ONTARIO POWER GENERATION

**Coversheet**

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Title:
**PRELIMINARY DECOMMISSIONING PLAN FOR THE DARLINGTON NEW NUCLEAR PROJECT AS BUILT FACILITY**



# PRELIMINARY DECOMMISSIONING PLAN FOR THE DARLINGTON NEW NUCLEAR PROJECT AS BUILT FACILITY

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# PRELIMINARY DECOMMISSIONING PLAN

**for the**

# DARLINGTON NEW NUCLEAR PROJECT AS BUILT FACILITY

*prepared for*

**Ontario Power Generation Inc., Canada**

*prepared by*

**TLG Services, LLC**
Bridgewater, Connecticut USA

**March 2023**

## APPROVALS

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## REVISION LOG

| No. | Date | Item Revised | Reason for Revision |
|---|---|---|---|
| 0 | 12/19/2022 | | Original Issue |
| 1 | 1/30/2023 | | Major revision as requested by OPG |
| 2 | 3/3/2023 | | Major revision as requested by OPG |

## Acronyms

| | |
|---|---|
| ALARA | As Low As Reasonably Achievable |
| CAD | Canadian (Dollars) |
| CB | Control Building |
| CEAA | Canadian Environmental Assessment Act |
| CN | Canadian National |
| CNSC | Canada Nuclear Safety Commission |
| CSA | Canadian Standards Association |
| DBE | Design Basis Earthquake |
| DDP | Detailed Decommissioning Plan |
| DNNP | Darlington New Nuclear Project |
| DNGS | Darlington Nuclear Generation Station |
| DOC | Decommissioning Operations Contractor |
| HVAC | Heating Ventilation and Air Conditioning |
| I&C | Instrument & Control |
| ICS | Isolation Condenser System |
| LTC | Licence to Construct |
| LTO | Licence to Operate |
| NSCA | Nuclear Safety and Control Act |
| NSS-DWMF | Nuclear Sustainability Services – Darlington Waste Management Facility |
| OPG | Ontario Power Generation |
| PDP | Preliminary Decommissioning Plan |
| PLSA | Plant Services Building |
| PSAR | Preliminary Safety Analysis Report |
| RB | Reactor Building |
| RPV | Reactor Pressure Vessel |
| RWB | Radwaste Building |
| SCCV | Steel-plate Composite Containment Vessel |
| SCR | Secondary Control Room |
| SMR | Small Modular Reactor |
| SSC | Structures, Systems, Components |
| TB | Turbine Building |
| TLG | TLG Services, LLC (an Entergy Company) |

## Darlington Lands Acknowledgement

The lands and waters on which the Darlington New Nuclear Project (DNNP) is situated are the traditional and treaty territory of the Williams Treaties First Nations, which includes Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Chippewas of Beausoleil First Nation, Chippewas of Georgina Island First Nation, Chippewas of Rama First Nation, and the Mississaugas of Scugog Island First Nation.

To acknowledge the traditional territories is to recognize its history, predating the establishment of the earliest European colonies. It is also to acknowledge the significance for the Indigenous peoples who lived and continue to live upon it, to acknowledge the people whose practices and spiritualties are tied to the land and water and continue to develop in relation to the territory and its other inhabitants today.

## Abstract

This Preliminary Decommissioning Plan (PDP) describes the activities that will be required to decommission the as-built Darlington New Nuclear Project (DNNP) Small Modular Reactor (SMR) facility (prior to fuel load) and restore the site for other Ontario Power Generation (OPG) uses. This PDP demonstrates that decommissioning is feasible with existing technology and it provides the schedule as well as the basis for estimating the cost of decommissioning.

# 1. INTRODUCTION

## 1.1 PURPOSE

OPG is responsible for planning, executing, and funding all phases of decommissioning of the DNNP facility. This Preliminary Decommissioning Plan (PDP or plan) has been prepared for the as-built (prior to the first fuel loading) Darlington New Nuclear Project (DNNP), to comply with the requirements of Regulatory Document REGDOC-1.1.2, *Licence Application Guide, Licence to Construct a Nuclear Power Plant* (Ref. 1). This document requires decommissioning practices to be addressed with the application for a License to Construct (LTC) a nuclear power plant. Requirements and guidance on nuclear station decommissioning preparation and planning in Canada is found in the Canadian Nuclear Safety Commission's (CNSC) REGDOC 2.11.2, *Waste Management, Decommissioning* referred to herein as REGDOC 2.11.2 (Ref. 2). This PDP will be submitted for CNSC acceptance during the license to construct application portion of the station's life cycle. In addition to the regulatory requirement for submittal of this plan, OPG will use the plan to:

1. Guide the facilitation of the decommissioning process
2. Document the preferred decommissioning strategy that represents a technically feasible, safe and environmentally acceptable approach in light of current knowledge
3. Provide a reasonable basis for establishing and maintaining an acceptable financial guarantee program
4. Provide guidance for future decommissioning planning and the preparation of a detailed decommissioning plan

## 1.2 LICENSEE REQUIREMENTS

DNNP will provide a new Class I nuclear facility, as defined by the Nuclear Safety and Control Act (NSCA) (Ref. 3). This facility is a critical new source of clean electricity for the Province of Ontario's future energy needs and will assist Canada in achieving its commitment to be Net-Zero by 2050. The DNNP will be implemented at the existing Darlington Nuclear site that is owned and operated by Ontario Power Generation (OPG).

OPG is the holder of a Nuclear Power Reactor Site Preparation Licence 18.00/2031. This licence permits OPG to perform activities to prepare the DNNP site for the future placement of a nuclear facility. In December 2021, OPG announced the selected technology for this nuclear facility to be the grid-scale BWRX-300 Small Modular Reactor (SMR), designed by GE-Hitachi Nuclear Energy Americas, LLC (GEH). The BWRX-300 is approximately 300

megawatt-electric in size and, is capable of preventing between 0.3 and 2 megatonnes of carbon dioxide emissions per year, depending on the kind of alternative power generation technology it is displacing. OPG has submitted a Licence to Construct (LTC) application (Ref. 4) in accordance with the NSCA, Class I Nuclear Facilities Regulations (SOR/2000-204) and CNSC REGDOC-1.1.2 . Once granted, the LTC will permit the construction of a one-unit BWRX-300 facility.

All decommissioning activities will be performed in accordance with the most relevant legislation, regulations, codes and standards. REGDOC 2.11.2 provides the requirements and guidance for all phases of decommissioning. REGDOC 2.11.2 is complemented by the requirements and guidance in Canadian Standard Association (CSA) N294, *Decommissioning of Facilities Containing Nuclear Substances* (Ref. 5). Together, these documents provide requirements and guidance for decommissioning. REGDOC 2.11.2 is further complemented by other CNSC regulatory documents. Appendix A and B demonstrate how the applicable requirements of REGDOC-2.11.2 and CSA N294:19 have been satisfied in this PDP. A graded approach was used in the development of this document, as the facility will not have been operated and the level of hazard would be correspondingly lower than an operating facility. The graded approach for the applicable elements of REGDOC-2.11.2 and CSA N294:19 in this document does not compromise the protection of health, safety, security and the environment for the decommissioning activities described.

The following provisions of the NSCA and the regulations made under it are relevant to REGDOC 2.11.2:

1. NSCA, subsection 24(5) and paragraphs 26(e) and 26(f)
2. General Nuclear Safety and Control Regulations, paragraph 3(1)(l)
3. Class I Nuclear Facilities Regulations, sections 7 and 8, subsections 14(3) and 14(4), and paragraphs 3(k), 5(i) and 6(h)
4. Class II Nuclear Facilities and Prescribed Equipment Regulations, sections 3 and 5
5. Uranium Mines and Mills Regulations, section 7, paragraphs 8(b), 8.3(2)(c), and 8.3(2)(d), and subparagraph 3(a)(viii)

In addition to this regulatory document, the CNSC's regulatory framework regarding waste management, specifically decommissioning, includes:

1. REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada* (Ref. 6)
2. REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* (Ref. 7)

3. REGDOC-2.11.1, *Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings* (Ref. 8)
4. REGDOC-2.11.1, *Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste* (Ref. 9)
5. REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* (Ref. 10)

The following CSA standard complements the CNSC's regulatory framework regarding waste management, specifically decommissioning:

1. N294, *Decommissioning of Facilities Containing Nuclear Substances* (Ref. 5)
2. N286, "Management Systems Requirements for Nuclear Power Plants" (Ref. 11)

## 1.3 SCOPE

This PDP covers the decommissioning of the facility at DNNP for the as-built facility prior to fuel load and is assumed to be superseded by a PDP for the Licence to Operate (LTO). It provides general descriptions of activities that are scheduled to occur in support of the demolition. Should the DNNP facility construction take longer than 5 years, OPG will review and update this decommissioning plan as required by REGDOC-2.11.2. Additionally, if the project is cancelled prior to operation, this PDP will be further developed into a DDP for CNSC acceptance.

This document describes the preliminary plan for the decommissioning of the powerhouse and associated buildings of the DNNP facility. Should the DNNP project be cancelled prior to operation, the buildings outside of the powerhouse and associated structures (e.g., the Administration building, workshops, etc.) would be maintained and repurposed to support the DNGS site or other OPG activities, as was identified in the site preparation PDP (Ref. 12). The list of buildings and structures included in this decommissioning plan are identified below:

- Reactor Building
- Control Building
- Fire Water Storage Tanks
- Intake Tunnel
- Local Switchyard – 115 kV
- Main Switchyard – 230 kV
- Radwaste Building
- Reactor Aux Bay
- Security Building

- Turbine Building
- Yard Fencing, Paving & Landscaping
- Intake Structure/Forebay & Pumphouse

### 1.3.1 Planning assumptions

1) A decision to not proceed with operations of the DNNP/SMR Unit 1 reactor will be made sufficiently in advance to allow decommissioning activities to commence in early 2029.

2) OPG will retain ownership of the site throughout the course of the decommissioning and subsequent restoration of the site.

3) A Decommissioning Operations Contractor (DOC), a company or consortium selected on the basis of experience, safety record, overall approach and cost, will perform all work during the Dismantling & Demolition and the Site Restoration stages. OPG will provide the necessary oversight.

4) It is assumed site services (e.g. electrical, sanitary sewer, fire water, etc.) are inspected and maintained as required to facilitate decommissioning activities.

5) Building materials such as concrete are assumed to be rubblized and be used for backfill on site as needed.

6) Consistent with international practices, sub-surface structures will be dismantled to a 'nominal removal depth' of one meter below grade, backfilled with concrete rubble and/or soil and graded over. The one meter depth allows for the placement of both gravel for drainage and topsoil for erosion control through the establishment of vegetation. At-grade foundation slabs exceeding one meter in thickness will be abandoned in place and covered with a one meter thick layer of backfill.

7) For the purpose of establishing the financial guarantee, no salvage credit is assigned to equipment and components removed during decommissioning; these are considered waste for costing purposes. However, consistent with the principles of the waste management hierarchy, recycling of clean materials will be pursued.

8) The site will be graded and made available for other OPG uses after completion of decommissioning.

9) The decommissioning activities are assumed to be performed in accordance with the applicable regulations in place at the time of writing based on a graded approach commensurate with the risks associated with decommissioning a non-nuclear power plant. Changes in current regulations may have an impact on the proposed assumptions and activities assumed to be undertaken as part of this plan.

# 2. STRUCTURE AND CONTENT OF PLAN

This PDP includes the following:

Section 1 Description of the site

Section 2 Description of the facility to be decommissioned

Section 3 Overview of site radiological, chemical and physical conditions expected after station shutdown

Section 4 Discussion of the strategy for decommissioning

Section 5 Discussion of plan for the decommissioning work

Section 6 Description of the hazardous monitoring and survey commitments

Section 7 Description of the waste management strategy

Section 8 Detailed Decommissioning Plan (DDP) preparation prior to decommissioning

Section 9 Periodic review and update the PDP

Section 10 Description of the physical state of the facility

Section 11 Records

Section 12 A public consultation plan, including a public information program and avenues for public participation as per the requirements and guidance of REGDOC-3.2.1, *Public Information and Disclosure* (Ref. 13)

Section 13 An Indigenous engagement plan as per the requirements and guidance of REGDOC-3.2.2, *Indigenous Engagement* (Ref. 14)

Section 14 A cost estimate

Section 15 Uncertainty

## 2.1 DESCRIPTION OF THE SITE TO BE DECOMMISSIONED

### 2.1.1 Darlington Nuclear Site Context and Surrounding Land Uses

The Darlington Nuclear site (see Figure 2.1.2-1), is located in the township of Darlington, on the north shore of Lake Ontario at Raby Head, approximately 70 km east of Toronto. The site is approximately 5 km southwest of the community of Bowmanville and 10 km southeast of the City of Oshawa. Immediately to the east of the site is St. Marys Cement limestone quarry and processing plant. The site is traversed by an east-west operating Canadian National (CN) railway and an 8.5m high berm that

provides the site protection in the event of a railway accident. The site is also traversed by the Lake Ontario Waterfront Trail, which is a multi- use recreation trail extending from Niagara-on-the-Lake to the Quebec border along the north shores of Lake Ontario and the St. Lawrence River.

Currently, the Darlington Nuclear site (see Figure 2.1.2-2) is home to the 3,512 megawatt-electric Darlington Nuclear Generating Station (DNGS), comprised of four operating CANada Deuterium Uranium (CANDU) pressurized heavy water generating reactors, the Tritium Removal Facility (TRF) that serves all of Ontario's CANDU nuclear reactors, and the Nuclear Sustainability Services-Darlington Waste Management Facility (NSS-DWMF) facility that stores spent nuclear fuel from the DNGS. The DNNP site is in the eastern one-third of the site bounded by the site property limits to the east and north, by Lake Ontario to the south, and by Holt Road to the west.

*Area and Bounding Roads*

The Darlington Nuclear site is approximately 4.9 $km^2$ in size and located within the Municipality of Clarington, Regional Municipality of Durham, Province of Ontario, Canada. OPG also owns and operates the eight-unit Pickering Nuclear Generating Station (PNGS) (with six operating units with a generating capacity of 3,100 MWe and two units in safe storage) within the City of Pickering which is located approximately 30 km to the west of the Darlington Nuclear site, as shown in Figure 2.1.1-1.

The Darlington Nuclear site is bounded by Crago Road to the west, Energy Drive to the north, St. Marys Cement to the east and Lake Ontario to the south. The existing DNGS is located west of Holt Road on the western portion of the site, whereas the lands for the DNNP are located east of Holt Road. The allocation of lands within the Darlington Nuclear site for the DNNP is approximately 1.8 $km^2$. Also shown in Figure 2.1.1-2 is the 914-meter exclusion zone for the DNGS.

*Industrial Facilities*

The major industrial facilities in the vicinity of the Darlington Nuclear site, as shown in Figure 2.1.1-3, include:

1. St. Marys Cement Group which is located directly east of the DNNP site on Bowmanville Avenue, and is an active quarry for resources servicing the aggregate and concrete industry
2. The lands designated as Clarington Energy Business Park which is located directly west of the DNGS site and includes:
    a. Covanta Durham York Energy Centre which manages household waste from the regions of Durham and York

b. OPG's Darlington Energy Complex, an approximately 27,900 $m^2$ multi-use building that provides offices and services supporting the Darlington Refurbishment project
c. CoPart, a vehicle auction and recycling facility
d. A warehousing facility for batteries (East Penn)
e. Courtice Water Pollution Control Plant (WPCP), a wastewater treatment facility commissioned in late 2007, with an average day rated capacity of 68.2 million litres per day with a peak hourly flow capacity of 180 million litres per day

There are some industrial developments in the Courtice Employment Area located northwest of the Darlington Nuclear site, including warehousing and automobile dealerships.

While not located in the survey area, the PNGS is located approximately 30 km west of the Darlington Nuclear site.

*Developmental Activities*

OPG actively reviews planning applications in the Municipality of Clarington to monitor sensitive land use developments within 3 km of the DNGS and DNNP facilities. Additionally, OPG reviews planning applications within 10 km of the Darlington Nuclear site in the Municipality of Clarington and the City of Oshawa. These applications include official plan amendments, zoning by-law amendments, draft plans of subdivision and condominium, and other miscellaneous planning related documents.

*Urban Communities and Rural Areas*

The urban communities of Oshawa and Courtice are located northwest of the Darlington Nuclear site, while Bowmanville is located to the northeast of the DNNP site. A rural area providing a separation between the Clarington urban areas of Courtice and Bowmanville is located immediately north of the DNNP site. The community of Newcastle is also located east of the DNNP site within the survey area; albeit only a portion is included in the survey area. The geographic limits defined for the survey area are approximately 10 km from the site and include Taunton Road to the north, Simcoe Street to the west, an approximate border of Darlington Clarke Townline Road to the east, and Lake Ontario to the south.

*Land Use Assessment for Environmental Effects*

The survey area is consistent with the Land Use Effects Assessment Zone, which was the furthest distance that measurable effects on planned land use structure as well as impacts on sensitive land uses are identified in the proximity to the Darlington Nuclear site. The Land Use Assessment of Environmental Effects Technical Support Document completed in 2009 identified the Regional Study Area as being approximately 50 km from the

Darlington Nuclear site as shown in Figure 2.1.1-4. The DNNP Land Use Environmental Assessment Follow-Up Monitoring Plan / Methodology Report was developed in 2022, NK054-CORR-00531-10635 (Ref. 15) to fulfill the requirement of OPG Commitment D-P-12.7 in NK054-REP-01210-00078 (Ref. 16). As per the report, OPG will continue to monitor planning development in land use in proximity to the DNNP site, and regularly consult with the Municipality of Clarington, City of Oshawa and the Regional Municipality of Durham on proposed land use changes. The effects on implementation of emergency plans will be investigated throughout the site preparation and construction phases.

## 2.1.2 Description of the Surrounding Environment

### *2.1.2.1 Natural Environment*

The Darlington Nuclear Site is situated in an undulating to moderately rolling limestone till plain, spotted with remnants of a lake plain deposit. Inland, the previously irregular terrain has been graded in the DNGS powerhouse area to an elevation of about 100 m. The surface elevation generally rises towards the north with a mean elevation of 122 m just south of the railway tracks. North of the tracks, the ground is irregular ranging from 120 to 128 m elevation. A higher ridge, starting from the shore just east of Raby Head, extends diagonally across the site in a north-westerly direction. In general, the area possesses no significant topographic features (Ref. 17).

The dominant vegetation cover surrounding the Darlington Nuclear Site relates to agricultural use, including row crops and pastureland. As of 2018, approximately 265 ha, or 57%, of the Darlington Nuclear Site area is covered by vegetation communities. Upland vegetation communities and wetland vegetation communities cover approximately 46% and 11% of the Darlington Nuclear Site area, respectively. The Darlington Nuclear site forest community consists of deciduous and mixed forest classes dominated by such indigenous species as Sugar Maple, White and Green Ash, Manitoba Maple, Trembling Aspen, Balsam Poplar, White Birch, Eastern White Cedar, and Willow species (Ref. 18).

Two individual Butternut trees, listed as a nationally endangered species provincially and federally, have been inventoried at the Darlington Nuclear Site in the eastern part of the site, last observed in 2019 (Ref. 18).

Wildlife habitat is associated with the vegetation communities, and natural and developed areas found within the Darlington Nuclear Site. Regionally, over 350 bird species and 50 mammalian species (e.g., coyote, red fox and

white-tailed deer) have been inventoried, as well as a number of reptiles and amphibians and insect species of interest (Ref. 18).

Eight species of amphibians and five species of reptiles have been inventoried for the Darlington Nuclear Site during the breeding season from 2008 to 2019. Amphibians that currently breed within the area are American toad, northern leopard frog, and green frog. Reptiles are recorded as incidental observations. In 2019, many Eastern Garter snakes and a Dekay's Brownsnake were found under previously laid snake boards; reports of snakes are generally becoming more frequent (Ref. 18).

To date, 299 insect species (butterflies, dragonflies/damselflies, moths, and other insects) have been inventoried for the Darlington Nuclear Site. Other invertebrate groups that have been identified include tiger beetles (2 species), spiders (2 species) and other insects (9 species) (Ref. 18).

One reptile species, eighteen breeding bird species, three mammals (bats), one insect, and one tree species at risk with a provincial ranking of endangered, threatened or special concern were recorded at the DNGS site over the period from 2006 to 2019 (Ref. 18).

