Ontario Region 8 occurred through the Indigenous Advisory Council of the Canadian Centre for Nuclear Sustainability where OPG was able to share quarterly updates in 2021. The Canadian Centre for Nuclear Sustainability has nuclear sustainability at the forefront of its mandate and the Indigenous Advisory Council, launched in April 2021, serves as a body to both receive communications about nuclear sustainability topics (e.g., decommissioning and Nuclear Sustainability Services) and to offer advice and guidance to ensure meaningful Indigenous engagement and participation.

Awards

OPG was awarded a Gold Designation under the Canadian Council for Aboriginal Business' Progressive Aboriginal Relations program in August 2021. The program is a certification program that confirms corporate performance in Indigenous relations at the Committed, Bronze, Silver, or Gold level. Progressive Aboriginal Relations Gold companies demonstrate sustained leadership in Indigenous relations and commitment to working with Indigenous businesses and communities through innovative programs and engagement.

The designation is determined by a jury comprised of members from the Indigenous business community and supported by an independent and third-party verification company that reports on measurable outcomes and initiatives in four key areas:

- Leadership actions
- Employment
- Business development, and
- Community relations

Collaboration internally and with communities is the keystone of OPG's Indigenous relations program and has led to effective strategy development and mutually beneficial outcomes in the areas of employment, business development and community investment. Previously, OPG held the silver designation in the Progressive Aboriginal Relations program.

4.4 Future Plans and Improvements

OPG continues to build upon its relationships with the identified Indigenous Nations and communities regarding its nuclear facilities, operations, and projects, including NSS-D.

In October 2021, OPG developed and published its first-ever Reconciliation Action Plan which includes clear commitments with identified targets and timelines to advance reconciliation with Indigenous Nations, communities, and peoples across Ontario. The commitments align with the pillars of the Progressive Aboriginal Relations program, with an additional pillar related to the environment:

- Leadership
- Relationships
- Economic Empowerment
- People
- Environmental Stewardship

OPG's Reconciliation Action Plan serves as a roadmap to reconciliation and to drive accountability with OPG and among its supplier community. An annual report will be published in late 2022, stating that all of our commitments to date have been completed or are on track to be completed by the end of 2022.

5.0 Other Matters of Regulatory Interest

5.1 Environmental assessment

All Environmental Assessments for NSS-D were completed when the facility was named DWMF, hence DWMF is used in this section

5.1.1 Previous Environmental Assessment Study Report

In 2003, OPG completed and submitted to the CNSC an Environmental Assessment Study Report for the then proposed Darlington Used Fuel Dry Storage Facility, which was renamed the Darlington Waste Management Facility when it was built. This Environmental Assessment Study Report met the CNSC *Environmental Assessment Guidelines for Construction and Operation of the Darlington Used Fuel Dry Storage Facility* (the "Environmental Assessment Guidelines") issued in 2002.

The Environmental Assessment examined site preparation, construction and operation activities for storage buildings and a processing building. The results of the assessment identified no significant residual adverse environmental effects of the Used Fuel Dry Storage Facility project with the proposed mitigation measures in place. In 2013, the Commission concluded that the project, taking into account the appropriate mitigation measures identified in the Screening Report, was not likely to cause significant adverse environmental effects, and approved the Environmental Assessment. The Follow-Up Monitoring Program for the Environmental Assessment included four recommendations, which are summarized with the respective actions:

- Mitigative actions, should active bird nests be identified during construction:
    - Breeding bird surveys were undertaken in 2004 and 2005.
    - As recommended by biologists, site clearing took place between August and March to minimize nest disturbances.
- Soil sampling and analysis program, where potentially contaminated soils were disturbed / redistributed by construction:
    - Program was carried out in 2005; all results were less than the Ministry of Environment Conservation and Parks - Site Condition Standards for non-potable groundwater conditions.
- Public attitude research survey, to monitor public attitudes and effectiveness of mitigation:
    - Completed in 2009 and compared to the 2002 survey, OPG and CNSC agreed no further survey work was needed.
- Indigenous Interests:
    - Inclusion of First Nation communities and Métis Nation of Ontario on the Darlington Nuclear Community Stakeholder list (Mississaugas of Scugog Island First Nation, Ojibways of Hiawatha First Nation, Alderville First Nation, Curve Lake First Nation, Chippewas of Georgina Island First Nation, Mississaugas of the New Credit First Nation, and the Métis of Ontario)

The DWMF Environmental Assessment follow-up monitoring was considered complete by the CNSC in 2012 after submission and acceptance of the *Closure of Environmental Assessment Follow- Up and Monitoring Program for the DWMF* report.