#### *2.1.2.2 Geophysical Environment*

*Soils*

The soils onshore are between 21 m and 36 m thick covering the bedrock over most of the site. The soils consist of a thin layer of topsoil and up to 3 m of loose to dense silt clay and fine sand overlaying between 2 m and 20 m of dense to very dense sandy till. The till is underlain by interglacial soils consisting of alternate layers of very dense, pervious fine sand and hard, impervious varied silt and clay. A layer of very dense silty fill (generally less than 5 m thick) lies between the interglacial soils and the bedrock.

The soils offshore range from 7 m to 8 m thick at the shoreline and become less than 1 m thick about 1000 m offshore. The soils consist of thin interglacial soils overlying silty till. Gravel, cobbles, and boulders are found in some areas.

A sand, gravel, and cobble beach exists at the base of the steep shoreline cliffs that are found to the east and west of the new protected shoreline at the site (Ref. 17).

*Bedrock*

The bedrock consists of nearly flat lying limestone of Middle Ordovician age. The upper rock unit consists of dark brown, very thin to medium bedded shaley limestone of the Whitby Formation. The Whitby Formation ranges in thickness from 8 m to 1.5 m, thinning towards the eastern part of the site. North of the DNGS Powerhouse area near the CN tracks, the upper surface of the bedrock is at an elevation of about 91 m while the bedrock at the shoreline is around 88 m. At a distance of 1,000 m from the shoreline, the bedrock elevation is about 85 m.

The bedrock is hard and sound. At the bedrock surface, there is a zone of broken, weathered rock up to 2 m in thickness. This zone is characterized by weathered, open, water-bearing bedding joints.

The nuclear containment structures are founded on hard and sound shaley limestone of more than adequate bearing capacity to carry the structural loading without any adverse response (Ref. 17).

*Groundwater*

Water-bearing zones of low permeability occur within the interglacial soils and in the upper part of the bedrock. The groundwater levels in the interglacial soils were measured in September 1976. The levels ranged from a depth of about 16 m below ground in the west part of the site to about 1 m in the east. The apparent groundwater movement is from north to south toward Lake Ontario. The hydraulic gradient is approximately 2 percent (Ref. 17).

The majority of the groundwater within the interglacial deposits is most likely recharged upstream from the station, north of the CN line where the deposits are close to the surface and the upper till is thin. Recharge to the interglacial deposits in the vicinity of the station will be limited due to the thick upper till layer comprised of fine-grained, low permeability soils.

Tritium concentrations at perimeter groundwater monitoring locations remain very low. Municipal drinking water samples collected from downstream Water Supply Plants, as part of the annual OPG DNGS Environmental Monitoring Program, were well below the Ontario Drinking Water Quality Standard for tritium of 7,000 Bq/L (Ref. 19).

*Seismicity*

The western Lake Ontario region lies within the tectonically stable interior of the North American continent, which is characterized by low rates of

seismicity. Only one seismic event with a magnitude of greater than 4 has ever been recorded within 100 km of the station. This earthquake occurred on April 27, 1954. It had a magnitude of 4.1 and it was centered 9 km southeast of St. Catharines (just under 100 km from the Darlington Nuclear Site).

The historical record of earthquakes for the region confirms relatively low seismic activity. Over the period of record since 1840, within the region to 150 km from the Darlington site, the maximum seismic event has only generated a calculated peak ground motion at the site of less than 1.5% of gravity. Over this period of records, only seven events were reported to have occurred within 150 km of the site with sufficient magnitude to generate a calculated peak ground motion at the site greater than 0.5% of gravity (Ref. 17).

From July 2017 to March 2021 inclusive, there have been an additional 12 seismic events (two of which are man-made seismic events) reported in Ontario of a magnitude greater or equal to 3.0. The magnitude of these earthquakes range between 3.0 and 4.1, with one earthquake of 3.0 magnitude occurring within a 100-km radius of the Darlington Nuclear Site (Ref. 20).

#### *2.1.2.3 Aquatic Environment*

*Drainage*

Darlington Creek is the main drainage feature located to the northeast and east of the DNGS site. The watershed area for Darlington Creek includes the northeastern portion of the Darlington Nuclear Site and there is a direct runoff to the creek in this area. Darlington Creek drains through St. Marys' Cement property as a channelized stream to the immediate east of the Darlington Nuclear Site. Most of the DNGS site drains to the south directly to Lake Ontario. Drainage features on the Darlington Nuclear Site include ditches, ponds and storm drains (Ref. 17). There are also a number of major cold-water streams entering Lake Ontario within 50 km of the station. The Raby Head Wetlands, two small, locally significant wetlands, are located just east of DNGS. The Bowmanville and Westside Marshes are located further to the east. These two large, provincially significant wetlands are managed by the Central Lake Ontario Conservation Authority (CLOCA) (Ref. 21). Coot's Pond is located about 900 meters northwest of the Darlington Nuclear Site and another smaller pond (Tree Frog Pond) is slightly further away to the northeast.

*Fish*

In 2019, the total commercial catch from Lake Ontario commercial fishery harvested over 305,800 pounds of locally caught fish (Ref. 22).

While recreational fishing does occur at the Darlington Nuclear Site, the site is not known to host concentrations of sport fish similar to the Pickering Nuclear Site and Bruce Nuclear Site, because DNGS utilizes an offshore diffuser for cooling water discharge rather than a surface discharge channel. The diffuser prevents the formation of an extensive thermal plume, and therefore does not seem to be a fish attractant. In addition, DNGS was the first OPG station where fish protection principles were considered in the decision-making process for both design and shoreline location of the intake. The intake incorporates a porous concrete intake "field" that circumvents the impingement and entrainment problems associated with a more traditional velocity cap intake. The intake is designed to minimize the entrainment of all juvenile and adult fish and the drawdown of cooling water (i.e., the maximum height above the intake from which water is drawn) (Ref. 23). The DNNP facility cooling water intake will also be designed to minimize impingement and entrainment problems and the discharge will have offshore diffusers to prevent the formation of an extended thermal plume (Ref. 24).

Major cold water streams are along the northern shore of Lake Ontario. These streams are concentrated within 50 km of the Darlington Nuclear Site, but they also extend in the west to the 100 km limit. The major species of fish found either inhabiting or migrating up these streams during the spawning season are the salmonoids: Coho Salmon, Chinook Salmon, Rainbow Trout, Brown Trout, and Lake Trout. Highest fishing activities are found at the branches of these streams (Ref. 17). Alewife and emerald shiner are two of the most abundant fish species along the Darlington Nuclear Site shore.

Major populations of warm water species of fish inhabit the Kawartha Lakes, distributed 25 to 100 km from Darlington Nuclear in the north to east quadrant. The major species of fish are walleye, muskellunge, small-mouth bass, large-mouth bass, and yellow perch. The data required to carry out a detailed analysis of distribution of the fish populations in these lakes are not presently available. Lake Simcoe supports large populations of lake trout, herring, smelt and whitefish, walleye, northern pike, muskellunge, panfish, large-mouth and small-mouth bass (Ref. 17).

Although the fish community also includes species that are subject of conservation concern, there is no evidence that the Darlington Nuclear Site nearshore area contains unique habitat such as spawning or limited nursery areas for any of these species. Further detail on the fish community is provided in the DNGS Environmental Risk Assessment (Ref. 18).

*Lake Water Levels*

The Darlington Nuclear Site is protected from high lake levels by the new shoreline, which is built to elevation 101 m, 1 m above site grade level and about 2.9 m above the highest water level recorded. This new shoreline will provide an adequate safety barrier against the severest anticipated combination of spring runoff and wave action (Ref. 17).

Based on measurements of the monthly average water levels of Lake Ontario (i.e., the average levels of the whole lake) from 1918 to 2019, the annual maximum monthly average water levels range from a low of 73.74 m relative to the International Great Lakes Datum (IGLD) (1934) to a high of 75.91 m relative to the IGLD (2019). Lake Ontario water levels have been regulated since the completion of the St. Lawrence Power Project in 1958. The mean monthly Lake Ontario water level from 2004 to 2019 has varied between 74.63 m (December) – 75.79 m (June) above the mean sea level (Ref. 25).

### 2.1.3 BWRX-300 Facility Layout and Exclusion Zone

The layouts of the DNNP site and BWRX-300 Power Block and other infrastructures satisfy the regulatory requirements of Subsection 4.5.2 of REGDOC-1.1.2 (Ref.1). The site layout shows a single unit but incorporates considerations that support adding future units. The selected location, in the southwestern corner of the DNNP area, limits the amount of spoilage to remove and avoids encroachment on the Bank Swallow habitat. This location is also in proximity to DNGS ensuring effective connections to DNGS available infrastructure. The 230 kV switchyard is located closer and more central to the DNNP site to allow for expansion for future units. Existing roads are being used to the maximum extent practicable and no new off-site roadways are required.

The Pumphouse/Forebay structure is positioned outside the northwestern corner of the protected area. The discharge structure is located near the lakeshore and does not require lake infill.

#### Required Exclusion Zones

The exclusion zone is established at 350 m from the Reactor Building (RB) outside wall, as shown in, Figure 2.1.2-2.

#### Description of Site Layout

See Section 2.2

**Minimizing Environmental Impacts**

Measures are included in the DNNP site layout and BWRX-300 design to minimize the impact on the surrounding environment, for example:

1. The location and placement of the lakebed intake structure regarding the commitment for fish entrainment and impingement as well as the discharge diffusers to meet the commitment for effluent plume in NK054-REP-01210-00078 (Ref. 16).
2. Consideration of sensitive land features, such as shoreline bluffs and Bank Swallows, habitat to the extent practicable.
3. A smaller BWRX-300 footprint which does not need any additional land area that could be obtained from lake infill.
4. Designing storm water management provisions for the construction and post construction phases.
5. Minimizing the area of disturbance for permanent structures on the DNNP site by optimizing the BWRX-300 footprint.

### 2.1.4 Population Distribution and Density

The Municipality of Clarington and the City of Oshawa have both experienced steady growth over the last ten years. According to recently released Statistics Canada data, Clarington's population was 101,427 in 2021, which is an increase of 10.2% from that in 2016 when the population was recorded at 92,130.

The rural area of Clarington has a population of 11,297.

The Municipality of Clarington Official Plan forecasts that Clarington will have a population of 140,340 by 2031, with 124,685 in its urban areas and 15,655 in its rural areas.

The population of the City of Oshawa was 149,607 in 2011 and grew to 159,458 in 2016, which was a 6.6% increase. The City of Oshawa's Official Plan provides population forecasts of 174,695 in 2021, 184,460 in 2026 and 197,000 in 2031. The population data listed in Table 2.1-2 for the Municipality of Clarington is distributed amongst four urban areas including Courtice, Bowmanville, Orono, and Newcastle as shown in Figure 2.1.3-1.

**Table 2.1-2: Population Data for the Municipality of Clarington for 2016 and 2021**

| Urban Area | Population (2021) | Population (2016) |
|---|---|---|
| Courtice | 28,545 | n/a |
| Bowmanville | 47,176 | 39,371 |
| Orono | 2,476 | 1,105 |
| Newcastle | 11,933 | 9,167 |
| Total | 90,130 | 49,643 |

### 2.1.5 Indigenous First Nations and Communities

The DNNP is located on the treaty and traditional territory of the Williams Treaties First Nations (WTFN). There are six WTFN communities located within distances between 50 km to 135 km of the Darlington Nuclear Site, one each in Durham Region and Northumberland County, two in southern Peterborough County, one located on Georgina Island in South Lake Simcoe in York Region, and another near Orillia. Another is located further, approximately 210 km from Site, on Beausoleil Island in the municipality of Georgian Bay. The Mohawks of the Bay of Quinte is a Haudenosaunee community located approximately 140 km from site near Belleville. These Indigenous First Nations and communities all have a historical relationship with the lands along the north shore of Lake Ontario from Toronto east to the Bay of Quinte, and north to Lake Simcoe and Rice Lake as a result of their occupation and traditional use of these lands prior to European settlement and subsequent signing of treaties.

These Indigenous communities are listed below along with their approximate locations:

- **Alderville First Nation:** 20 km southeast of Peterborough on south side of Rice Lake.
- **Curve Lake First Nation:** 15 km north of Peterborough on Buckhorn Lake.
- **Hiawatha First Nation:** 15 km southeast of Peterborough on north side of Rice Lake.
- **Mississaugas of Scugog Island First Nation:** 35 km north of Oshawa on Scugog Island in Lake Scugog.
- **Chippewas of Georgina Island First Nation:** 10 km north of Sutton West on the southern end of Lake Simcoe.

- **Mohawks of the Bay of Quinte**: 35 km east of Belleville.

- **Beausoleil First Nation**: 30 km northwest of Midland on the southern tip of Georgian Bay on Christian, Beckworth and Hope Islands

- **Chippewas of Rama First Nation:** 10 km east of Orillia on the eastern side of Lake Couchiching

There are no Métis settlements in or near the Darlington Nuclear Site property; however, there are Métis persons residing within the regional area. The Oshawa and Durham Region Métis Council represents Métis people in Durham Region (Ref. 26).

### 2.1.6 Community Relationships

OPG believes in open and transparent communication with the public in a timely manner, in accordance with CNSC REGDOC-3.2.1 (Ref. 13). As such, OPG regularly and proactively provides information to the public on its operations and projects. OPG's Stakeholder Relations manages communications and relationships between the nuclear facilities and the host communities by fostering healthy, open relationships and sustainable partnerships with communities, including government, media, business leaders, educational institutions, interest groups and community organizations. OPG's Stakeholder Relations organization adheres to the principles and process for external communication as governed by the nuclear standard N-STD-AS-0013 (Ref. 27), Nuclear Public Information and Disclosure.

OPG conducts integrated communications and regular community liaison activities. For the Darlington Nuclear Site, the community relations program proactively provides information on DNGS and NSS-DWMF operations and the status of key projects, including the Darlington Refurbishment Project, and the Darlington New Nuclear Project. OPG regularly provides milestones and regular waste management updates to Indigenous rights holders and key stakeholders. Presentations are regularly made at the Darlington Community Advisory Committee and Durham Nuclear Health Committee. In addition, presentations and informal meetings are held with local elected officials and community leaders a number of times each year to provide updates on performance and other activities taking place both at the stations and waste facilities.

A major component of the site public affairs program is Darlington's Public Information Program, which includes key activities such as the Darlington Information Centre, the Darlington 'Neighbours' newsletter and the Speaker's Bureau. Ongoing communication of Darlington Nuclear operations

is provided through these public information programs and vehicles, including social media (Facebook, Twitter, and Instagram). It is expected that the same mechanisms will be employed during the site's decommissioning phase.

In 2017, OPG conducted a one-day emergency exercise at the Darlington Nuclear to test the emergency response plans and demonstrate how the participating agencies and government work together. OPG also conducts multiple Emergency Response Organization drills throughout the year to demonstrate proficiency and capture lessons learned. In 2021, a number of DNNP contract partners participated in the annual DNGS full site assembly and accounting drill with early dismissal (Ref. 28). The DNNP contract partners were conducting early site preparation geotechnical field work on site the day of the drill. This allowed the opportunity for OPG and contract partners to effectively test the unique nuclear assembly and accounting protocols as identified in the contract partners SSSP including station emergency tone notifications and follow up. OPG regularly meets with citizens and community groups in a variety of forums to discuss issues related to the Nuclear Emergency Preparedness program.

Under CNSC's mandate, potassium iodide (KI) pills have been distributed by OPG to all homes and businesses within a 10 km zone surrounding Darlington Nuclear Site beginning in 2015. These pills are routinely refreshed prior to their expiration date. New residents and businesses within the 10 km zone are sent KI pills every year based on data provided by Canada Post, and KI pills remain available to the public within 50 km around Darlington Nuclear Site through a dedicated website.

In addition to operational-related liaisons, Darlington also supports a large number of local not-for-profit organizations. Of note, OPG has worked with Bring Back the Salmon, Scientists in School, Toronto & Region Conservation Authority, Rouge Valley Health System Foundation (Ajax & Pickering Site), and the Oshawa & Durham Region Métis Council's Heritage Celebration in a corporate-wide initiative to better the local environment, education, and community.

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

#### 2.1.6.1 Indigenous Relationships

OPG has a board-level Indigenous Relations Policy (Ref. 29) and active community relations program that focuses on:

- Community relations and outreach;
- Capacity building support with communities;
- Employment/business contracting opportunities; and
- OPG staff education.

Building positive, community-minded relationships with Indigenous First Nations and community leaders is important to OPG with respect to current operations and the planning of new projects. OPG recognizes close consultation with Indigenous First Nations and community leaders is an essential part of the process. OPG continues to engage in active dialogue with Indigenous First Nations and communities on a number of issues and operational decisions related to our nuclear operations. Discussions and information sharing to build long-term mutually beneficial working relationships with Indigenous First Nations and communities near the nuclear host communities occurs on a regular basis (Ref. 26).

### 2.1.7 Municipal Services

Within the survey area, there are 17 education institutions available for students: 12 primary schools and five secondary schools. In addition, there are six fire emergency stations (excluding OPG's on-site Darlington fire station) and one regional police station (plus one administrative police department) within the survey area. Additionally, one hospital, Lakeridge Health in Bowmanville, is located in the survey area.

### 2.1.8 Site Access and Transportation Networks

The Darlington Nuclear site can be accessed via two roads. Holt Road runs north to south and allows for direct access to the site. Energy Drive runs west to east and connects to Park Road for access to the site. Multiple parking lots are present on the site.

Within 10 km of the site, there are many arterial roads, minor arterial roads, highways, residential roads, and rural roads. These roads fall within the borders of the survey area defined in Subsection 2.1.1.

Transportation networks of significance are listed in the following:

1. Three 400-series highways are located within 10 km of the site - Highways 401, 407, and 418.
2. Two railway lines are located within 10 km of the site which converge and run adjacent to one another east of Lakeshore Road, Newcastle:

a. The Canadian Pacific line runs west east, which is located just north of Highway 401, and is used for trains transporting cargo.

b. The Canadian National line runs west east, which is located south of Highway 401 and used for trains transporting people and cargo, and part of which bisects the DNNP and DNGS sites.

3. Oshawa Executive Airport is located at the southeast corner of Taunton Road and Thornton Road North. The airport is located just outside the 10 km survey area.
4. The Port of Oshawa East Pier (at the bottom of Simcoe Street South) is located west of the site and allows cargo ships to receive/deliver shipments.
5. St. Marys Cement has a private dock at its facility to the east of the DNNP site for the shipment of aggregate from its operations.

### 2.1.9 Active Hiking and Cycling Trails

As shown in Figure 2.1.8-1, the Darlington Waterfront Trail, part of the Great Lakes Waterfront Trail, is a multi-use path that forms part of the recently approved Durham Regional Cycling Plan. The trail is used by pedestrians and cyclists for transportation or recreational purposes, provides direct access to the Darlington site and falls within OPG owned lands. Additionally, hiking trails are available near Lakeview Park in Oshawa, as the Larry Ladd Harbour Trail connects to Lakeview Beach. The Primary Cycling Network Durham currently provides over 400 km of cycling infrastructure in the region. However, it is unclear what percentage of infrastructure is located within the survey area.

### 2.1.10 Park Spaces and Waterbodies

There is abundance of parks, greenspaces, conservation areas, and waterbodies located within the survey area, with multiple public recreational spaces directly adjacent to DNGS site. Part of the Darlington Waterfront Trail - a multi-use recreational trail network for cyclists and pedestrians - runs through the DNGS site. Directly adjacent to the west of the DNGS site is Alijco Beach, a beachfront which can be accessed by users for recreational purposes. Other Park spaces and waterbodies are dispersed throughout the rest of the survey area, with places of significance listed below:

1. One provincial park falls within the survey area: Darlington Provincial Park.
2. The Darlington Hydro Soccer Fields facility (owned by OPG and licensed to the Municipality of Clarington) falls within the survey area, as does Bowmanville's Baseball Fields Complex (located at Green Road just north of Highway 401).

3. Five conservation areas fall within the survey area: three are located in Bowmanville (Bowmanville Valley Conservation Area, Bowmanville Westside Conservation Area, Stephen Gulch's Conservation Area) and two are located in Oshawa (Harmony Valley Conservation Area, Oshawa Valleylands Conservation Area).
4. Three beaches fall within the survey area: two are located in Bowmanville (Alijco Beach, Port Darlington Beach) and one is located in Oshawa (Lakeview Beach).

### 2.1.11 Industrial Facilities

The industrial facilities that are within the survey area of 10 km, and with directly adjacent to Darlington Nuclear site are discussed in Subsection 2.1.1.

Other industrial facilities are dispersed throughout the rest of the survey area, with most facilities located west of the site in Oshawa.

While not located in the survey area, the PNGS is located approximately 30 km west of the Darlington Nuclear site.