5.1.2 DNGS Refurbishment and Continued Operation Project

In 2011, an Environmental Assessment was conducted for the DNGS Refurbishment and Continued Operation project. The DWMF was considered a key support facility within the Darlington Nuclear site. The following activities applicable to the DWMF were assessed:

- Construction of the RWSB at the DWMF, in support of refurbishment activities.
- Management of nuclear and non-nuclear waste (including storage of retube waste at the DWMF and transportation of miscellaneous refurbishment low and Intermediate level radioactive Waste), in support of refurbishment activities.
- Management of routine operational radioactive wastes (including construction and operation of additional facilities at the DWMF for interim storage of used fuel and any Steam Generators that may have to be replaced as part of normal maintenance) and non-radioactive wastes, in support of continued operation activities.

The DNGS Refurbishment and Continued Operation Project Environmental Assessment documents were prepared in compliance with the requirements of the *Environmental Assessment Scoping Information Document*, as issued by the CNSC. In December 2011, the *DNGS Refurbishment and Continued Operation Environmental Impact Statement* and fifteen technical support documents (considered the definitive Environmental Assessment document) were submitted to the CNSC.

In 2013, the Environmental Assessment was approved and the Record of Proceedings and Decision concluded that the proposed project was not likely to cause significant adverse effects. No specific follow-up activities related to the construction and operation of additional storage building(s) or management of wastes, pertinent to the DWMF, were identified.

5.1.3 Environmental Risk Assessments

In addition to the previously completed Environmental Assessments described above, OPG has conducted Environmental Risk Assessments for the Darlington Nuclear site (which includes the DWMF) on a routine basis. More details on the Environmental Risk Assessments are described under Section 3.9.

5.2 Cost recovery

OPG has provided timely payments during the current licensing period to the CNSC on a quarterly basis upon receipt of invoices. OPG will continue to make timely payments as required. There is no special request or inquiry about cost recovery at this time.

5.3 Financial guarantees

Cost Estimates

NSS-D is included in OPG's Consolidated Financial Guarantee for all of the costs of implementing proposed decommissioning plans for all of its Class I licensed facilities.

Cost estimates are prepared based on the NSS-D Preliminary Decommissioning Plan to determine the liability to be incurred during decommissioning. The most recent comprehensive review and update of the Ontario Nuclear Funds Agreement Reference Plan and associated lifecycle cost estimate for nuclear waste management, stations and waste facilities decommissioning is contained in the 2022-2026 Ontario Nuclear Funds Agreement Reference Plan Update as part of the five-year update cycle as required by *Ontario Nuclear Funds Agreement*. The updated Ontario Nuclear Funds Agreement Reference Plan was approved by Ontario Minister of Finance in March 2022, effective January 1, 2022. The updated and approved cost estimates formed the basis of OPG's proposed 2023-2027 CNSC Consolidated Financial Guarantee requirement submission.

Financial Guarantee

In August 2022, OPG submitted a Request for Acceptance of OPG's Financial Guarantee to the Commission in support of the 2023-2027 Financial Guarantee. The sources to satisfy the Consolidated Financial Guarantee requirement are the *Ontario Nuclear Funds Agreement* segregated funds augmented by a Provincial Guarantee, when required. CNSC's access to these funds is provided by the CNSC *Financial Security and Ontario Nuclear Funds Agreement Access Agreement* between the CNSC, OPG and the Province of Ontario, and the *Provincial Guarantee Agreement* between the CNSC and the Province of Ontario. NSS-D is included within this Consolidated Financial Guarantee scope. The Consolidated Financial Guarantee is normally updated on a five-year cycle using the guidance set out in CNSC Regulatory Guidance documents. Specific to NSS-D, this requirement is embedded in the NSS-D waste facility operating licence requirement under Licence Condition G.3, which requires OPG to maintain a Financial Guarantee acceptable to the CNSC Commission.

OPG has a Regulatory Management Action Request in place to submit to CNSC staff a gap analysis and implementation plan for compliance with the requirements in REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* at the Waste Management facilities, including NSS-D, by March 17, 2023.

Financial Guarantee Reporting

In addition to the five-year update cycle, OPG provides an annual Financial Guarantee report to CNSC detailing the status of the guarantee including the amounts accumulated in segregated funds and the value of the Provincial Guarantee required. The report compares the amount of the liabilities and the financial resources available to discharge the obligations. The guarantee remains valid and in effect and is sufficient. The 2021 Annual Report for the 2018-2022 CNSC Financial Guarantee was submitted to the CNSC in February 2022.

Financial Guarantee Hearing

The next Financial Guarantee hearing before the CNSC Commission, which will be a hearing in writing, will occur in 2022. OPG is requesting that the Commission accept OPG's Consolidated Financial Guarantee for the 2023-2027 period.

5.4 Other regulatory approvals

At the time of writing, Table 8 provides a listing of federal, provincial, municipal, and other regulation, other than the regulations pursuant to the *Nuclear Safety and Control Act*, which NSS-D must abide by.

Table 8: List of Federal, Provincial, Municipal or Other Regulations

Regulatory Agencies	Legislation	Description
FEDERAL		
Environment and Climate Change Canada	Canadian Environmental Protection Act	Section 48
Environment and Climate Change Canada	Canadian Environmental Protection Act	Federal Halocarbon Regulations (SOR / 2003 / 289)
Environment and Climate Change Canada	Canadian Environmental Protection Act	Federal PCB Regulations
Environment and Climate Change Canada	Canadian Environmental Protection Act	Migratory Birds Convention Act
Environment and Climate Change Canada	Canadian Environmental Protection Act	Species at Risk Act – Wildlife Species at Risk Regulations
Environment and Climate Change Canada	Canadian Environmental Protection Act	Environmental Emergency Regulation
PROVINCIAL		
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	Section 20.2 (Stormwater)
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	Section 20.2 (Air)
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	O. Reg. 419/05: Air Pollution Local Air Quality
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	O. Reg. 1/17: Registration under Part II.2 of the Act Activities Requiring Assessment of Air Emissions
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	O. Reg. 347: General Waste Management – Section 17 Management of Asbestos Waste

Regulatory Agencies	Legislation	Description
PROVINCIAL		
Ministry of the Environment, Conservation and Parks	Environmental Protection Act	O. Reg. 347: General Waste Management – Section 74 Land Disposal of Hazardous Waste
Ministry of the Environment, Conservation and Parks	Ontario Water Resources Act	Section 53
Ministry of the Environment, Conservation and Parks	Endangered Species Act	Section 17(2)(B)
Ministry of Labour	Occupational Health and Safety Act	O. Reg. 278/05: Designated Substance Asbestos on Construction Projects and in Buildings and Repair Operations
Ministry of Labour	Workplace Safety and Insurance Act	
Minister of Community Safety and Correctional Services of Ontario	Emergency Management and Civil Protection Act	Provincial Nuclear Emergency Response Plan
MUNICIPAL		
Municipality of Clarington	Fire Protection	Memorandum of Understanding

At the time of writing, Table 9 provides a listing of permits, certificates, and other licences that have been issued to OPG for NSS-D.

Table 9: List of Permits, Certificates and Other Licenses

Certification # or Registration #	Description
PWC-ISO14000-510	ISO 14001:2015 Environmental Management Systems
ECA# 0187-BGYNDD	Environmental Compliance Approval for Air
ECA# 4810-A78QUZ	Environmental Compliance Approval for Sewage works
DA-OR-2022-1196	Migratory Bird Damage and Danger permit obtained annually from Environment and Climate Change Canada (valid Apr 26/22 through Dec 31/22)
HWIN # ON0490015	Hazardous Waste Information Network annual registration
www.wildlifehc.org	Wildlife Habitat Council Certification
WD-76200-ELV1 #085196	Wheelchair Lift NSS-D – DSC Processing Building (Amenities Area)
10934844	Professional Engineers Ontario - Certificate of Authorization
O243.11	X-ray machine located in the NSS-D Entrance Lobby

5.5 Licensee's public information program

OPG implements and maintains a public information and disclosure program informing persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects of the licensed activity on the environment as well as any potential effects to their health and safety. The primary goal of the public information and disclosure program, as it relates to the licensed activities, is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the life cycle of nuclear facilities are effectively communicated to the public.