**Figure 2.1.1-1: Darlington Nuclear Site Proximity to Pickering Nuclear Generating Station**

**Figure 2.1.1-2: Darlington Nuclear Generation Station and Darlington New Nuclear Project Lands**

**Figure 2.1.1-3: Darlington Nuclear Generating Station and – Darlington New Nuclear Project Proximity to Industry**

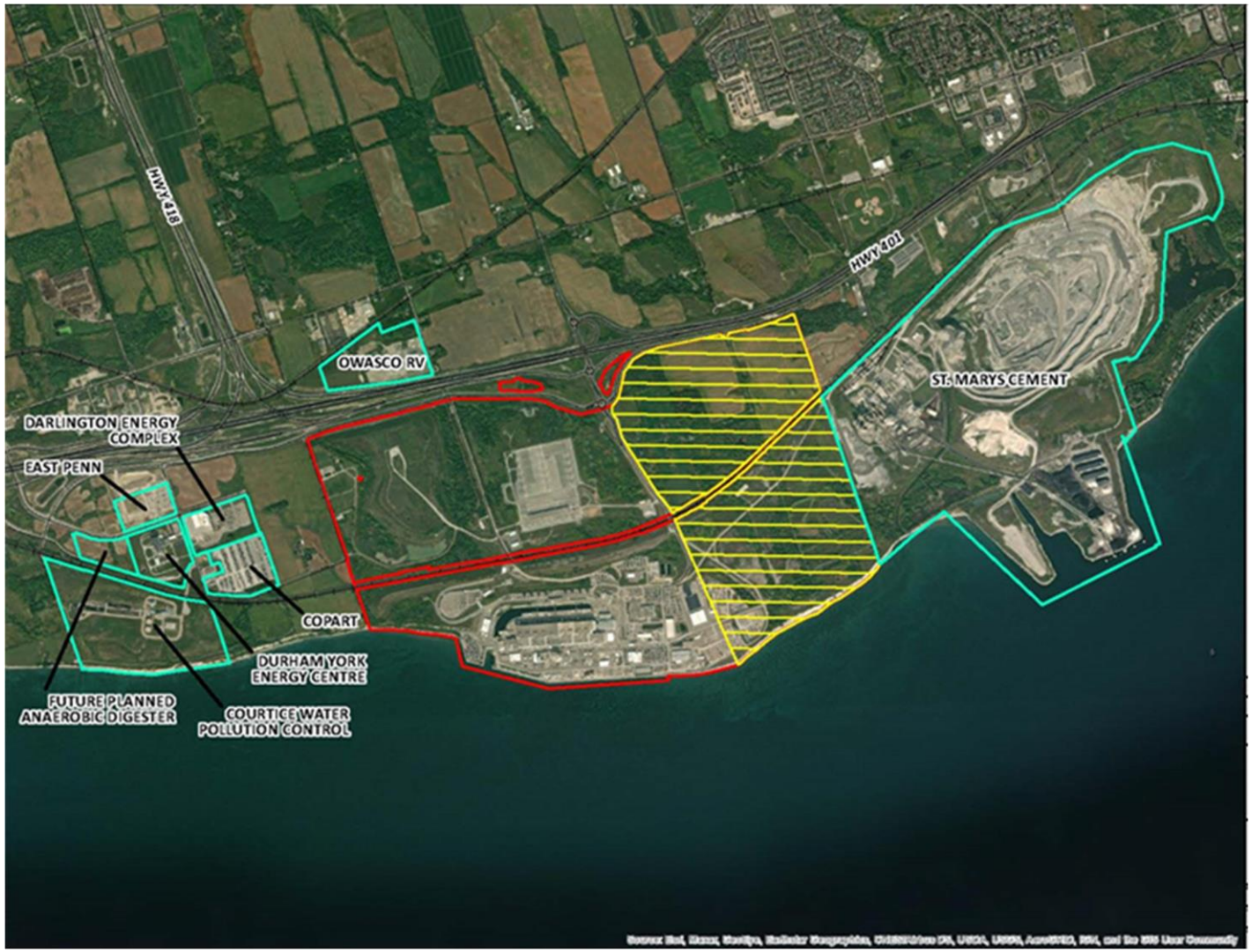
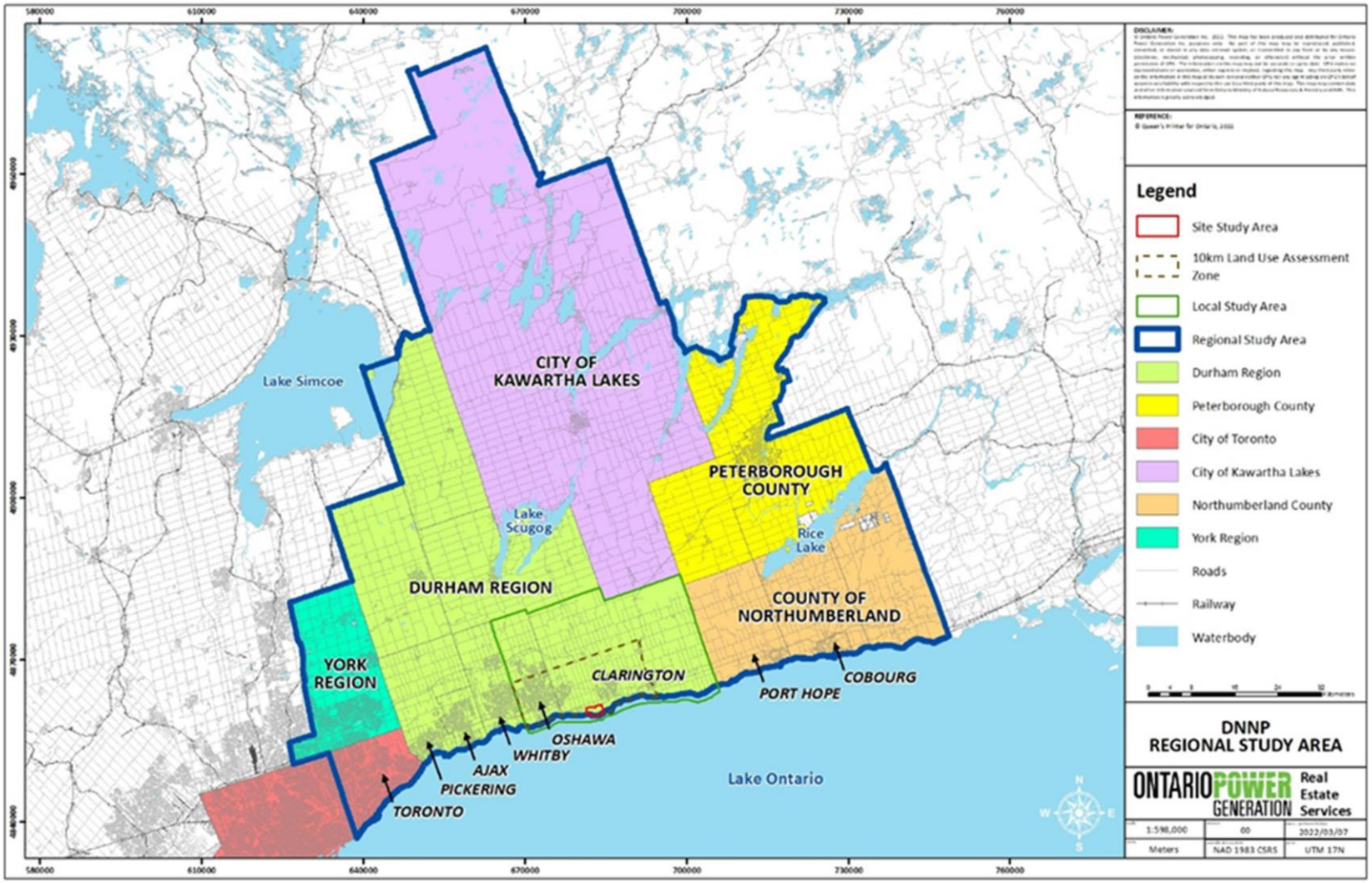
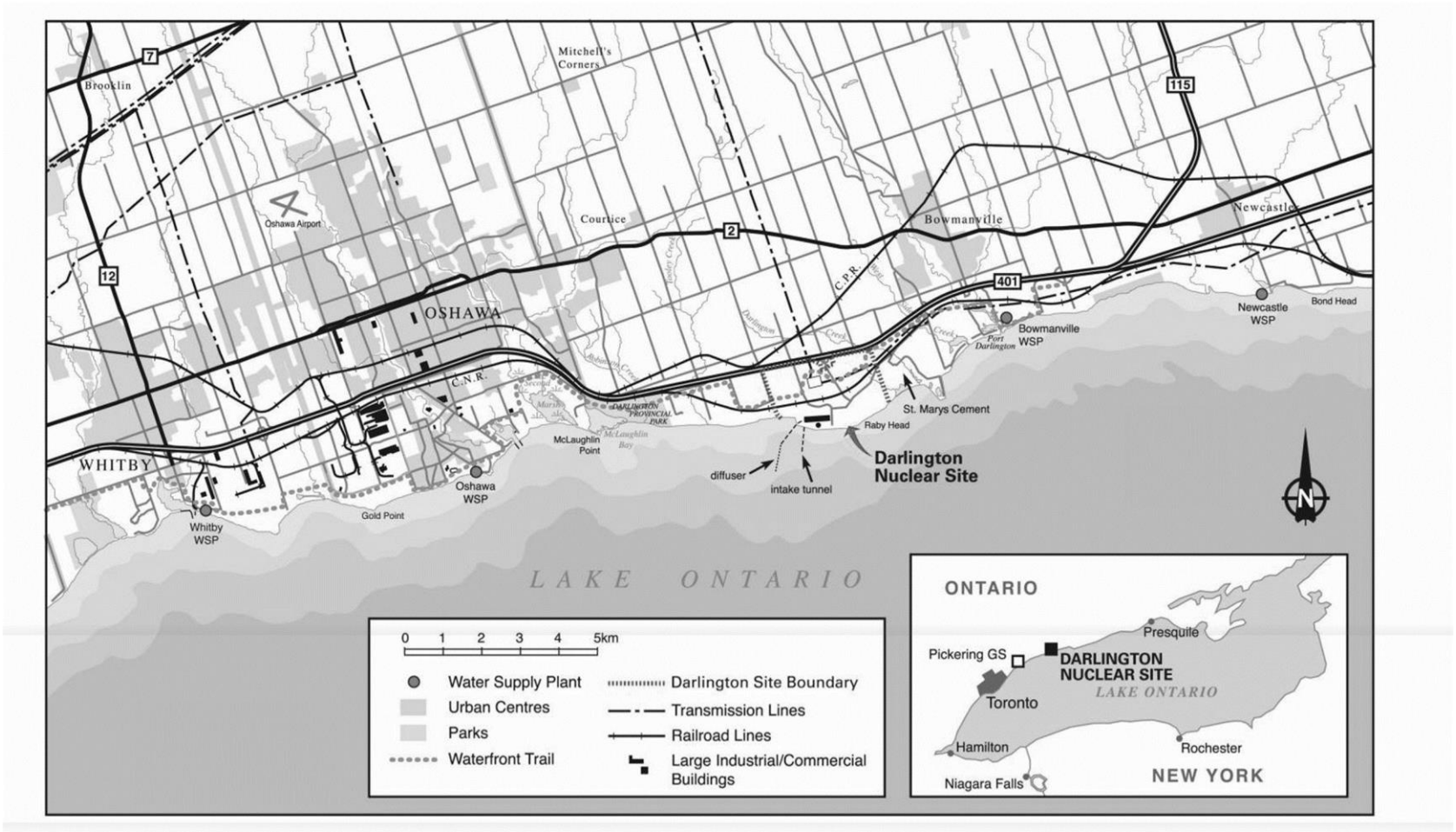


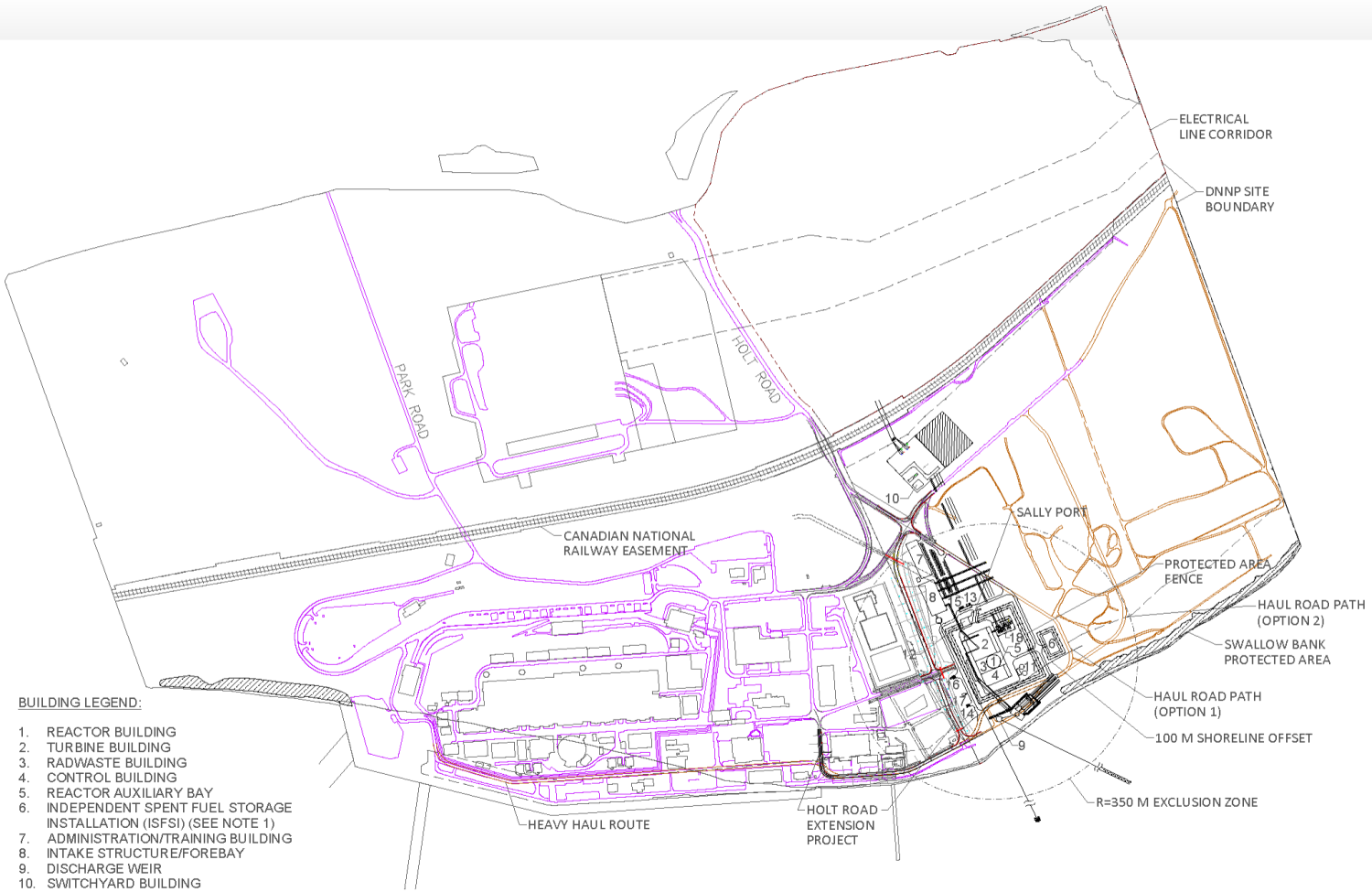
**Figure 2.1.1-4: DNNP Regional Study Area**



## Figure 2.1.2-1: Darlington Nuclear Site Regional Location



## Figure 2.1.2-2: Darlington Nuclear Site (DNNP Proximity to DNGS)




BUILDING LEGEND:

1. REACTOR BUILDING
2. TURBINE BUILDING
3. RADWASTE BUILDING
4. CONTROL BUILDING
5. REACTOR AUXILIARY BAY
6. INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) (SEE NOTE 1)
7. ADMINISTRATION/TRAINING BUILDING
8. INTAKE STRUCTURE/FOREBAY
9. DISCHARGE WEIR
10. SWITCHYARD BUILDING
11. FIRE WATER STORAGE TANKS AND PUMP ENCLOSURE
12. PROTECTED AREA ACCESS BUILDING
13. DIESEL FUEL STORAGE TANK
14. HYDROGEN EQUIPMENT
15. TURBINE LUBE OIL TANK
16. DEMINERALIZED WATER EQUIPMENT
17. NITROGEN EQUIPMENT
18. TRANSFORMERS

PURPLE AREA IS PAVEMENT
LIGHT BROWN AREA IS DIRT ROAD

NOTE:

1. ISFSI - FUTURE INSTALLATION ITEM TO BE LICENSED SEPARATELY

**Figure 2.1.3-1: Clarington Urban Areas**

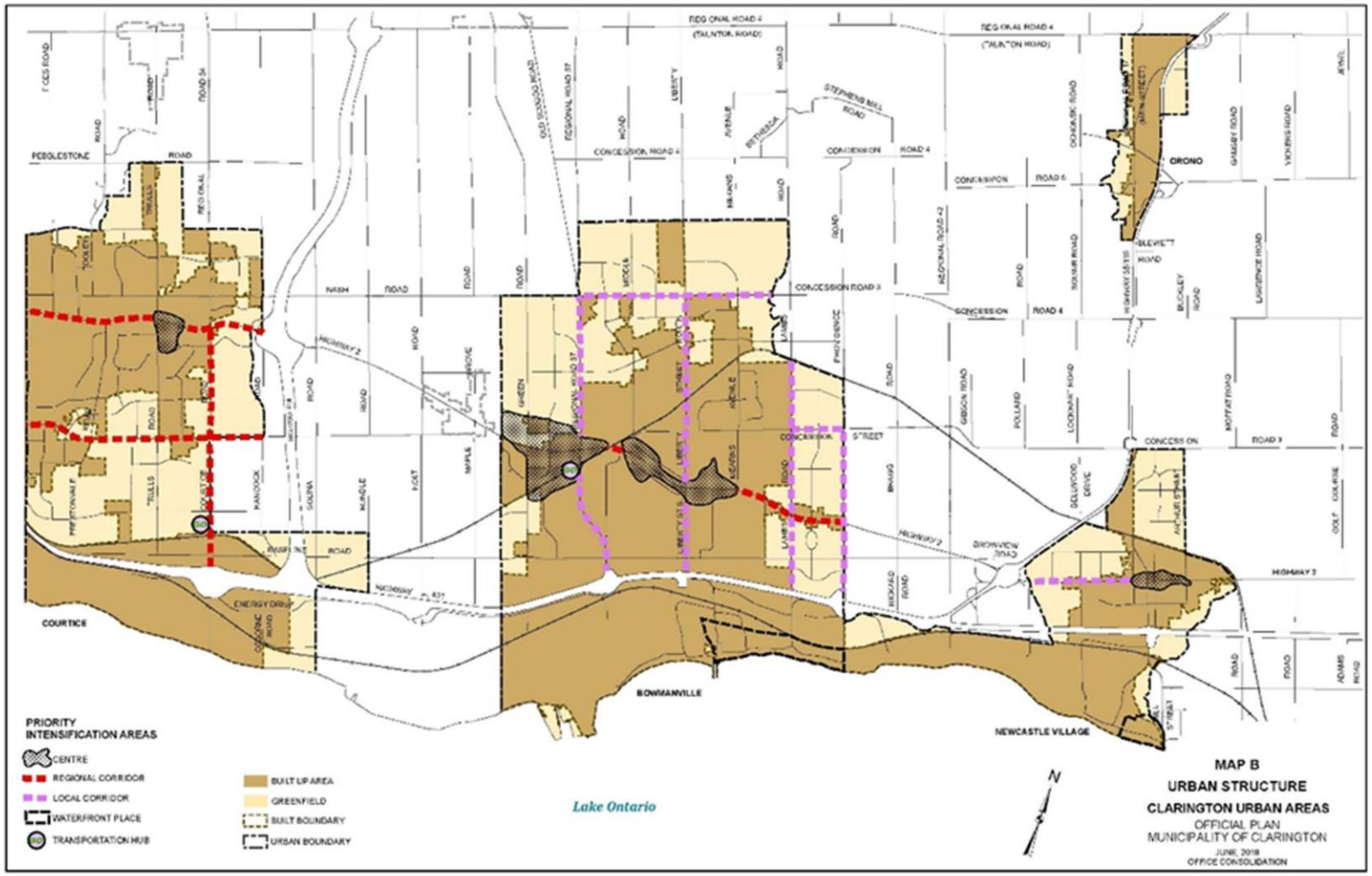
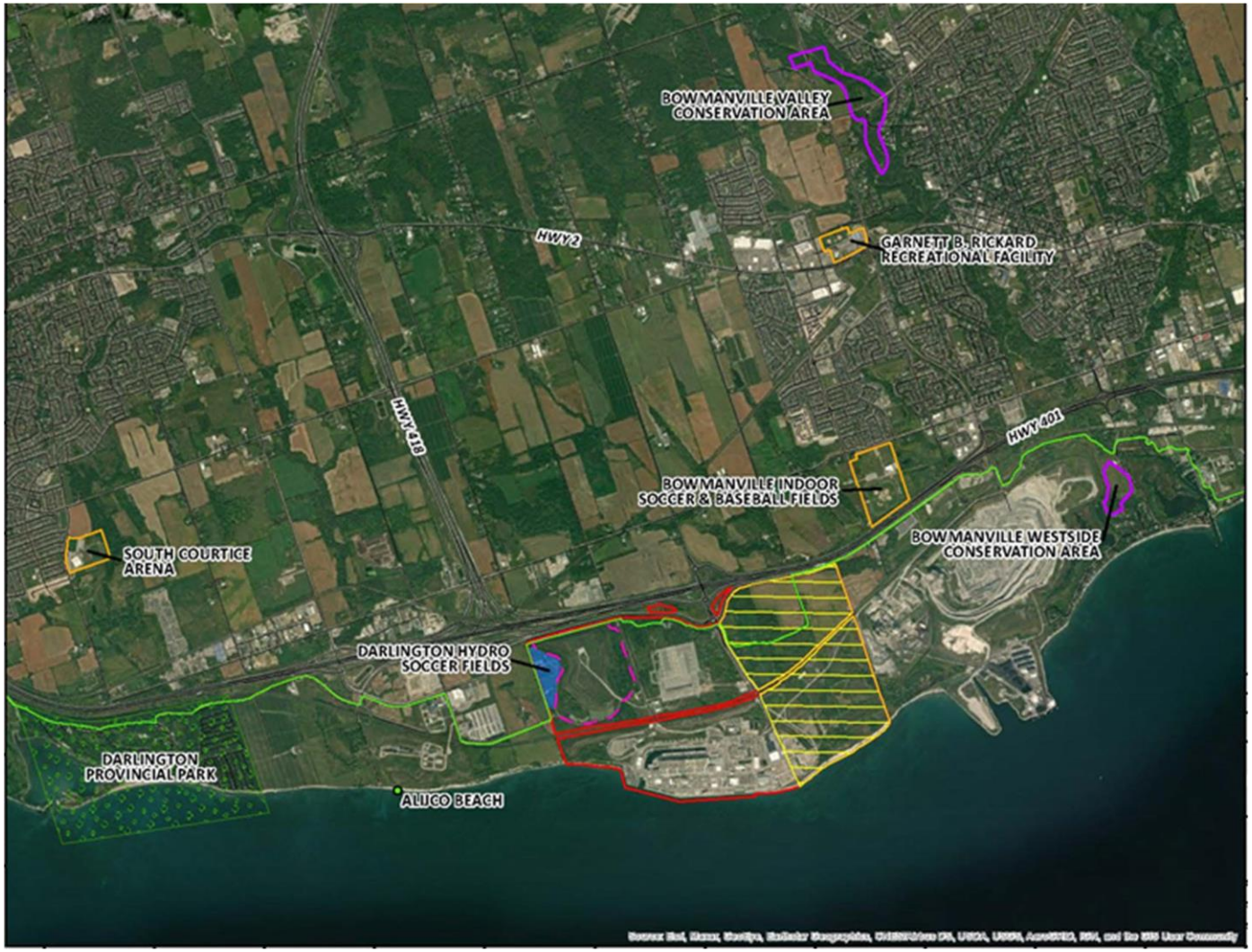


**Figure 2.1.8-1: Darlington Nuclear Site – Active Darlington Waterfront Trail**



## 2.2 DESCRIPTION OF THE FACILITY TO BE DECOMMISSIONED

The DNNP site layout, infrastructure, intake and discharge water, switchyard, BWRX-300 Power Block, and their respective interfaces are shown in Figures 2.2-4 and 2.2-6. Descriptions of the site layout, infrastructure, intake and discharge water, and switchyard are provided in this Section.

Descriptions of the BWRX-300 Power Block are provided in Section 2.2.6.

### 2.2.1 BWRX-300 SMR Decommissioning Design Elements

Decommissioning considerations made during the BWRX-300 Small Modular Reactor (SMR) design phase are discussed in this subsection.

#### *2.2.1.1 Site Plot Plan*

The BWRX-300 design has been optimized for constructability, which may be beneficial for dismantling the facility during decommissioning. Space allocation is considered to accommodate construction activities (i.e., access area around the plant, areas for laydown, etc.), thereby facilitating the ability to decommission and dismantle the plant once a Licence to Decommission the plant is granted.

#### *2.2.1.2 Modular Construction*

A modularization strategy will be used to design and construct the BWRX-300 at the DNNP site. The module and skid assemblies are intended to be built off-site, transported to the site, and erected on-site. This modularization strategy will provide guidance in selection of disassembly methods employed during decommissioning.

#### *2.2.1.3 Control of Materials During Design*

Specific guidance for plant systems materials to minimize corrosion products during plant operation is a design requirement, which provides restrictions regarding use of cobalt-based alloys and cobalt in stainless steel and nickel base alloys. These restrictions reduce personnel dose exposure during plant operation and decommissioning activities.

#### *2.2.1.4 Decommissioning Considerations for As Low As Reasonably Achievable*

Decommissioning considerations made to comply with the principle of As Low As Reasonably Achievable (ALARA), in the design of the BWRX-300, include the following aspects:

1. Shielding design considers protection during maintenance, inspection, decommissioning and operations.
2. To facilitate decommissioning, the Reactor Building, Turbine Building, and Radwaste Buildings are designed for large equipment removal, consisting of entry doors from the outside and numerous cubicles with equipment hatches inside the buildings.
3. To facilitate decommissioning and ease of access, the radwaste process systems are skid-mounted and located in the Radwaste Building to allow truck access, and system skid loading and unloading.

#### *2.2.1.5 Design Features that Facilitate Decommissioning*

BWRX-300 design features that facilitate decommissioning by maintaining low occupational exposures are summarized below:

- Provisions for draining, flushing, and decontaminating equipment and piping
- Design of equipment to minimize the buildup of radioactive material and to facilitate flushing of piping systems
- Shielding that provides protection during maintenance, inspection, and operations, that may facilitate decommissioning
- Provision for adequate space for utilization of movable shielding
- Separation of more highly radioactive equipment from less radioactive equipment
- Provision for separate shielded compartments for adjacent items of radioactive equipment
- Provision for access hatches for the installation or removal of plant components
- Provision for the Reactor Water Cleanup System, Shutdown Cooling System, and the condensate demineralizer to minimize crud buildup

BWRX-300 design objectives that minimize radioactive contamination include:

1. Provide containment in areas where leaks and spills are most likely to occur.
2. Provide leak detection capability for prompt detection of leakage from Structures, Systems, and Components (SSC).
3. Use leak detection methods (e.g., instrumentation, automated samplers) capable of early detection of leaks in areas where it is difficult (inaccessible) to conduct regular inspections (such as the Spent Fuel Pool and buried, embedded, or subterranean piping) to avoid release of contamination. BWRX-300 active liquid waste is kept within the radwaste building in tanks located in cubicles.
4. Facilitate decommissioning by minimizing embedded piping, sumps, or buried equipment.

5. Design the plant to facilitate the removal or replacement of equipment or components during facility operation or decommissioning.
6. Minimize the generation of radioactive contamination and waste during operation and decommissioning by reducing the volume of components and structures that become contaminated during plant operation.

### 2.2.2 Site Layout and Infrastructure

The DNNP site will contain infrastructure, including additional buildings, to support operations inside the Power Block.

Currently anticipated services include:

1. A demineralized water supply pipeline extending from the Darlington Demineralized Water Plant eastwards approximately 400 m towards the DNGS/DNNP property line along the Third Line Road corridor. The demineralized water is used for the Power Block operations.
2. A potable water pipeline extension tying into the existing municipal water supply just south of the CN railway and west of Holt Road bridge on the west side of the road. This pipe carries potable water for use inside the power block as well as various outbuildings around the DNNP property including the administration building, warehouse, temporary construction buildings, and potentially other buildings to be determined.
3. Sanitary sewer connections to the existing Darlington East Sewage Lift Station are planned. These carry sewage from inside the power block as well as the administration building, warehouse, and potentially other buildings not yet determined, to the lift station. From here the effluent is pumped north and west towards the Courtice Water Pollution Control Plant for treatment and eventual discharge to Lake Ontario.
4. Fibre-optic cables for a business Local Area Network and copper telephone/public address cables to create a communications link between DNGS and DNNP. These run from the DNGS Engineering Support Services Building in an underground duct bank eastward approximately 400m towards the DNGS/DNNP property line mostly along the Second Line Road corridor.
5. Additional fibre-optic cables for a security Local Area Network are brought from the Darlington Main Security Building approximately 600m east towards the DNGS/DNNP property line in an underground duct bank mostly along the Second Line Road corridor.
6. Up to 10 MW of construction power are brought from the existing 54M15 feeder through Darlington DS5 substation at 13.8 kV, located

near the intersection of Park Road and Second Line, approximately 1km east to a new switchgear to be located near the northeast corner of the Nuclear Sustainability Services-Darlington. This switchgear is planned to feed construction loads as well as the new administration building and warehouse. A second feed will be taken from the same 54M15 through the existing Darlington DS1-F1 substation at 8.32 kV and will supply construction loads including the construction trailers.

Planned structures/features include:

1. An administration building with office spaces and a simulator training space. The simulator space will support the SMR full scope simulator and desktop simulator plus limited maintenance training space.
2. A warehouse is necessary to provide long term storage space for SMR components and equipment. It has some maintenance space and a calibration shop suitable for the service of non-contaminated equipment.
3. There is a parking lot near the administration building. There is an existing parking lot south of the Canadian National Railway near the border between DNNP and St. Marys Cement that will also be utilized.
4. A Steel Bricks production facility is planned to be constructed on the northwest quadrant of the intersection of Maple Grove Road and Second Line. This facility produces the Steel Brick components for the construction of the reactor building.
5. A concrete batching plant will be provided and suitably located if it is determined that onsite concrete batching is required.
6. Holt Road will be improved in two phases:
    a. Phase 1 - The Holt Road extension is a new stretch of road to be built from the intersection of Second Line and Old Holt Road at the northwest corner of DNNP property. This will extend south along the DNGS/DNNP property line between the Nuclear Sustainability Services-Darlington and the SMR facility until it reaches Lake Ontario. At this point it turns west and continues until it connects with the existing Lakeshore Road. The portion of Holt Road along Lake Ontario will be reinforced, and form part of the heavy haul route used to transport heavy components from the DNGS wharf to DNNP.
    b. Phase 2 - The Holt Road expansion will add an additional northbound lane from Second Line north towards Highway 401.

This additional lane will end south of Energy Drive and will be used by soil transport trucks to place soil onto the northern parts of DNNP property forming the spoils piles. There will also be a new southbound left turn lane to be created just south of the Holt Road bridge to aid traffic turning onto DNNP property.

7. The existing Old Holt Road that stretches diagonally across DNNP property will be kept intact up to the point where it joins the ring road around the Power Block facility.
8. The heavy haul road along Lakeshore Road will extend east onto DNNP property to support the construction of the Power Block. It is planned to extend as far east as the Power Block facility and then extend only as far north as necessary to support the Power Block facility construction.
9. Maple Grove Road is planned to be improved and extended south and then west to join the heavy haul road at the south part of the DNNP property. The improvements will likely include a new bridge to cross over the Canadian National Railway.
10. A soil conditioning pile is created from excavated earth during the site preparation phase and located at the southeast quadrant of the Maple Grove Road and Second Line intersection. This soil will be reconditioned and placed back into the SMR facility foundation.
11. A soil spoils pile is located in the northern part of DNNP property south of Energy Drive and west of Maple Grove Road. Excavated earth from the site preparation phase will be placed here.
12. Storm water management features are part of the overall site layout. One known feature is the relocation of the existing Bowmanville SS drainage ditch that currently runs from Bowmanville SS through DNNP property, southeast along Old Holt Road and draining into Lake Ontario. This will be relocated west to run along the eastern edge of the new Holt Road Extension.

### 2.2.3 DNNP Switchyard

The local DNNP switchyard (see Figure 2.2-5) is located North of the SMR Facility, East of the Extended Holt Rd and South of the CN Rail tracks. The local switchyard consolidates power produced by the Power Block facility. The Power Block facility has two 230 kV lines connected to the local DNNP switchyard. One line connects the Facility Generator Step Up Transformer, and one line connects to the Reserve Auxiliary Transformer. The local switchyard has two redundant 230 kV connections with the transmitter. The transmitter is working to connect these lines to Clarington Transformer Station, 22 km North of the DNNP site.

OPG is responsible for the ownership and operation of the local DNNP switchyard, containing the high voltage circuit breakers and disconnect switches, in addition to equipment within the Power Block facility. Hydro One, the transmitter for the electrical grid, is responsible for the ownership and operation of the two redundant 230 kV lines connecting the local DNNP switchyard with Clarington Transformer Station.

### 2.2.4 Normal Heat Sink

The normal heat sink removes excess heat to a large water body. For the DNNP, water withdrawn from Lake Ontario flows through the plant surface condensers to remove the excess energy of the turbine exhaust steam. The amount of heat removed during this process depends on the flow rate and the temperature rise of the water passing through the condensers. The plant heat is rejected to Lake Ontario.

Cooling water from Lake Ontario is delivered to an intake structure for the nuclear facility through an intake tunnel. The intake structure sends the cooling water to the Pumphouse/Forebay that contains circulating water pumps which deliver the cooling water to plant surface condensers before returning the heated water back to the lake through the discharge tunnel.

The Normal Heat Sink includes, but is not limited to the following:

1. Intake Tunnel, located deep in Lake Ontario to decrease potential impacts to fish habitat and is sized to provide the required flow of cooling water to the plant. It is also constructed to minimize the intake velocity to prevent impingement and entrainment of fish and effect on local currents.
2. Discharge Tunnel and diffusers are constructed deep in Lake Ontario to meet regulatory requirements by limiting the temperature increase to minimize thermal and flow effects of the plant cooling water discharge to ensure surface water temperature does not exceed 2 degrees C above ambient surface temperature and minimize impact to aquatic habitat.
3. Pumphouse/Forebay is composed of the forebay, pump bays and superstructures to house the Circulating Water System pumps and related equipment.

### 2.2.5 Security Building

A security building, known as the Protected Area Access Building, is provided on the protected area boundary to allow for ingress and egress to and from the protected area. Additionally, a sally port is provided adjacent to the security building to allow for vehicular traffic to enter the protected area. Detailed information about the protected area and vital areas, including their structures and/or barriers, are provided in a separate security annex of the PSAR (Ref. 30) since the content contains prescribed information as defined by Section 21 of the General Nuclear Safety and Control Regulations (SOR/2000-202) (Ref. 24).

### 2.2.6 General BWRX-300 Power Block Description

The BWRX-300 is a Boiling Water Reactor (BWR) that employs natural circulation and passive emergency cooling features and is rated at approximately 300 megawatts-electric.

The passive design features of the BWRX-300 provide decay heat removal capability using only installed systems with no reliance on operator actions or external resources for at least 72-hours. For the BWRX-300, a safe stable condition ("stable shutdown") is defined as safe shutdown with average reactor coolant temperature ≤ 215.6°C (420°F). Following 72-hours post-accident, on-site or off-site resources are used to power non-safety equipment for proceeding to cold shutdown conditions, as needed.

The BWRX-300 design applies a defence-in-depth process for safety assessment and safety analysis to ensure that radiological acceptance criteria are met. The leveraging of passive design features greatly simplifies the design and results in a significant reduction in total number active systems, structures, and components (SSCs) compared to conventional Nuclear Power Plants (NPPs).

See Figures 2.2-1 – 2.2-3 for schematics of the BWRX-300 systems. For more detailed information, see section 1.7 in the Preliminary Safety Analysis Report (PSAR), September 30, 2022 (Ref. 30).

**Figure 2.2-1: BWRX-300 Major Systems**

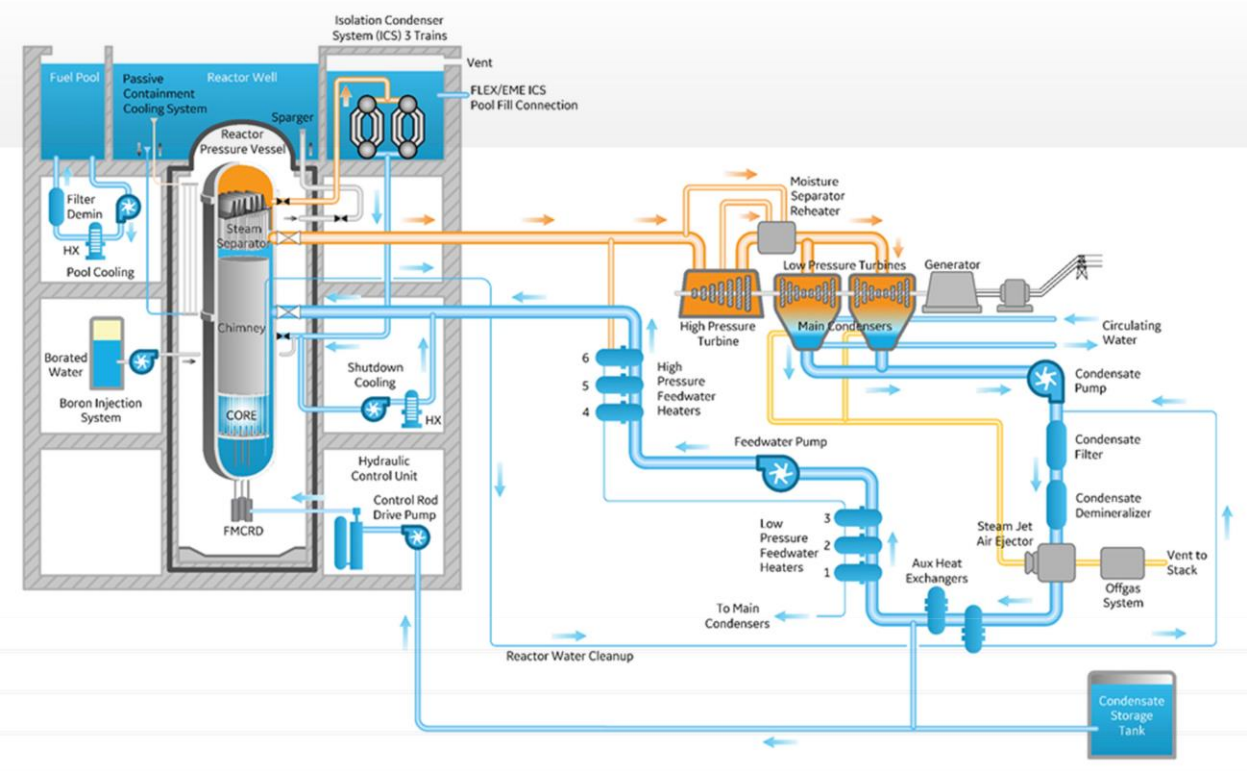


**Figure 2.2-2: BWRX-300 RPV and Internals**

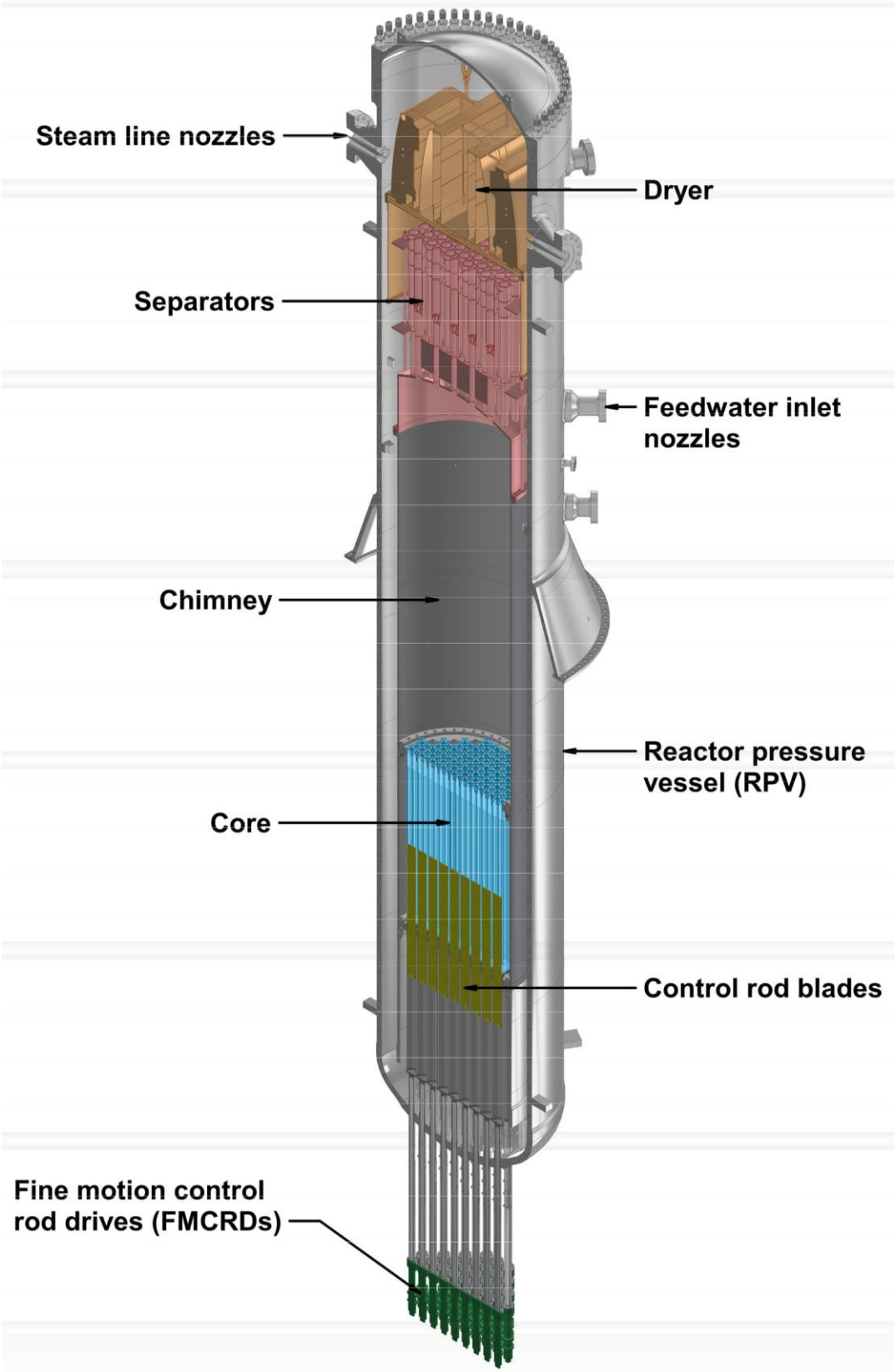
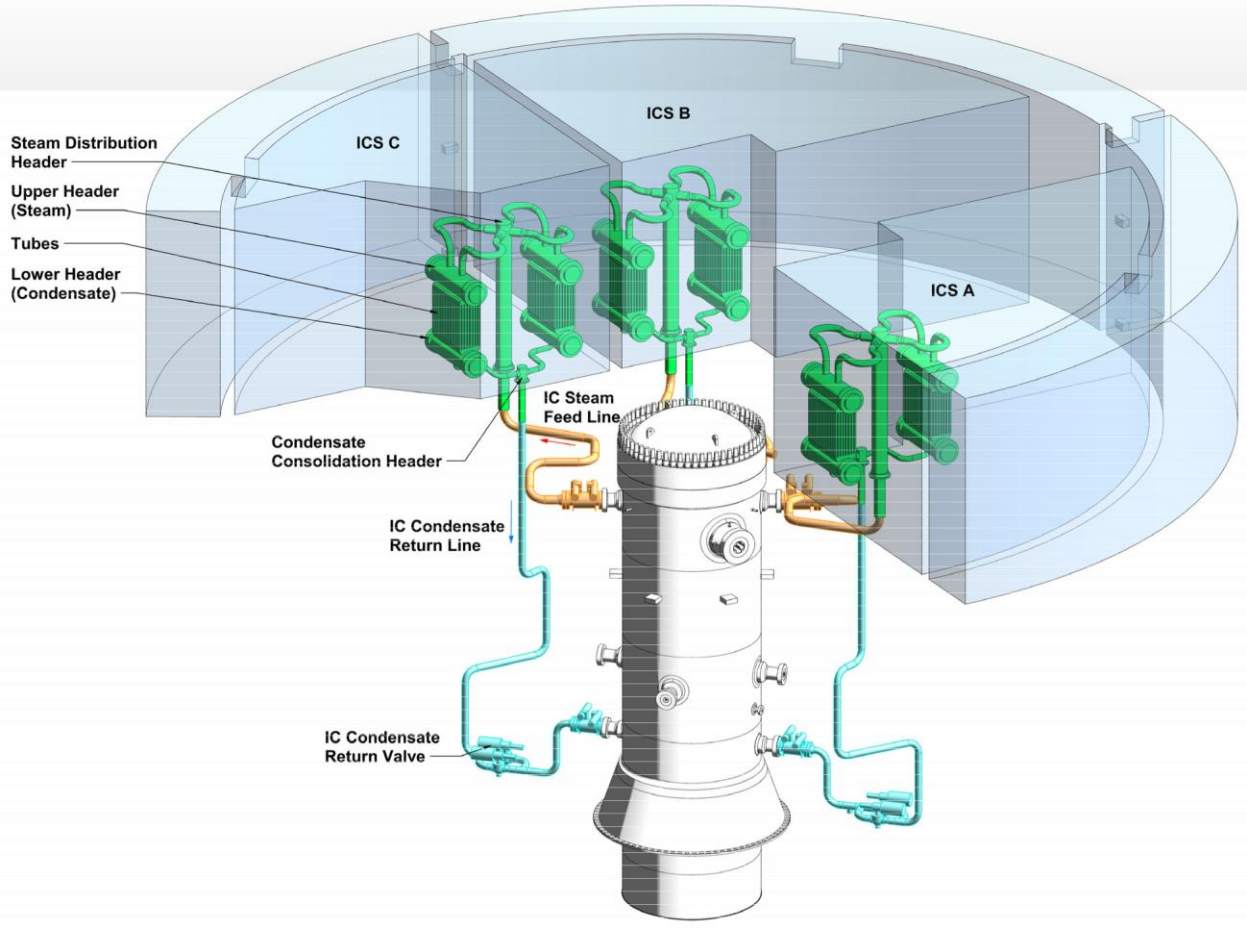


**Figure 2.2-3: Isolation Condenser System**



#### *2.2.6.1 Basic Technical Characteristics*

The principal technical characteristics of the BWRX-300 are provided in Table 2.2.6-1.

**Table 2.2.6-1: Principal Characteristics of Interest for the DNNP BWRX-300**

| Parameter Description | Value | Comments |
|---|---|---|
| Type of plant | Boiling Water Reactor | |
| Core coolant | Light Water | |
| Neutron moderator | Light Water | |
| Nuclear Steam Supply System layout | Direct-Cycle | |
| Primary circulation | Natural | |
| Thermodynamic cycle | Rankine | |
| Type of containment structure | Dry | |
| Reactor thermal power level | 870 MWth | |
| Normal Heat Sink | Once Through Cooling System using water from Lake Ontario | |
| Ultimate Heat Sink | ICS pools | Pools are vented to atmosphere |
| Plant gross electrical power output | ~ 300 MWe | |
| Plant Footprint | ~ 9,800 m2 | Rectangular building envelope |
| Site Footprint | ~ 30,000 m2 | Fenced area |
| Design life | 60 years | |
| Exclusion Zone | 350 m (radius) | Measured from exterior of the Reactor Building |
| Seismic Design (DBE) | 0.310 g (horizontal and vertical) | Bounding rock peak ground acceleration<br>Bounding surface peak ground acceleration |
| Reactor Design Pressure | 10.3 MPa | |
| Fuel | UO2 pellets | |
| Fuel enrichment | <5% U-235 | |
| RPV diameter (ID) | ~ 4 m | |
| RPV height (Inside) | ~ 26 m | |
| Control rod drive type | Fine Motion Control Rod Drive (FMCRD) | |
| Containment Vessel type | Steel-plate Composite | |
| Fuel pool capacity | Up to 8 years of full-power operation | Fuel pool accommodates up to 8 years of spent fuel plus one core load of new fuel and one full core off-load |
| Refueling cycle | 12 - 24 months | |
| Emergency Power Supply | Safety Class 1 DC batteries | Capable of sustaining required loads for 72 hours |

#### *2.2.6.2 Reactor Building*

The Reactor Building (RB) is a Safety Category 1 and Seismic Category A structure. It is a cylindrical shaped structure embedded in a vertical shaft to a depth of approximately 36 m below grade. The Reactor Pressure Vessel (RPV), Steel-plate Composite Containment Vessel (SCCV) and other important systems and components are located in the deeply embedded RB vertical right-cylinder shaft to mitigate effects of external events, including aircraft impact, adverse weather, fires, and earthquakes. The Secondary Control Room (SCR) is located in the RB. The below-grade portion also contains reactor support and safety class systems and the Safety Class 1 power supply and equipment. The reactor cavity pool is above the containment dome. Also, within the RB, three separate Isolation Condenser System (ICS) pools sit next to the reactor cavity pool above the SCCV, with one isolation condenser located in each pool. The Fuel Pool is also located in the RB.

#### *2.2.6.3 Turbine Building*

The Turbine Building (TB) houses the steam turbine generator, standby diesel generators, main condenser, condensate and feedwater systems, turbine-generator support systems, and parts of the Offgas System (excluding the offgas charcoal adsorbers). While considered a separate functional area from the Turbine Building, the northern portion of the Plant Services Area (PLSA) is structurally integrated with the Turbine Building. See Section 2.2.6.6 for a description of the PLSA.

The TB is a Safety Class 2 structure and is categorized as Non-Seismic. Additionally, it is evaluated for seismic interaction to ensure that it will not compromise the structural integrity and safety functions of the adjacent Seismic Category A RB following a Design Basis Earthquake (DBE) or extreme Tornado wind conditions.

#### *2.2.6.4 Control Building*

The Control Building (CB) houses the Main Control Room, Emergency Operations Centre, electrical, control, and instrumentation equipment. The CB is a Safety Class 2 structure and is categorized as Non- Seismic. Additionally, it is evaluated for seismic interaction to ensure that it does not compromise the structural integrity and safety functions of the adjacent Seismic

Category A RB following a DBE or extreme Tornado wind conditions. The CB serves as main entrance and exit for the Power Block unit during normal operations.

While considered a separate functional area from the Control Building, the southern portion of the PLSA is structurally integrated with the Control Building. See Section 2.2.6.6 for a description of the PLSA.

#### *2.2.6.5 Radwaste Building*

The Radwaste Building (RWB) houses rooms and equipment for handling, processing, and packaging liquid and solid radioactive wastes as well as the Offgas System charcoal adsorbers that are used for processing radioactive gas. Some of these systems can contain highly radioactive materials should DNNP operate. The RWB is classified as a Safety Class 3 building and categorized as RW-IIa in accordance with Regulatory Guide (RG) 1.143, Rev. 2, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light Water-Cooled Nuclear Power Plants." Additionally, it is also evaluated for seismic interaction to ensure that it will not compromise the structural integrity or safety function of the adjacent Seismic Category A RB following a DBE or extreme Tornado wind conditions.

#### *2.2.6.6 Plant Services Area and Reactor Auxiliary Bay*

The PLSA houses a decontamination area, a contaminated part/tool storage room, an Instrument & Control (I&C) calibration room, a truck space for cask removal, a hot machine shop, laydown areas for new fuel and the Fine Motion Control Rods Drives (FMCRD), and a miscellaneous storage area.

While the PLSA is a separate functional area from the CB and TB, the northern portion of the PLSA shares a foundation and is structurally integrated with the TB and the southern portion of the PLSA shares a foundation and is structurally integrated with the CB (see Figure 2.2-6).

A portion of the PLSA, the Reactor Auxiliary Bay, is constructed on a separate foundation with respect to the portions of the PLSA that are adjacent to the CB and TB. The functions performed in the Reactor Auxiliary Bay include new fuel and spent fuel cask transit, equipment ingress and egress to the RB, and personnel

access to the RB. The Reactor Auxiliary Bay is a Safety Class 2 structure and is categorized as Non-Seismic. Additionally, it is evaluated for seismic interaction to ensure that it does not compromise the structural integrity and safety functions of the adjacent Seismic Category A RB following a DBE or extreme Tornado wind conditions.

## Figure 2.2-4: DNNP BWRX-300 Facility Site Layout

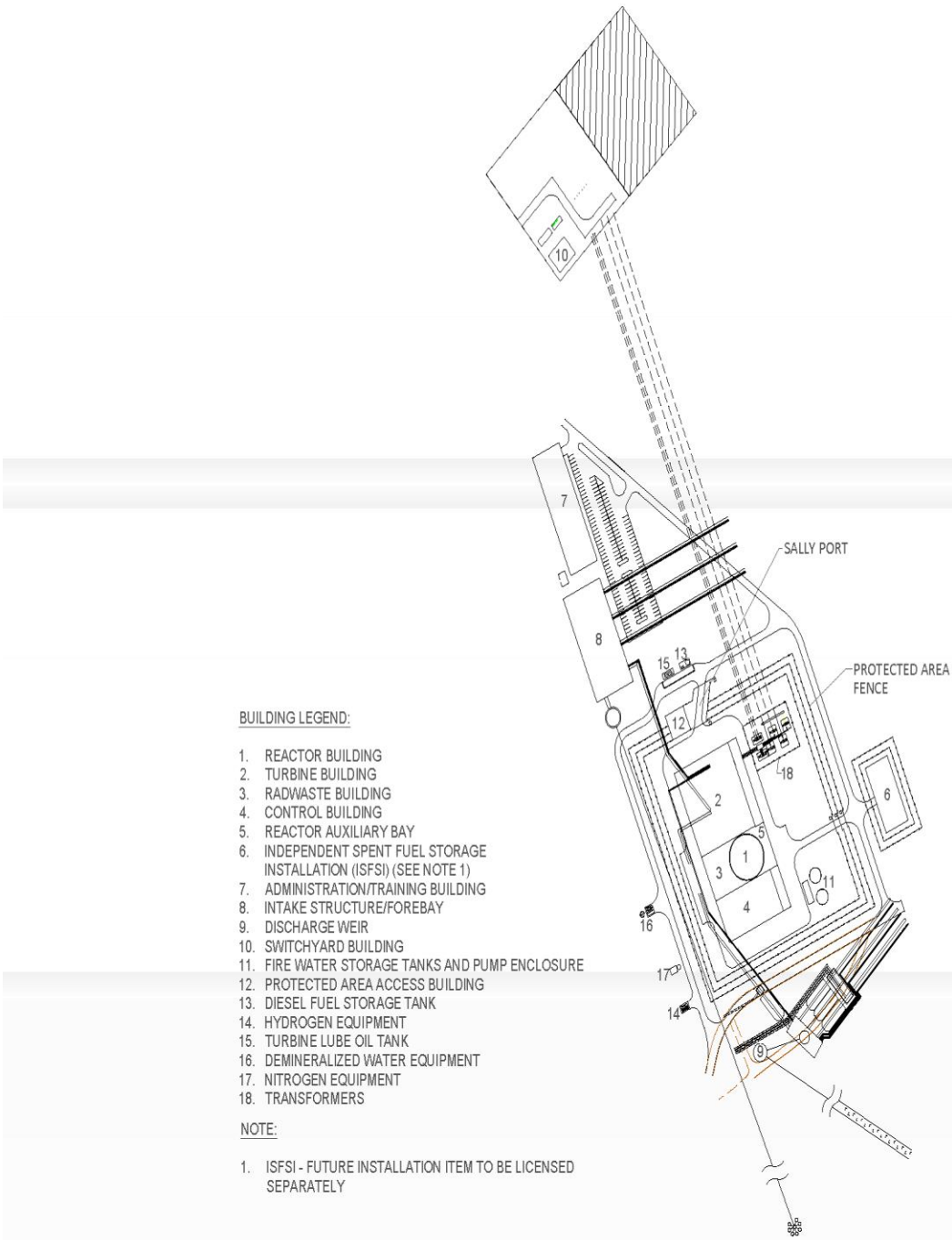


**Figure 2.2-5: DNNP Switchyard Site Plan**

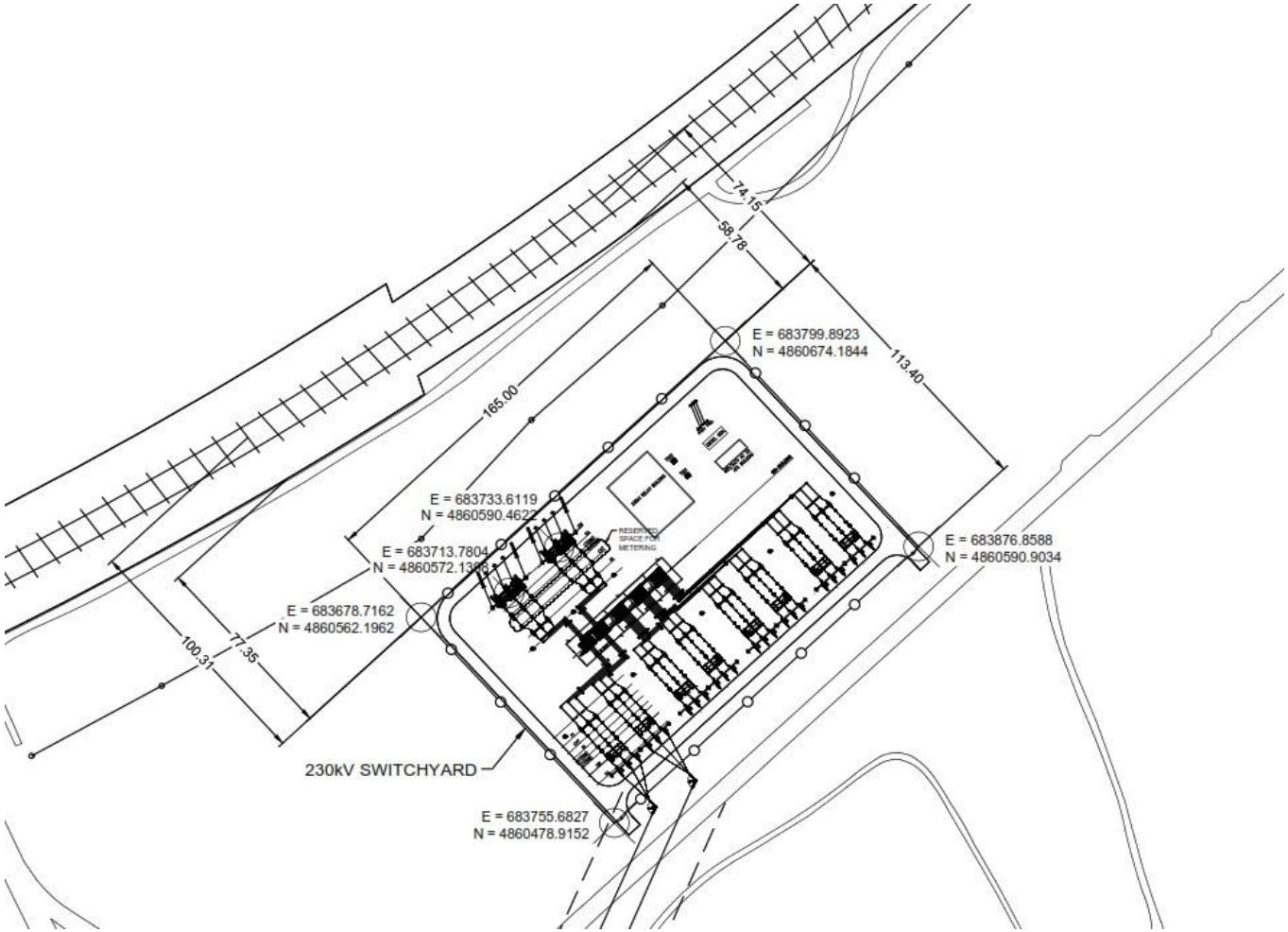
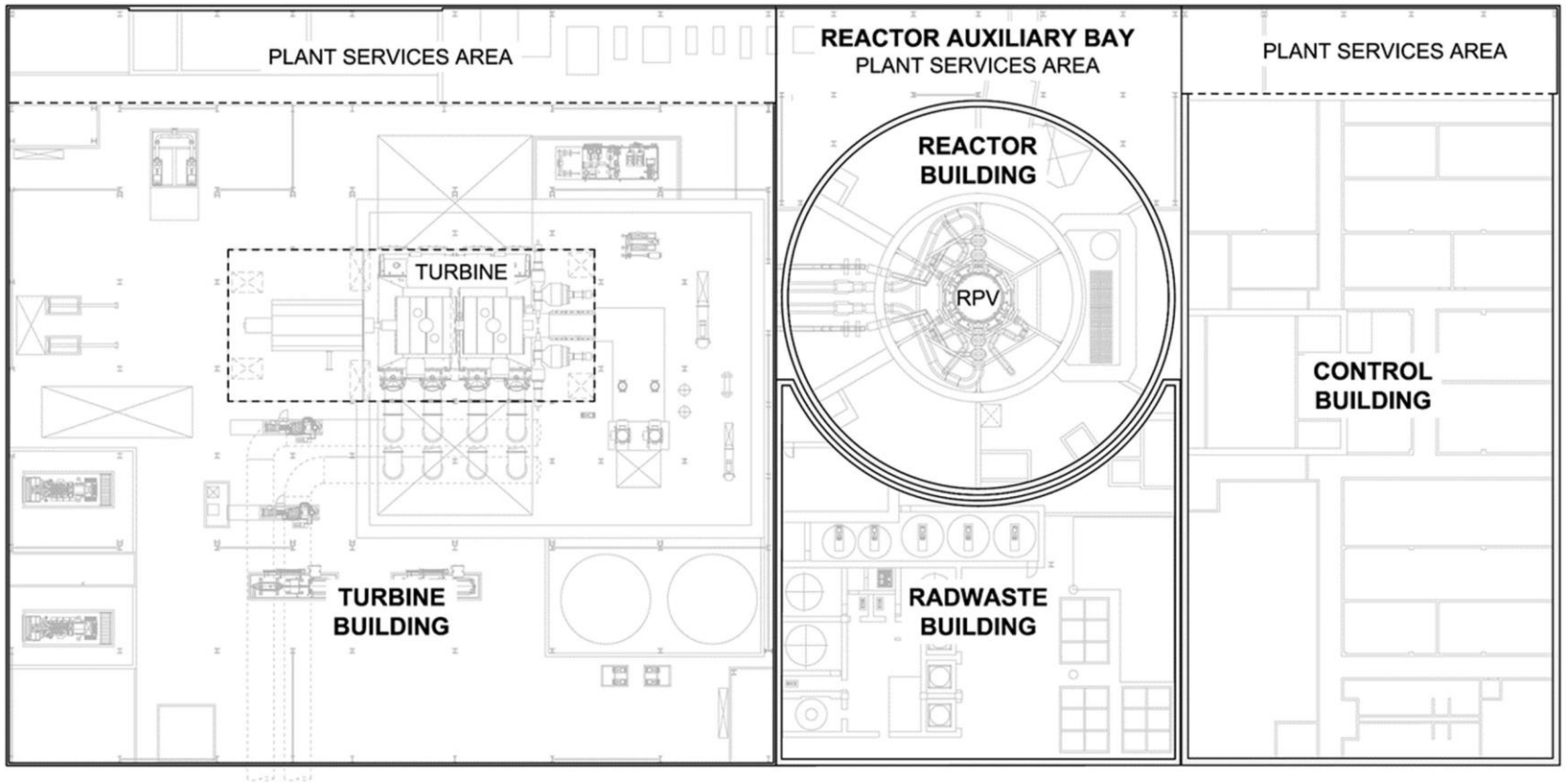