5.5.1 Community Consultation Program

OPG ensures timely, open, and transparent communication to maintain positive and supportive relationships and confidence of key stakeholders. OPG develops, maintains, and implements an annual Public Information and Disclosure program.

Annual engagement activities are directed towards community stakeholders, including government, media, business leaders, educational institutions, interest groups, and community organizations. OPG ensures transparent disclosure of operations and potential impacts, both positive and negative that may occur.

5.5.2 Current Operations and Results

During the reporting period, OPG regularly and proactively provided information to the public on its facility activities. For operational status changes or unscheduled operations that may cause public concern or media interest, OPG follows the OPG Disclosure protocol to notify key community stakeholders in a timely manner. OPG maintains a duty on-call position 24 hours a day, seven days a week, to manage this requirement.

Increased efforts over the past nine years have resulted in expanded outreach with key stakeholders, government officials and the broader public. This is in response to growing interest by the public and community in OPG's waste operations, and the future of Canada's long-term permanent and safe solutions for nuclear by-products.

On a quarterly basis, OPG publicly posts performance reports on nuclear waste operations at www.opg.com and shares this document electronically with key stakeholders. Additionally, starting in 2014, OPG developed and began issuing a quarterly Environment report in an easy to read and understandable format. Annually, OPG posts the Environmental Monitoring Program report on www.opg.com for both Pickering and Darlington Nuclear sites, which includes NSS-D. In 2015, OPG initiated the quarterly posting of Waste Facilities Reportable Events, which aligns with OPG's nuclear station disclosure activities.

Disclosure Protocol

In 2013, OPG implemented a managed system to carry out the requirements of CNSC RD/GD-99.3 *Public Information and Disclosure* and transitioned to REGDOC-3.2.1, *Public Information and Disclosure* in 2020. This included the development and issuance of OPG's Nuclear Public Information and Disclosure standard and the development and public posting of an OPG *Nuclear Information Disclosure and Transparency protocol*. All of OPG's nuclear waste operations at the NSS-D facility adhere to OPG's Nuclear Public Information and Disclosure standard and the Nuclear Information Disclosure and Transparency protocol.

Community Outreach and Programming

OPG's community relations and Public Information program has been recognized as a strength by national and international utility peers. OPG benchmarks current practices amongst other industries to ensure continuous performance improvement.

The Public Information program proactively provides information to the public and stakeholders on Darlington's operations, which includes NSS-D.

Through community outreach, OPG has established strong working relationships within the community. Regular briefings are provided to elected officials and council, key community stakeholders, media, business leaders, educational institutions, and interest groups on waste operations and OPG's long-term permanent and safe solutions for nuclear by-products. OPG continues to respond to and supports requests for information or briefings. OPG provides a quick

response to questions raised by stakeholders and the public, and identifies trends in order to further refine proactive communications. Two-way dialogue with the public is facilitated through personal contact, community newsletters, speaking engagements, educational outreach, paid advertising, and robust websites with email response options.

Darlington's Corporate Citizenship Program partners with more than 300 community initiatives across Durham Region focused on community, education, environment, and indigenous community-building events. Darlington's senior management participates in many community activities, providing regular updates and presentations and supporting partnerships that benefit the social fabric of the community.

Darlington Nuclear's Stakeholder Relations and Communications group continues provide quality programs within our host community. Prior to the COVID-19 pandemic, our annual March Break Blitz, and Tuesdays on the Trail programs (Figure 24) annually reached thousands of community members throughout the winter and summer months. Since the start of the pandemic, OPG has pivoted to continue to provide free, educational, and quality programs through virtual and curbside pickup platforms (Figure 25). Since 2021, OPG's Virtual Power Kids program reached over 120,000 participants.

Although the pandemic has been challenging in many ways, OPG has developed alternative ways in which we can continue to engage, share information, and build relationships within our host communities.

Figure 24: Tuesdays on the Trail program (Summer 2019)

Figure 25: Power on Tuesdays Curbside Pickup

Darlington is certified by the Wildlife Habitat Council as a Corporate Lands for Learning site, recognizing the environmental learning opportunities that are provided on site. One of OPG's many environmental partnerships is with Courtice Secondary School students and involves:

- building nest boxes, bee hotels, turtle rafts and benches (Figure 26),
- monitoring nesting activity,
- tree identification, and
- development of a pollinator garden.

Figure 26: Courtice Secondary School Partnership (Summer 2021 / Spring 2022

Since 2011, OPG has been a lead partner in the Bring Back the Salmon (BBS) program with the Ontario Ministry of Natural Resources, and the Ontario Federation of Anglers and Hunters (Figure 27).

OPG's support contributes to all four pillars of the BBS program, but is weighted towards fish production. In 2019, Darlington Nuclear Information Center launched a hatchery with a local school as part of the program. During non-COVID years, OPG hosted the students at the Info Centre and provide a presentation about Atlantic Salmon history in January, as well as organized the release of the fish in June with the school. Since 2021, the program has run virtually, reaching thousands of students across the province. OPG supported the virtual classroom hatchery episodes with a segment on how OPG generates electricity.

Figure 27: Students helped open a new educational Atlantic salmon hatchery at Darlington (Spring 2019**)**

In 2014 DNGS began hosting annual Community Open Houses at the Darlington Energy Complex (Figure 28). In 2019 approximately 3,250 people from across Durham and the Greater Toronto Area attended the event. Due to the COVID-19 pandemic OPG did not host public open houses in 2020 or 2021, however OPG will resume in person public open houses post-pandemic.

Figure 28: Open House at the Darlington Energy Complex (DEC) – Fall 2019

To increase the understanding of nuclear waste operations, DNGS provides presentations and tours to key stakeholder groups, media and interested groups. OPG has also provided virtual presentation and tours since the start of the COVID-19 pandemic and returned to in-person/hybrid in the spring of 2022.

OPG received, documented, and responded to concerns, complaints and inquiries raised by the public. A managed process is in place to track actions through to closure.

During the current licence period, communications in support of waste operations generated the following:

- Eighteen (18) Darlington newsletters distributed to a combined audience of250,000 households.
- Sixty-nine (69) tours and presentations of the NSS-D to interested groups and stakeholders.
- From 2012, OPG attended twenty-eight (28) Durham Nuclear Health Committee meetings and fifty-four (54) Community Advisory Council (CAC) meetings to provide updates or to respond to questions about nuclear waste operations.
- Twenty-six public open houses were held on the Darlington Refurbishment Project, which provided the community information, exhibits and an opportunity for the public to ask questions, obtain clarification, and identify or raise any concerns or issues they may have pertaining to current waste operations or the continued operations.

OPG relies heavily on websites to provide up-to-date information that is easily accessible by the public and offers opportunities for further contact. During this licensing period, several newsletters, reports, media releases, updated stories and links to other agencies and regulatory proceedings were kept current on a number of nuclear-related websites. All OPG websites are in compliance with web accessibility standards, allowing individuals, who may be hard of hearing or are visually impaired, the ability to review the websites.

Social media continues to increase in popularity and use. OPG actively monitors and responds to activity through Twitter, Facebook, LinkedIn, and other social media platforms. OPG maintains a Twitter account with a current following of 18,330 followers, an Instagram account with a current following of 6,829 followers, a Facebook page with 10,342 current followers and a LinkedIn account with a current total of 91,684 followers. Reported social media totals are current as of June 30, 2022. Each social media page is updated to include information on relevant nuclear activities and information.

During the licence renewal process, OPG developed and undertook a public community engagement program. The program:

- Communicated and informed the public of the future site operations and expansion to determine the level of interest and concern.
- Documented findings and addressed concerns.
- Took appropriate steps for public engagement and consultation to help inform the public about the environmental review work, as part of OPG's licence submission.
- Addressed and managed concerns as appropriate.

5.5.3 Future Plans and Improvements

OPG plans to:

- Continue to develop and implement an annual public information work plan.
- Continue to maintain strong community relationships.
- Continue with website improvements and migration of all relevant NSS-D information to OPG websites.
- Continue to expand public environmental reporting and engagement including environmental follow up processes.