**Figure 2.2-6: BWRX-300 Power Block Plan View at Elevation 0**



## 2.3 OVERVIEW OF SITE RADIOLOGICAL, CHEMICAL, AND PHYSICAL CONDITIONS EXPECTED AFTER STATION SHUTDOWN

This PDP is based on the assumption that DNNP never received an operating licence and that no radioactive material has been brought on site prior to fuel load. Decommissioning will proceed immediately after the decision not to operate has been made. The site will be analyzed for any chemical and or physical issues that could impact dismantlement.

## 2.4 DECOMMISSIONING STRATEGY

This PDP evaluates the as-built conventional dismantling of DNNP prior to plant operations, not including the first fuel load. The estimate includes three periods, Preparation, Dismantling, and Site Restoration. The full scope of the project is expected to take a nominal period of 6 years.

Three decommissioning options were considered, consistent with REGDOC-2.11.2 (Ref. 2):

a) **immediate (prompt) decommissioning** – to decontaminate, dismantle and/or clean up without any planned delays

b) **deferred decommissioning** –

   i. to place the facility, location or site in a period of storage with surveillance (sometimes referred to as care and maintenance), followed by decontamination, dismantling and/or clean-up
   ii. to conduct activities directed at placing certain buildings or facilities, locations or sites in a safe and secure interim end state, followed by a period of storage with surveillance, and ultimately, decontamination, dismantling and/or clean-up

c) **in situ decommissioning** – to place the facility, location or site, or portions thereof, in a safe and secure condition in which some or all of the radioactive contaminants are disposed of in place, which may result in the creation of a waste disposal site.

**Note:** In-situ decommissioning is not considered a reasonable decommissioning option for future facilities, except in exceptional circumstances, as per CNSC REGDOC-2.11.2 (Ref. 2). In-situ decommissioning is not considered or evaluated for the DNNP facility.

A prompt decommissioning strategy for the DNNP as-built facility was selected based on a high-level review of the factors strategy consideration provided as

guidance in REGDOC-2.11.2. The review identified the following key reasons for strategy selection:

- There is no need to delay decommissioning to allow radioactive hazards to decay as the facility has not been operated.
- Disposal facilities for conventional construction materials are already available.
- Prompt decommissioning allows the site to be available for repurposing as soon as possible.
- Although OPG does not take credit for salvage in the decommissioning cost estimate, prompt decommissioning would allow OPG to realize salvage credit as soon as possible to minimize OPG losses from project cancellation.

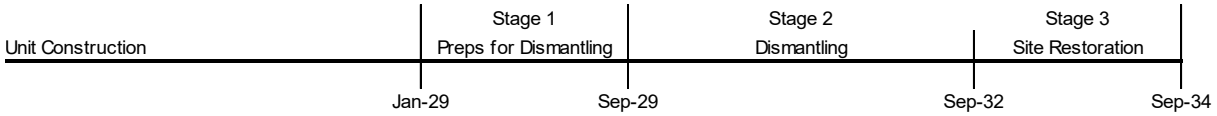
In-depth studies will be performed as warranted over the life cycle of the plant, to refine and solidify the recommended decommissioning strategy as part of the regular review cycle to account for the following issues, which may have relevant consequences for decommissioning:

- changes in site conditions, or incidents and events
- changes to the proposed decommissioning objectives
- changes to ownership or management structure
- advances in decommissioning technology
- significant modifications to the facility, location or site
- updated schedule, cost and funding information
- operational experience and lessons learned
- revised regulatory requirements
- availability of facilities, locations or sites for the management of radioactive waste

## 2.5 PLAN OF DECOMMISSIONING WORK

The following sections describe the basic activities associated with the as-built conventional dismantling of the DNNP prior to plant operations, not including the first fuel load. Although detailed procedures for each activity identified are not provided, and the actual sequence of work may vary, these activity descriptions provide a basis not only for estimating, but also for the expected scope of work, i.e., engineering and planning at the time of decommissioning. Decommissioning work will be executed in accordance with the accepted DDP and detailed work plans. See Figure 2.5-1 for a conceptual decommissioning schedule.

**FIGURE 2.5-1**
**CONVENTIONAL DISMANTLING TIMELINE**




## 2.5.1 STAGE 1 - PREPARATIONS FOR DISMANTLING

Preparations are undertaken to transition from construction to site dismantling. The organization required to manage the intended dismantling activities is assembled from available plant staff at DNNP and other OPG stations, and from outside resources as required. Planning would include a description of the dismantling activities, plans for site demolition, designation of the end-use of the site, preparation of the DDP, an updated cost estimate to complete the dismantling, and any associated plans for environmental remediation. OPG's existing programs would be utilized (or modified if required) for waste management, work planning, environmental protection, etc. to protect or mitigate against specific hazards or atypical situations envisioned to occur during dismantling or site restoration. This includes planning for hazard surveys throughout the decommissioning project for the protection of the workers, the public, and the environment to ensure risks are being adequately controlled and to confirm the effectiveness of risk reduction strategies. Work plans will be developed for CNSC acceptance for monitoring work hazards, environmental emissions and effluents, and for disposal of wastes.

Engineering and Planning

The dismantling will address the continued protection of the health and safety of the public and the environment during this stage.

Much of the work in preparation phase is relevant to the development of the detailed engineering plans and procedures. This work includes, but is not limited to:

- A review of the records from construction and site preparation and the state of the facility at the end of construction.
- Site preparation plans for the proposed dismantling activities.
- Detailed procedures and sequences for removal of systems and components.

- Evaluation of the disposition and selection of the most suitable option for the reactor vessel and internals.
- Design/procurement and testing of tooling and equipment.
- Identification/selection of specialty contractors.
- Sequential planning of activities to minimize conflicts with simultaneous tasks.
- Obtain any additional licences, permits or approvals that may be required and complete any other regulatory requirements that may be applicable (this includes an environmental review if required). Note: a decommissioning licence or modifying the existing construction licence to allow decommissioning activities will be required prior to starting decommissioning.

Site Preparations

In preparation for dismantling, the following activities are initiated:

- Prepare site support and storage facilities, as required.
- Prepare lighting, electrical, and alarm systems whose continued use is required. Consistent with any code requirements de-energize and/or secure portions of fire protection, electric power, and heating, ventilation and air-conditioning (HVAC) systems whose continued use is not required.

### 2.5.2 STAGE 2 - DISMANTLING

This stage includes the physical dismantling activities associated with the removal and disposal of components and structures. Significant dismantling activities involve the following steps:

- Construct temporary facilities and modify existing storage facilities to support the dismantling activities. These may include a cutting station (for large components), additional facilities for increased work force, establishment of laydown areas to facilitate equipment removal, upgrading roads to facilitate hauling and transportation, and modifications to the reactor building to facilitate access of large/heavy equipment.
- Procure specialty tooling. Modify containment to support segmentation activities and prepare rigging for segmentation and extraction of heavy components.
- Perform system and pool draining as required.
- The reactor internals are removed from the reactor vessel using normal plant procedures. Once removed, they are transferred to the Reactor Building truck bay for transport to the on-site scrap recovery area for final segmentation.

- The reactor vessel head is transported intact to the on-site scrap recovery area for final segmentation.
- The reactor vessel is segmented using a vessel cutting machine. Rings of the vessel flange, shell segments, the vessel support skirt, lower vessel ring segments, and the bottom head are all removed from the reactor cavity, transferred to the Reactor building truck bay for transport to the on-site scrap recovery area for final segmentation.
- Removal of spent fuel storage racks from spent fuel pool.
- Remove and dispose of all piping and components that are no longer essential to support dismantling operations.
- Remove and segment isolation condensers for shipment and controlled disposal.
- Dismantling of the reactor pedestal concrete by controlled demolition.
- Remove systems and associated components as they become non-essential to the vessel removal operation, related dismantling activities, or worker health and safety (e.g., water collection and processing systems, electrical and ventilation systems, etc.).
- Removal of the steel liners from the equipment pool, reactor cavity pool, isolation condenser pools, and spent fuel storage pool.
- Removal of the remaining components, equipment, and plant services.
- Routing of material removed during dismantling to be released for unrestricted disposition, e.g., as scrap, recycle, or general disposal.

### 2.5.3 STAGE 3 – SITE RESTORATION

Site restoration activities may begin following the completion of dismantling operations. This PDP presumes that non-essential structures and site facilities will be dismantled as a continuation of the dismantling activity. Foundations and exterior walls are assumed to be removed to a nominal depth of one meter below grade whenever possible. Foundation grade slabs are removed and replaced with fill. The fill allows for the placement of both gravel for drainage and topsoil for erosion control through vegetation. Site areas affected by the dismantling activities are cleaned and the plant area graded as required to prevent ponding and inhibit the resurfacing of subsurface materials. Activities include:

- Perform demolition of the remaining portions of the power block and remaining buildings and structures. Internal floors and walls are removed using conventional demolition techniques. Concrete rubble and clean fill produced by demolition activities are used on-site to backfill voids. Suitable materials can be used on site for fill; otherwise the rubble is trucked off site for disposal as construction debris. The volume of concrete rubble inventory is assumed to be not enough to backfill the voids. As such, backfill will need to be procured and be an additional expense to account for in the cost estimate.

- Upon completion of decommissioning, the DNNP facility will be in a condition to support its removal from regulatory control. A Final End-State Report (or site abandonment plan) on the decommissioning program will be prepared. The Final End-State Report will describe the decommissioning work that has been performed and the outcome of that work, the results of the final surveys which were performed to a survey plan, and the interpretation of those results (i.e., whether the results meet the end-state objectives defined in the Detailed Decommissioning Plan). Other information required by applicable regulations will also be included in the report. This Final End-State Report will be submitted to the CNSC for acceptance as part of the request for a release from regulatory control.

## 2.6 HAZARDOUS MONITORING AND SURVEY COMMITMENTS

### 2.6.1 Hazard Assessment

A thorough assessment of the chemical and construction safety hazards that might be encountered in the course of the decommissioning project shall be performed during the preparation for decommissioning. A preliminary assessment of some of the hazards likely to be encountered during the course of the decommissioning of DNNP is summarized in Table 2.6-1. This preliminary hazard assessment is not exhaustive. Other potential hazards may be identified during the course of decommissioning planning and will be addressed as appropriate.

## Table 2.6-1: Preliminary Hazard Assessment for the Decommissioning of DNNP

| Hazard | Most Likely Source(s) of Hazard | Description/Comments | Hazard Impact On |
|---|---|---|---|
| **Radiation Hazard** | • None expected | | |
| **Chemical Hazard** | **Preparation for Dismantling**<br>• Draining and cleaning of water treatment facility tanks, etc.<br>• Handling the cleaning agents used during decontamination work.<br>• Transporting bulk/waste chemicals. | | Workers, public, environment |
| | **Dismantling & Demolition and Site Restoration**<br>• Handling the cleaning agents used during decontamination work.<br>• Transporting bulk/waste chemicals.<br>• Concrete dust generated during the dismantling | | Workers, public, environment |
| **Industrial and Construction Hazards** | **Preparation for Dismantling**<br>• Similar hazards to those encountered in a conventional demolition project.<br>• Airborne hazards necessitating the use of supplied breathing air or Powered Air Purifying Respirator (PAPR) may be encountered, such as confined space entry. | | Workers |
| | **Dismantling & Demolition and Site Restoration**<br>• Airborne hazards necessitating the use of breathing air or PAPR.<br>• The operation of heavy construction equipment in close proximity to workers.<br>• Fires caused by cutting torches and grinders.<br>• The collapse of equipment or structures during dismantling.<br>• The use of blasting and other techniques to demolish concrete structures.<br>• Falls, lifting heavy objects, falling objects, use of hand tools and the other hazards routinely encountered during construction work.<br>• Working at heights inside the station.<br>• Hazards from concealed or hidden services. | | Workers |
| **Biological Hazards** | Biological organisms and materials that might be found on the site during the decommissioning could also produce hazards that include:<br>• Stings and bites from insects, rodents, birds or other animals that might live or nest inside accessible buildings.<br>• Toxins and antigens produced by molds and other fungi that might grow on surfaces (particularly those made of biological materials). | | Workers |

| Hazard | Most Likely Source(s) of Hazard | Description/Comments | Hazard Impact On |
|---|---|---|---|
| **Biological Hazards** | • Infections or adverse reactions resulting from exposure to organisms living in decaying biological material (such as carcasses and droppings) or their by-products. | | Workers |
| **Motor Vehicle Accidents** | • Highway travel/shipments.<br>• Vehicle/pedestrian collisions.<br>• Vehicle/wildlife collisions. | | Workers, public, environment |
| **Inclement Weather** | • Temperature extremes (hot/cold).<br>• Lightning.<br>• High winds. | Workers at the above-grade structures face the greatest risk of lightning strike. | Workers |
| **Work around Open Water** | • Work around the forebay and Pump Houses. | | Workers |
| **Work at Heights** | • Work over the reactor pit after the reactor and components have been removed, stacks, and other tall structures. | | Workers |
| **Fire/Explosion** | • Hot work (e.g., cutting torches, etc.).<br>• Storage of flammable liquids. | | Workers, public, environment |
| **Flying/Falling** | • Objects falling from heights. | Pipes, walkways and other equipment will fall to the ground after it is cut. | Workers |
| | • Objects falling off buildings/structures as they are demolished. | Objects could fly off buildings and structures as they are being demolished. | Workers |
| **Sharp/Heavy Objects** | • Heavy objects. | Objects will be cut to the size required by recyclers, etc. Most objects will be too heavy to lift by hand. | Workers |
| | • Sharp objects. | Metal objects that are cut or torn may have sharp corners/edges. | Workers |
| **Confined Spaces** | • Work in confined spaces. | Little work will be performed in confined spaces. | Workers |
| **Power/Hand Tools** | • Working with power tools and hand tools. | | Workers |
| **Heavy Equipment** | • Working around heavy equipment. | | Workers |
| **Excavations** | • Work in or near below-grade structures.<br>• Work in or near excavation in soil. | There are open, below-grade concrete structures on the site. | Workers, environment<br>Workers, environment |
| **Demolitions** | • Working near buildings and structures under demolition. | | Workers, public, environment |
| **Noise** | • All conventional industrial processes. | PPE will be used. | Workers, public, environment |
| **Work around Live Services** | • Work near live above-ground services. | Due to the tight building footprint, the logistics for safe work areas, laydown areas and access for heavy lifts, etc. need to be planned. | Workers |
| | • Work near live underground services. | Live electrical and water lines are buried below the site. | Workers |

*Occupational Dose Estimate*

None expected.

*Hazards to Workers*

Primary hazards to workers throughout the decommissioning will be from conventional (non-radiological) hazards, particularly through the Dismantling & Demolition and Site Restoration period. Further details on the hazards that are likely to exist during decommissioning are provided in Table 2.6-1.

*Hazards to the Public*

With the exception of the transportation of demolition waste, there should be no significant hazards to the public. See also Table 2.6-1.

### 2.6.2 Chemical and Demolition Safety

OPG will ensure that all decommissioning work is conducted in accordance with the requirements of the applicable federal and provincial Occupational Health and Safety (OH&S) regulations. OPG currently has a comprehensive OH&S program that meets the requirements of the OH&S Act of Ontario (Ref. 31). This program recognizes:

- The right of employees to know of the hazards associated with their work;
- The right of employees to participate in decisions related to health and safety; and
- The right of employees to refuse to perform work that is considered to be unsafe.

A Demolition Contractor(s) will be retained to perform the decommissioning work on behalf of the owner during the Dismantling & Demolition and Site Restoration period of the project. The Demolition Contractor(s) will be given charge and control of the work area (or designated parts of the work area) as the "Constructor". The Demolition Contractor(s) will be responsible for:

- Registering the Construction Project with the Ontario Ministry of Labour as required by the Construction Safety Regulations made pursuant to the OH&S Act; and

- Providing the personnel, equipment, procedures and training required for the protection of workers, the public and environment.

OPG will provide oversight of the Demolition Contractor(s) to ensure that the work is performed in accordance with the requirements of the decommissioning licence (or a licence which authorizes decommissioning), OPG policies and the

contract(s). The licence to construct could be modified to allow decommissioning activities.

### 2.6.3 Emergency Response Planning

During the preparation of the DDP, OPG will prepare an assessment of the potential hazards to workers, the public and the environment. Potential emergency situations will resemble those that might occur during the course of a major construction project.

At all stages of the project, OPG will ensure that:

- The plans are reviewed and exercised regularly;
- An adequate number of personnel are available to respond to any emergency situation that may occur;
- The emergency response personnel receive the training required to respond appropriately to any emergency situation that may occur; and
- The necessary equipment and supplies are available for use by emergency response personnel.

OPG will coordinate its response to a real or potential emergency situation with the regional and/or municipal agencies. It is not anticipated that there will be any federal and/or provincial coordination required.

## 2.7 WASTE MANAGEMENT STRATEGY

Hazardous wastes generated during the Demolition and Site Restoration periods of the decommissioning will likely be limited to hazardous materials originally used as building materials. Volumes of these wastes are likely to be small, since very few hazardous materials are expected to be used in the construction of the plant. Waste such as combustibles (paper, cloth, wood, filter cartridges) could also be generated in the removal of plant systems. The potential for generating hazardous wastes (e.g. silica from crushing concrete) will be incorporated into the waste management strategy and the necessary precautions and reporting will be incorporated into the decommissioning programs and procedures during execution.

As the facility would not have been operated, it is expected hazardous materials typically used during operations would not be present. An allowance for the removal and disposal of approximately 81,000 pounds of hazardous materials is included. This is an estimated amount for station batteries and other hazardous material required to operate the plant which is assumed to be on-site during dismantling. This mass was based on decommissioning OPEX. The bulk

of the non-hazardous waste materials generated during decommissioning will be produced during the Demolition and Site Restoration periods of the decommissioning. See Table 2.7-1 for amounts of non-hazardous waste.

**TABLE 2.7-1**
**VOLUMES OF CONVENTIONAL WASTES**

| Conventional Waste | |
|---|---|
| **Waste Type** | **Volume $m^3$** |
| Metallic | 35,480 |
| Non-Metallic | 4,776 |

Notes
Non-Metallic waste is construction debris (asphalt roofing, drywall, etc.).
Concrete rubble is assumed to remain on site and be used as backfill.

Appropriate disposal facilities for hazardous wastes will be identified prior to the beginning of the decommissioning project. Hazardous wastes will be packaged for transport and disposal according to the requirements of the applicable provincial regulations, and OPG's waste management standard (Ref. 32). All hazardous wastes will be transferred to an appropriate, licenced waste management facility for storage or disposal at approved disposal facilities. Waste manifests will be prepared and submitted as required by provincial regulations. Up-to-date records will be maintained of wastes generated during decommission and the specifics of the disposal (disposal location, quantities, and characteristics).

Non-hazardous wastes will be reused or recycled wherever possible or disposed of at approved disposal facilities. Clean concrete rubble may be used to fill the demolished DNNP facility or disposed according to applicable regulations.

## 2.8 COMMITMENT TO PREPARE A DETAILED DECOMMISSIONING PLAN FOR CNSC ACCEPTANCE PRIOR TO DECOMMISSIONING

A Detailed Decommissioning Plan will be prepared and submitted for CNSC acceptance prior to the start of decommissioning. The Detailed Decommissioning Plan will be prepared to meet the requirements of CNSC REGDOC-2.11.2 (Ref. 2) and CSA N294, "Decommissioning of Facilities Containing Nuclear Substances" (Ref. 5). The DDP will include a safety assessment to identify any hazards to workers, the environment, and the public from both routine decommissioning activities and credible potential accidents during decommissioning. It has been assumed that a permanent shutdown plan and stabilization activity plan will not be required as the facility will not

have been operated. Should decommissioning take longer than 5 years, OPG will review and, if necessary, update the DDP, or as requested by the CNSC.

## 2.9 COMMITMENT TO PERIODICALLY REVIEW AND UPDATE THE PDP, IN ACCORDANCE WITH SECTION 6.1 of REGDOC 2.11.2

It is assumed this PDP will be superseded by a PDP for the Licence to Operate (LTO). However, should the DNNP facility construction take longer than 5 years, OPG will review and update this decommissioning plan as required by REGDOC-2.11.2. Additionally, if the project is cancelled prior to operation, this PDP will be further developed into a DDP for CNSC acceptance.

REGDOC-2.11.2 and CSA N294:19 have a requirement for an overarching site PDP to be produced to take into account the interdependencies between facilities located on the same site. The DNGS PDP (Ref. 33) meets this requirement for the DNGS site (including the Nuclear Sustainability Services – Darlington Waste Management Facility (NSS-DWMF) facility). As the DNNP SMR will be a new facility on the site, the interdependencies with the rest of the facilities are described below and will be included in the next revision of the DNGS site PDP.

Interfacing systems between the DNNP facility and the rest of the site are provided in section 2.2.2. Interfacing services for DNNP are expected to be similar as provided between the DNGS station and the NSS-DWMF facility, for example: security, environmental monitoring, emergency response, and radiation protection (if required). There are no expected interdependencies in regards to decommissioning schedules as decommissioning of DNGS and NSS-DWMF will occur decades later than the decommissioning of the as-built DNNP facility given the schedule provided in section 2.5.

## 2.10 PHYSICAL STATE OF THE FACILITY

The proposed end-state of the DNNP facility is that OPG will dismantle the facility shortly after the construction is complete and restore the site to an industrial end-state status suitable for other OPG uses, commonly known as "brownfield". As per industry practice, a brownfield is defined as a former industrial land that has the potential to be developed for new industrial uses. By the end of the Dismantling and Site Restoration periods, the DNNP facility will be free of industrial hazards. Station SSCs will have been dismantled.

Hazardous materials will be removed from the DNNP facility. After site remediation and completion of the decommissioning, institutional controls are not expected to be required after the release from regulatory control. Station systems will have been dismantled and buildings demolished. Subsurface structures will have been drained and de-energized. These subsurface

structures will be dismantled to a nominal depth of one meter below grade (consistent with international practices), backfilled with clean concrete rubble and soil, graded over, and vegetation restored. The remaining facility will have been backfilled to prevent future subsidence and restored to a state suitable for other OPG uses. By the end of this phase, the end-state objectives will be verified to have been achieved by submitting an end-state report to the CNSC for acceptance and the DNNP facility will meet the criteria for release from regulatory control.

## 2.11 RECORDS REQUIRED FOR DECOMMISSIONING

Records filing and retention are governed by OPG's Information Management program (Ref. 34), which identifies records relevant to decommissioning are permanent records. Decommissioning-related documentation will also be managed and maintained in accordance with CSA N294:19 (Ref. 5). It is assumed the DNNP facility will not begin operations prior to decommissioning, however siting and construction records will be maintained.

## 2.12 PUBLIC ENGAGEMENT PLAN

A public and stakeholder engagement plan will support the dismantling activities and support consultation for future uses of the site. This plan will include both information and consultation opportunities. The plan will be designed to involve a broad cross-section of stakeholders employing a variety of methods that will meet the needs of the participants and the objectives of the business.

The plan will identify issues and concerns; ensure opportunities for involvement; ensure that all inputs were considered in decommissioning planning and/or in the environmental risk assessment and include the documentation of the process and results. The public and stakeholder engagement plan will also support the development of an integrated community impact management plan.

The public and stakeholder engagement plan will comply with the applicable requirements of REGDOC-3.2.1, Public Information and Disclosure (Ref. 13).

## 2.13 INDIGENOUS ENGAGEMENT PLAN

An Indigenous engagement plan will support the dismantling activities and support consultation for future uses of the site. The plan will be designed to involve Indigenous rights holders employing a variety of methods that will meet the needs of the participants and the objectives of the business. The plan will focus on information sharing, constructive dialogue, collaboration, and meaningful engagement.

The plan will include identification of issues and concerns; ensure opportunities for involvement; ensure that all inputs were considered in decommissioning planning and/or in the environmental risk assessment and include the documentation of the process and results. The Indigenous engagement plan will also support the development of an integrated community impact management plan.

The Indigenous engagement plan will comply with the applicable requirements of REGDOC-3.2.2, Indigenous Engagement (Ref. 14).

## 2.14 DECOMMISSIONING COST ESTIMATE AND FINANCIAL GUARANTEE

Decommissioning Costs and financial guarantee information will be provided in a separate report as allowed by REGDOC-2.11.2.

## 2.15 UNCERTAINTY

There are several elements of risk and uncertainty associated with decommissioning of the DNNP facility. At this point in the facility lifecycle, some of the sources of uncertainty and risk are:

- Design is still underway;
- Planning assumptions;
- Physical state of the facility;
- Regulatory framework;
- Technical strategy/approach for decommissioning;
- Waste disposition; and
- Indigenous rights holders and stakeholder concerns

As mentioned previously, this decommissioning plan is being prepared early in the life cycle of the facility, thus there is uncertainty in some of the information being presented herein as the final design for this first of a kind BWRX-300 SMR facility is underway. This plan has been developing utilizing OPEX from the decommissioning of conventional power plants and the decommissioning of prior generations of Boiling Water Reactors (BWRs) in the US and internationally.

Any risks associated with the current planning assumptions supporting this PDP have been identified, documented and are being tracked by OPG. As mentioned above, the decommissioning process is also based on a well-established methodology through OPEX from the decommissioning of conventional power plants, other BWRs and industry best practices.

The physical state of the facility prior to decommissioning is assumed that the decision to decommission will be made when the facility will be constructed and

fully commissioned up to the point prior to fuel loading. Thus, there will be no radiological concerns with regards to the decommissioning of the facility, which would reduce potential uncertainty in regard to condition of the facility (i.e., the amount and extent of radiological contamination). Details regarding the modularization strategy which will be used to facilitate the BWRX-300 construction for the DNNP are not yet available at this point in the design. It is envisioned that the modules used to construct could be used to efficiently dismantle the facility as it would not be radiologically contaminated. For the purpose of this plan, it was conservatively assumed full conventional dismantling is used to decommission the as-built facility without taking into account modularization, thus increasing confidence in our estimate.

In terms of any uncertainty related to the regulatory framework, OPG maintains a good communication protocol with the CNSC and ensures that the PDP meets the regulatory requirements in its licence, as described in Section 2 and Appendices A and B. The timeframe between the decision to decommission for the as-built facility is in the near term (less than 10 years) so it is not expected there will be large changes in the regulatory framework. The decommissioning of this facility will be completely conventional, so it is expected the will be fewer requirements, however there will be a need to maintain a good regulatory relationship as clarifications and discussions on regulatory requirements are still expected to be needed.

This PDP demonstrates that decommissioning is feasible with existing technology and as mentioned previously is based on OPEX from actual decommissioning of conventional power plants and BWR reactors, thus increasing confidence in the decommissioning planning.

As this facility will not be radiologically contaminated, it is expected that existing conventional disposal facilities for waste and hazardous materials (if present) will be available to take the waste, thus there is confidence in waste disposition. Additionally, not all materials from dismantling are expected to be disposed: materials will be recycled or salvaged wherever possible; however, no salvage credit is accounted for in the decommissioning planning.

To manage uncertainty related to Indigenous rights holder and stakeholder perception for the DNNP facility decommissioning, OPG has extensive public and Indigenous engagement activities, as described in Section 2.1.6. For additional information, see sections 2.12 and 2.13.

# 3. REFERENCES

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# Appendix A - Compliance Matrix with REGDOC-2.11.2 and this Plan

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| **3.1. The Lifecycle Approach to Decommissioning** | The CNSC requires that planning for decommissioning take place throughout the lifecycle of a nuclear facility, location or site or for the duration of a licensed activity. | 1.3 |
| | Throughout the lifecycle of a nuclear facility or for the duration of a licensed activity, except for release from CNSC regulatory control, a decommissioning plan is required. A preliminary decommissioning plan (PDP) is developed during the siting phase for a Class I nuclear facility and uranium mine and mill, the construction phase for a Class II nuclear facility, or prior to submitting an application for a CNSC licence to possess, manage, use or store nuclear substances at a location. The PDP is progressively updated, where needed, to reflect the appropriate level of detail required for the respective licensed activities. Prior to the decommissioning stage, a detailed decommissioning plan (DDP) is developed. The DDP refines and adds details to the PDP. | 1.3, 2.9 |
| | A licence to decommission or a licence that authorizes decommissioning activities is required for Class I and Class II nuclear facilities and uranium mines and mills prior to the execution of decommissioning. For sites with more than one facility or location that are at different lifecycle stages, the CNSC may issue a licence that includes multiple activities (e.g., operate and decommission). | 2.5.1 |
| **4 Optimization and Graded Approach in Decommissioning** | The licensee shall ensure that protection of health, safety, security and the environment is planned and optimized during decommissioning. | 1.1, 2.1.3, 2.5.1, 2.6.2 |
| | With a graded approach, all of the requirements in this document shall apply, but to varying degrees depending upon the safety significance and complexity of the work being performed. The level of analysis, the depth of documentation and the scope of actions necessary to comply with the requirements of this document shall be commensurate with the nature and level of the hazards; the complexity of the facility, location or site; and the characteristics of the waste. | 1.2 |
| | A graded approach, if utilized, shall be applied in a way that does not compromise the protection of health, safety, security and the environment. Further information on the graded approach can be found in REGDOC-3.5.3, Regulatory Fundamentals. | 1.2 |
| **5 Decommissioning Strategy** | The licensee shall select a decommissioning strategy that will form the basis for planning for decommissioning and facilitate achieving the desired end state of the decommissioning project. For Class I nuclear facilities and uranium mines and mills, the decommissioning strategy shall be selected during the siting stage. For Class II nuclear facilities, the decommissioning strategy shall be selected during the construction stage. Prior to submitting an application for a licence to possess, manage, use or store nuclear substances at a location, the decommissioning strategy shall be selected. For existing facilities, uranium mines and mills, and nuclear substances and radiation device licensees who are required to have a decommissioning strategy and where there is no decommissioning strategy, the | 2.4 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| | licensee shall select a suitable strategy for decommissioning as soon as possible.<br><br>If shutdown of a facility, location or site is sudden, the decommissioning strategy shall be reviewed on the basis of the situation that initiated the sudden shutdown in order to determine whether a revision of the strategy is required. | N/A |
| **5.1 *In Situ* Decommissioning** | *In situ* decommissioning shall not be considered a reasonable decommissioning option for planned decommissioning of existing or future nuclear facilities and situations where removal is possible and practicable; nevertheless *in situ* decommissioning may be considered a solution only under exceptional circumstances (e.g., following a severe accident) or for legacy sites. *In situ* decommissioning for legacy sites is only considered viable where the use of *in situ* will be protective of workers, the public and the environment; decommissioning was not planned as part of the design; the fuel has been removed; and the site will remain under institutional control for the period defined in the safety case.<br>In a case where the end state for *in situ* decommissioning results in a waste disposal facility, location or site, the licensee shall satisfy all regulatory requirements for a radioactive waste disposal facility, location or site and demonstrate safety in a safety case and safety assessment of the disposal facility, location or site. | N/A<br><br>N/A |
| **6 Planning for Decommissioning** | Where required by a condition of the licence, a licensee shall maintain a financial guarantee for decommissioning that is acceptable to the CNSC. Requirements and guidance on financial guarantees can be found in REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*. | 2.14 |
| **6.1 Preliminary Decommissioning Plan** | The licensee shall prepare a PDP and submit it to the CNSC for acceptance with an application for a licence in respect of a nuclear facility or the conduct of a licensed activity, in accordance with the conditions of its licence. The PDP shall document the selected decommissioning strategy; main decontamination, dismantling and/or clean-up activities; end-state objectives; an overview of the principal hazards and protection strategies; a waste management strategy; a cost estimate; and financial guarantee arrangements.<br><br>The licensee shall review and, as necessary, update the PDP and submit it to the CNSC every five years or as requested by the CNSC.<br><br>For licensed sites with more than one facility or location for which the licensee is responsible, the licensee shall submit an overarching PDP to ensure that interdependencies between planning envelopes or facilities, locations or sites are taken into account. | 1.1<br><br>2.9<br><br>2.9 |
| **6.1.1 Content of the Preliminary Decommissioning Plan** | A PDP for a nuclear facility with a Class I or uranium mines and mills licence shall include, as applicable:<br>• a description of the location of the facility, including:<br>  • a map of the facility and its specifications<br>  • geographic information<br>  • details regarding the surrounding environment<br>  • land uses<br>  • illustrations and maps of the facility in relation to the municipality<br><br>• the purpose and description of the facility, including:<br>  • primary SSCs | 2.1<br><br>2.2, Figures 2.2-1 to 2.2-3 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| | • the building type and construction, including location of any hazardous building materials (e.g., asbestos, polychlorinated biphenyls)<br>• the building services (e.g., power, heating, ventilation, sewer, water, fire protection)<br>• laboratories and other hazardous handling areas<br>• the type, quantity and form of radioactive and hazardous materials managed, stored, produced or used during operation<br>• the design features used to reduce the spread of contamination and facilitate decontamination, dismantling and/or clean-up | N/A |
| | • the anticipated post-operational conditions, including:<br>• a summary of the shutdown process, including planned removal of stored inventories of hazardous or radioactive materials<br>• the predicted nature and extent of contamination remaining in the primary SSCs (in list or table format with reference to applicable illustrations)<br>• the predicted nature and extent of contamination on floors, walls and work surfaces, in ventilation systems, etc.<br>• an overview of the principal hazardous conditions anticipated<br>• the identification of any separate planning envelopes | N/A<br>N/A<br>N/A<br>2.6<br>N/A |
| | • the decommissioning strategy, including:<br>• the final end-state objective<br>• the rationale for:<br>▪ the decommissioning strategy selected<br>▪ interim end states<br>▪ periods of storage with surveillance<br>▪ any institutional controls<br>• the assessment of alternative strategies (or a rationale for why alternatives do not exist or do not warrant consideration) | 2.4, 2.10 |
| | • the plan of the decommissioning work, including:<br>• a work breakdown structure<br>• a summary of the main steps for decontamination, dismantling and/or clean-up, and removal of each of the SSCs, preferably grouped into work packages<br>• for each work package, an identification of those types of activities that could pose a significant hazard to workers, the public or the environment<br>• the role of existing operational standard procedures for radiation protection, hazardous materials handling, industrial safety, and environmental protection in managing hazards<br>• the specific activities for which additional protection/mitigation procedures will be required at the detailed planning stage (preparation for decommissioning phase)<br>• a summary of the final dismantlement of the structures<br>• a conceptual schedule showing the approximate year of facility shutdown and the approximate sequencing and | 2.5<br>2.5.2<br>2.6<br>2.5.1, 2.7, 2.6.2, 2.6.3<br>2.5.1, 2.6<br>2.10<br>Figure 2.5-1 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| | duration of the decommissioning work packages and, where relevant, storage periods | 2.5.1, 2.6 |
| | • the hazardous monitoring and survey commitments, including:<br>  • a program for conducting periodic contamination surveys and the recording of contamination events during facility operation<br>  • a commitment to develop plans and protocols acceptable to the CNSC at the detailed planning stage for monitoring:<br>  ▪ work hazards during decommissioning<br>  ▪ personnel dosimetry<br>  ▪ environmental emissions and effluents<br>  ▪ materials, sites and structures to be cleared from regulatory control | 2.7 |
| | • a waste management strategy specifying:<br>  • the conservative quantities and characteristics of radioactive and chemically hazardous wastes expected to arise from the decommissioning (tied to specific work packages, if possible)<br>  • the anticipated final disposition of radioactive and chemically hazardous materials<br>  • a commitment to segregate as much material as possible for reuse and recycling | 2.8 |
| | • a commitment to prepare a DDP for CNSC acceptance prior to decommissioning | 2.9 |
| | • a commitment to periodically review and update the PDP, in accordance with section 6.1 | 2.3, 2.5 |
| | • the physical state of the facility at:<br>  • the end of operations (permanent shutdown state)<br>  • the start of decommissioning (stable state for decommissioning) | 2.11 |
| | • the records required for decommissioning, including a description of the facility's operational records that will be maintained to periodically update the PDP and prepare the DDP(s) | |
| | • a public consultation plan, including a public information program and avenues for public participation as per the requirements and guidance of REGDOC-3.2.1, *Public Information and Disclosure* | 2.12 |
| | • an Indigenous engagement plan as per the requirements and guidance of REGDOC-3.2.2, *Indigenous Engagement* | 2.13 |
| | • the conservative cost estimate of decommissioning and a financial guarantee, as described in REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, specifying:<br>  • an estimate of the total present-value cost of the decommissioning<br>  • a reasonable basis for how cost estimates were derived<br>  • a description of how the required funds will be provided | 2.14 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| **6.2 Waste Management Strategy** | The licensee shall prepare a waste management strategy that identifies the categories and estimated quantities of all waste streams that will be generated and managed during decommissioning, and the planned disposition path. Requirements and guidance for radioactive waste management can be found in REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*. | N/A for PDP, relevant for execution of decommissioning, 2.7 |
| **7 Preparation for Decommissioning** | During the preparation for decommissioning phase, the licensee shall review and revise its impacted program documents to ensure that they align with the decommissioning activities.<br>The licensee shall inform the CNSC, in writing, prior to shutting down a facility, location or site permanently or ceasing to manage, possess, use or store nuclear substances.<br>For nuclear facilities with a Class I or a uranium mines and mills licence, the licensee shall submit to CNSC staff, for acceptance, the following documents, in order to transition from operation to decommissioning:<br>• a permanent shutdown plan – includes the steps to transition the facility from operation to a permanent shutdown state<br>• a stabilization activity plan – comprises steps for the facility's transition from a permanent shutdown state to a stable state for decommissioning<br>• a DDP – see section 7.1 | 2.5.1<br>2.5.1<br>2.8 |
| **7.1 Detailed Decommissioning Plan** | Prior to the execution of decommissioning, the licensee shall submit a DDP to the CNSC for acceptance, where required by a condition of the licence. For a Class I nuclear facility, the licensee should typically submit a DDP to the CNSC two to five years prior to executing decommissioning. The DDP shall document the decommissioning strategy; decontamination, dismantling and/or clean-up activities; final end-state objectives; the principle hazards and protection plans; a waste management plan; a cost estimate; and financial guarantee arrangements. Once accepted by CNSC staff, the DDP will be incorporated into a licence authorizing decommissioning.<br>For immediate (prompt) decommissioning, the licensee shall detail, in the DDP and supporting documents (e.g., safety assessment for decommissioning), the decontamination, dismantling and clean-up.<br>For deferred decommissioning, the licensee shall detail, in the DDP and supporting documents (e.g., safety assessment for decommissioning), the activities that will be performed during the storage with surveillance period. Toward the end of the storage with surveillance period, the DDP and supporting documents shall be revised, detailing the decontamination, dismantling work and clean-up activities to be completed and submitted to the CNSC for acceptance.<br>For *in situ* decommissioning, the licensee shall detail, in the DDP, any decontamination, dismantling, clean-up and storage with surveillance activities, as applicable. In cases where the end-state result is a waste disposal facility, location or site, the licensee shall submit, in addition to a safety assessment for decommissioning, a safety case and supporting post-closure safety assessment. Applicable requirements and guidance can be found in REGDOC-2.11.1, *Waste Management, Volume III: Safety Case for the Disposal of Radioactive Waste*. | 2.8<br>2.8<br>N/A<br>N/A |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| | Where decommissioning takes longer than five years, the DDP shall be reviewed and, as necessary, updated every five years or as requested by the CNSC.<br><br>For licensed sites with more than one facility or location preparing to undergo decommissioning for which the licensee is responsible, the licensee shall submit an overarching site DDP to ensure that interdependencies between the individual DDPs (planning envelopes or facilities or locations) are taken into account. | 2.8<br><br>N/A for PDP, relevant for execution of decommissioning |
| **7.1.1 Content of the Detailed Decommissioning Plan** | A DDP for a nuclear facility with a Class I or uranium mines and mills licence shall include, as applicable: … | N/A for Preliminary Decommissioning Plan |
| **7.2 Safety Assessment for Decommissioning** | The licensee shall perform a safety assessment to identify any radiological or non-radiological hazards to workers, the environment and the public from both routine decommissioning activities and credible potential accidents during decommissioning.<br><br>For a nuclear facility with a Class I or uranium mines and mills licence, the licensee shall ensure that the safety assessment: …<br><br>For *in situ* decommissioning resulting in a disposal facility, location or site, a post-closure safety case (see section 5.1) shall be provided, in addition to the decommissioning safety assessment. | 2.8<br><br>N/A for Preliminary Decommissioning Plan<br><br>N/A |
| **7.3 Storage with Surveillance Plan** | For deferred decommissioning, Class I nuclear facility and uranium mines and mills licensees shall submit a storage with surveillance plan, in addition to the DDP, to the CNSC for acceptance.<br>The licensee shall outline in the storage with surveillance plan any activities envisioned or planned to reduce the risks at the facility | N/A<br><br>N/A |
| **7.4 Waste Management Plan** | The licensee shall prepare a waste management plan that considers the waste hierarchy, including preventing generation, reducing volume and radioactivity, reusing and recycling materials and components, and disposing of the waste.<br>The waste management plan shall identify the waste streams together with the estimated quantities and characteristics of the waste.<br>The waste management plan shall describe the systematic process for how the waste will be moved from the decontamination and dismantling areas to the areas for subsequent steps of waste management.<br>The licensee shall assess the potential for generating non-radiological hazardous substances and incorporate the necessary precautions and reporting into its programs and procedures. | N/A for PDP, relevant for execution of decommissioning, 2.7<br><br>2.7 |
| **8 Execution of Decommissioning** | During the execution of decommissioning, the licensee shall:<br>• conduct decommissioning in accordance with the DDP and associated procedures<br>• implement a decommissioning process and supporting programs to ensure safety<br>• ensure that a methodology for issuing, modifying and terminating work procedures is established<br>• maintain an up-to-date list of SSCs important to safety, as well as surveillance and maintenance plans for these SSCs | 2.5<br><br>2.5.1<br><br>2.5.1<br><br>1.3.1 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| **8.1 Storage with Surveillance** | For deferred decommissioning, during periods of storage with surveillance, the licensee shall ensure that the facility, location or site is maintained in a safe configuration so that subsequent decontamination, dismantling and/or clean-up can be carried out. The licensee shall implement and maintain appropriate storage with surveillance programs to confirm that the SSCs needed to maintain safe storage are functioning as required. | N/A |
| **8.2 Waste Management** | Prior to the execution of decommissioning, the licensee shall ensure the availability of packages for radioactive waste, the disposition path of radioactive waste arising from decommissioning activities, and the ability of those disposition paths to accommodate the types and volumes of material.<br><br>The licensee shall characterize and manage all remaining operational waste from the facility, location or site and all waste from decommissioning.<br>The licensee shall ensure the traceability and maintain up-to-date records of the waste generated and managed at the facility, location or site or transferred to another facility, location or site, specifying its quantities, characteristics and destination. | N/A<br><br>2.7<br><br>2.11 |
| **9 Completion of Decommissioning** | Upon completion of decommissioning, the licensee shall demonstrate that the end-state criteria specified in the DDP have been met.<br>The licensee shall submit an end-state report to the CNSC for acceptance. The end-state report should be submitted no more than two years after completing the execution of decommissioning activities.<br>For a nuclear facility with a Class I or uranium mines and mills licence, the end-state report shall include: …<br><br>Where decommissioning of the facility will take place in discrete stages, an interim end-state report shall be prepared when each planned interim end state is achieved. This report should describe the decommissioning work undertaken, the physical condition of the facility, the remaining hazards, the interim end state achieved, the results of surveys, the hazards and physical condition of the facility, and the remaining decommissioning tasks or work packages to be completed. | 2.10<br><br>2.10<br><br>N/A for Preliminary Decommissioning Plan<br><br>N/A |
| **9.1 Institutional Controls** | If institutional controls are required to be in place, the licensee shall prepare plans to address the completion of decommissioning and submit them to the CNSC for review.<br><br>If institutional controls are required, the CNSC expects the following actions to be taken by the responsible party, following completion of decommissioning:…<br>• Implementation of a visual inspection plan for periodic examination of the facility, location or site to look for signs of deterioration of the facility, location or site (e.g., slumping of the ground), or erosion of the surface<br>• Operation and maintenance of a monitoring system to detect any radionuclide release within the site boundary<br>• Implementation of any active controls to prevent unrestricted access to the site | N/A<br><br>N/A |
| **10 Radiological and Non-Radiological Surveys** | The licensee shall perform radiological and non-radiological surveys throughout the various phases in the lifecycle to support decommissioning. | 2.5.1 |