5.6 Nuclear liability insurance

OPG continues to maintain Nuclear Liability Insurance for NSS-D consistent with the requirements of the *Nuclear Liability and Compensation Act*. Insurance inspections are conducted at NSS-D at the request of the nuclear property or conventional insurers.

5.7 Additional/Other matters

5.7.1 Permanent Disposal of Used Fuel and ILW

OPG will continue to safely store used fuel and intermediate level waste at the NSS-D until permanent disposal facilities becomes operational.

In November 2002, the Canadian Parliament passed the *Nuclear Fuel Waste Act*, which provides the legal framework for the Government of Canada to make a decision on the long-term management of Canada's used nuclear fuel. The *Nuclear Fuel Waste Act* required the majority owners of nuclear fuel waste to form a Nuclear Waste Management Organization to study approaches for managing Canada's used nuclear fuel. Nuclear Waste Management Organization is responsible for the long-term management of Canada's used nuclear fuel waste that currently exists and that which will be produced in the future.

Under the Nuclear Waste Management Organization's Adaptive Phased Management program, established by the federal government, the permanent disposal facility for used fuel is expected to be in service no earlier than 2043, at which time used fuel will start to be transferred from interim storage locations to the Adaptive Phased Management facility.

OPG had planned to dispose of L&ILW from the NSS-D in a Deep Geologic Repository; however, early in 2020, the L&ILW Deep Geological Repository project was cancelled. OPG is exploring options and remains committed to permanent and safe disposal of its operational waste as well as future decommissioning waste.

OPG is participating in the public review launched in November 2020 by Natural Resources Canada, with the goal of modernizing the federal policy framework for low- and intermediate-level radioactive waste, as well as developing an integrated waste strategy. Pending regulatory approval, any decommissioning low- and intermediate-level radioactive waste generated prior to the in-service dates of the disposal facilities is expected to be safely stored on an interim basis.

5.7.2 Open Action Items Discussed in CNSC Hearings and Meetings

There are no open action items remaining from the 2013 CNSC Hearing on DWMF Licence renewal, the waste management facility consolidated interim status update meeting held in 2015, and the meeting in which CNSC staff present the *Regulatory Oversight Report for Waste Management, Storage and Processing in Canada: 2015* held in 2016, and the annual *Regulatory Oversight Reports for Nuclear Generating Sites* held from 2017 through to 2021.

6.0 Conclusions

Through this Commission Member Document and the Application for the Renewal of the NSS-D waste facility operating licence, OPG has demonstrated that it is qualified to operate NSS-D and has made adequate provisions 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.

NSS' management system has fostered a strong and healthy safety culture at NSS-D. NSS-D has a history of strong safety performance coupled with reliable operation. Over its operating lifetime, NSS-D has met all of its environmental targets, and radiation exposures to workers and the public have been far below Regulatory limits and OPG control levels. NSS-D has met its obligations arising from the Canada/IAEA Nuclear Safeguards Agreement.

In conclusion, OPG is committed to its continued operation of NSS-D safely and reliably, and requests the renewal of the NSS-D waste facility operating licence for a period of ten years.

List of Acronyms

ALARA	As Low As Reasonably Achievable
CANDU	CANada Deuterium Uranium
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
DNGS	Darlington Nuclear Generating Station
DSC	Dry Storage Container
DSO	Darlington Storage Overpack
DWMF	Darlington Waste Management Facility
IAEA	International Atomic Energy Agency
ILW	Intermediate Level Waste
NBCC	National Building Code of Canada
NFCC	National Fire Code of Canada
NSS	Nuclear Sustainability Services
NSS-D	Nuclear Sustainability Services - Darlington
NWM	Nuclear Waste Management
OPG	Ontario Power Generation
PAUT	Phased Array Ultrasonic Testing
REGDOC	CNSC Regulatory Document
RWC	Retube Waste Container
RWSB	Retube Waste Storage Building
UFDSB	Used Fuel Dry Storage Building
UFDSS	Used Fuel Dry Storage Structure
WFOL	Waste Facility Operating Licence

Addendum A: NSS-D Organizational Chart