| Section in REGDOC-2.11.2 | Requirement in REGDOC-2.11.2 | Section in This PDP |
|---|---|---|
| **10.3 Decommissioning Surveys** | Radiological and non-radiological conditions shall be monitored throughout decommissioning activities to confirm that radiation risks to workers, the public and the environment are being adequately controlled. | 2.5.1 |
| | Surveys shall be performed throughout decommissioning to confirm the effectiveness of decommissioning activities used to reduce radiological and non-radiological risks (e.g., removal of excess radioactive material, decontamination of process equipment and immobilization of remaining contamination). | 2.5.1 |
| | Surveys of hazards shall also be performed to support the safe performance of surveillance and maintenance activities during periods when decommissioning is deferred. | N/A |
| **10.4 Decommissioning End-State Surveys** | The licensee shall conduct a final end-state survey in accordance with a survey plan. | 2.5.3 |

## Appendix B - Compliance Matrix with CSA N294:19 and this Plan

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
|---|---|---|
| 4.1 | The owner of a nuclear facility shall be responsible for planning, executing, and funding all phases of decommissioning. | 1.1 |
| 4.2 | Decommissioning activities shall be planned and executed in accordance with relevant regulations and standards and in keeping with relevant guides.<br><br>Responsibilities for decommissioning, preparing documents, and recordkeeping shall be clearly established throughout the life cycle of a facility. This responsibility includes planning and preparing for, executing, and completing decommissioning (i.e., until the final end-state objective has been achieved, all documentation completed, and all requirements satisfied).<br><br>Responsibility for the funding of the decommissioning shall be identified and financial guarantee shall be established to ensure adequate funding for decommissioning. | 1.2<br><br>1.1, 1.3, 2.9, 2.10, 2.11<br><br>1.1 |
| 4.3 | The owner shall consider the requirements of CSA N286 when executing decommissioning works, including the following:<br>(a) protecting the health and safety of workers and the public;<br>(b) protecting the environment;<br>(c) complying with requirements of the AHJ;<br>(d) keeping radiation exposures as low as reasonably achievable (ALARA);<br>(e) managing all radioactive and hazardous materials generated by the decommissioning;<br>(f) security; and<br>(g) safeguards. | 1.2 |
| 4.4 | Programs shall be developed and implemented to support decommissioning. | 2.5<br>This pertains to the execution phase. |
| 5.1.1.3 | A financial guarantee for decommissioning shall be established to ensure that adequate funding is available at the time of decommissioning.<br>The financial guarantee for decommissioning shall be maintained throughout the life cycle of the facility. | 2.14 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
|---|---|---|
| 5.1.6 | The final end-state shall be considered reached when the end-state objectives as set in the DDP are verified to have been achieved (Annex F describes how to establish the end-state objectives). | 2.10 |
| 5.1.7 | The party accountable for decommissioning shall identify the applicable institutional control requirements following decommissioning as well as the available administrative processes in the jurisdiction in which they are located. | 2.10 |
| 5.2.5 | Decommissioning records shall include, as applicable,<br>a) the DDP(s);<br>b) public and Indigenous engagement/communication records (as per CNSC REGDOC-3.2.2);<br>c) if required by the AHJ, an impact assessment or environmental review in accordance with applicable legislation;<br>d) licences and permits required for the decommissioning work;<br>e) the plans and procedures used in decommissioning;<br>f) reports and other documents that describe<br>i) the criteria used to define radioactive and hazardous materials and to distinguish contaminated from uncontaminated materials;<br>ii) the criteria used to define the final contamination status of the facility;<br>iii) the principles and models used in deriving the criteria in Items i) and ii);<br>iv) the residual radionuclide inventory after decontamination;<br>v) the amounts of radioactive and hazardous materials removed and the disposition method;<br>vi) waste management and transfer records;<br>vii) the equipment and materials removed from the facility for recycling or use elsewhere, their treatment prior to removal from the site, and the disposition method;<br>viii) the survey methods and the types of instruments used;<br>ix) the equipment, nuclear and non-nuclear materials, and structures remaining at the end of decommissioning; and<br>x) land remediation undertaken, results of verification analyses as compared to criteria used or derived for soil and water quality, and the disposition of affected media; | 2.11 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
|---|---|---|
| | g) reports, other documents, and photographs describing findings from inspections, modifications, and repairs to SSCs;<br>h) reports and other documents that describe unplanned or unusual occurrences;<br>i) results and interpretations of environmental monitoring programs;<br>j) occupational dose records;<br>k) deviations from plans and procedures;<br>l) quality assurance records;<br>m) storage-with-surveillance plans;<br>n) facility inspection, maintenance, and equipment records;<br>o) the final radiological and hazardous materials surveys; and<br>p) interim and final end-state reports. | |
| 5.4.2 | The facility shall be characterized. See Annex G for guidance. | 2.5.1 |
| 5.4.3 | All radioactive waste generated shall be characterized as per the CSA N292 series of Standards. | N/A |
| 5.5.1 | A strategy shall be developed for the management of all radioactive, hazardous, and conventional waste that will be generated throughout the course of the decommissioning.<br>The strategy should be based on good management practices including the waste hierarchy. | 2.6.1, 2.7 |
| 5.6 | A hazard assessment commensurate with the tasks to be performed shall be completed prior to decommissioning. | 2.6 |
| 5.8.1 | A quality assurance program shall be implemented. | 1.2 |
| 6.1.1 | A decommissioning strategy should be developed early in the life cycle of a facility (normally during the siting phase) and should be reviewed and updated as new information is obtained. The strategy should contain a high-level approach and rationale for decommissioning the facility, which will be further developed in decommissioning plans.<br>The owner shall demonstrate that, under the strategy selected, the facility will be maintained in a safe configuration at all times. | 1.3, 2.4, 2.9 |
| 6.1.2.2 | In such cases where the end-state for in-situ decommissioning results in a waste disposal site, an applicant shall satisfy all regulatory requirements for a radioactive waste disposal facility and demonstrate safety via a safety case and post-closure safety assessment of a disposal facility.<br>In-situ decommissioning is an acceptable practice for uranium mines and mills. Additionally, in-situ decommissioning may be considered a viable solution under exceptional circumstances | N/A |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| | (e.g., following a severe accident) or for legacy sites for which decommissioning was not planned as part of the design, and which will remain under institutional control for the foreseeable future. In order to align with international best practice, in-situ decommissioning should not be considered a reasonable decommissioning option for situations where removal is possible and practicable.<br>Note: Legacy sites (in the Canadian context) specifically refer to research and demonstration facilities dating back to the birth of nuclear technologies in Canada for which decommissioning was not planned as part of the design. | |
| 6.2.1 | For sites with more than one facility, a site decommissioning plan shall be developed to ensure that interdependencies are taken into account. | 2.9 |
| 6.2.3 | Cost estimates shall include all decommissioning activities from operations, during shutdown to the final release from regulatory control.<br>The cost estimate for decommissioning shall address the cost of the following principal activities, if applicable:<br>a) preparation for final shutdown;<br>b) site characterization, site surveys;<br>c) facility shutdown activities;<br>d) additional activities for safe enclosure;<br>e) decontamination and dismantling activities;<br>f) processing, storage and disposal of all waste including used fuel;<br>g) project management, engineering, and site support;<br>h) site clean-up, landscaping, and restoration;<br>i) long-term management of radioactive waste and used fuel;<br>j) long-term monitoring and maintenance of the site and institutional control;<br>k) licensing costs; and<br>l) miscellaneous expenditures. | 2.14 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| 7.1.1 | Preparation for decommissioning shall include<br>a) an assessment of the records from the previous life cycle stages and the state of the facility (e.g., baseline configuration) at the time of shutdown;<br>b) an impact assessment or environmental review in accordance with applicable legislation, if required;<br>c) a safety assessment for decommissioning;<br>d) ensuring that there is a sufficient number of qualified staff to ensure safe operation during the approach to shutdown;<br>e) further development of the PDP into the DDP;<br>f) placing a facility in a permanent shutdown state; and<br>g) any additional requirements specified by the AHJ. | a) 2.3, 2.5.1, 2.11<br>b) 2.5.1<br>c) 2.8<br>d) N/A<br>e) 2.8<br>f) N/A<br>g) 2.5.1 |
| 7.1.2 | The owner shall ensure that processes, systems, and personnel are in place to maintain the facility in a safe state during the transition to decommissioning. | 2.5 |
| 7.4.1.1 | To ensure a smooth transition from operation to decommissioning, the facility shall be prepared to complete stabilization activities as soon as practical after the permanent shutdown date. | N/A |
| 7.4.3 | During the transition period between shutdown and decommissioning, surveillance and maintenance shall be conducted to ensure the health and safety of persons and the protection of the environment. | N/A |
| 7.5.1 | An assessment of the state of the facility shall be performed to provide baseline information for evaluating the hazards to be controlled during decommissioning.<br>A thorough field survey shall be performed and supplemented by a review of existing records, as required. | 2.3, 2.6<br>2.5, 2.11 |
| 7.5.2.1 | The following hazards shall be investigated and assessed:<br>(a) radiological hazards;<br>(b) biologically, chemically, and physically hazardous materials;<br>(c) hazards from concealed or hidden services; and<br>(d) structural hazards. | 2.6 |
| 7.5.2.2 | Historical information shall be preserved that is relevant to the eventual decommissioning of the facility. | 2.11 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| 7.6.1 | A DDP shall be developed for nuclear facilities, in accordance with Annex C and regulatory requirements, and submitted to the AHJ for acceptance. | These requirements pertain to the preparation for the Dismantling & Demolition phase. Relevant for the DDP not the PDP 2.8 |
| 7.6.2.1 | The DDP shall meet the content provisions of Annex C. | These requirements pertain to the preparation for the Dismantling & Demolition phase. Relevant for the DDP not the PDP 2.8 |
| 7.6.3 | If deferred decommissioning is the preferred decommissioning strategy, in addition to a DDP, a SWS plan shall be developed.<br>If a SWS plan is standalone, it shall be submitted to the AHJ. | N/A |
| 7.6.4 | A safety assessment shall be performed to identify potential hazards to workers, the public, and the environment, from both routine decommissioning activities and credible accidents during decommissioning.<br>The assessment shall describe the relative importance of the potential hazards and identify the methods for mitigating the risks associated with such hazards.<br>If fissile material is involved, a criticality safety assessment and the planned actions involving fissile material shall be included.<br>The assessment shall also address the residual risks to the public, if any, after decommissioning is completed.<br>In-situ decommissioning may result in a waste disposal site. In such a case, an applicant shall satisfy all regulatory requirements for a radioactive waste disposal facility and demonstrate safety via a safety case and post-closure safety assessment of a disposal facility. | 2.8<br>2.5.1, Table 2.6-1<br>N/A<br>2.6<br>N/A |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| 7.6.5.1 | The strategy for managing all wastes from decommissioning shall include a management plan covering both the short term and, where possible, the long term. | These requirements pertain to the preparation for the Dismantling & Demolition phase.<br><br>Relevant for the DDP, not the PDP<br>2.7 |
| 7.6.5.2 | The waste management program shall cover the following processes, as applicable:<br>a) characterization;<br>b) classification;<br>c) minimization;<br>d) segregation;<br>e) clearance;<br>f) handling;<br>g) volume reduction;<br>h) treatment;<br>i) packaging;<br>j) storage;<br>k) transportation; and<br>l) final disposition.<br>Transportation requirements and the waste receiver's acceptance criteria shall be reviewed to ensure that the waste is appropriate for shipment and acceptable to the waste receiver. | These requirements pertain to the preparation for the Dismantling & Demolition phase.<br><br>Relevant for the DDP, not the PDP<br>2.7 |
| 8.1.2 | The work to be performed during the decommissioning shall be described in a DDP. | 2.8 |
| 8.1.3 | The physical work to be carried out shall be defined in terms of work packages and work procedures to the level of detail required for safe, effective, and efficient decommissioning. | These requirements pertain to the execution phase and are, as such, not applicable for this PDP.<br>2.5 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| 8.1.7.1 | Where decontamination is being used as part of decommissioning, the following shall be identified:<br>(a) the areas, locations, and equipment to be decontaminated;<br>(b) the objectives of the decontamination (e.g., decontamination of equipment for salvage and reuse, decontamination of metals for recycling, decontamination of building foundations that are to remain in place, decontamination for clearance of materials to be disposed of as non-radioactive);<br>(c) the decontamination methods to be employed; and<br>(d) the residual level of radioactivity that is to be achieved. | No radioactive contamination is expected at the site as it will have never been operated. It is unlikely the facility would have hazardous material contamination prior to operation, however section 2.6 does contain a hazard assessment which includes decontamination (if required). |
| 8.1.8.1 | A demolition plan shall be prepared.<br>The equipment and structures to be dismantled or demolished shall be identified.<br>The equipment and structures that are to remain at the completion of decommissioning shall also be identified.<br>Procedures for dismantling and demolition shall take into account the associated hazards. | 2.5, 2.6.2 |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
|---|---|---|
| 8.1.8.2 | The following factors shall be considered when selecting dismantling/demolition methods:<br>a) availability of professional competence associated with the operations of the chosen equipment;<br>b) the equipment should be simple to operate, decontaminate, and maintain;<br>c) remaining structural elements shall be kept in a physically stable state;<br>d) measures to prevent unintentional releases to the environment;<br>e) planned discharges to the environment shall be controlled as per licence conditions and previous commitments;<br>f) when underwater dismantling and cutting is used, provisions shall be made to process the water to promote and assist in effluent treatment;<br>g) the effect of dismantling tasks on adjacent systems and structures and on other work in progress shall be evaluated;<br>h) waste containers, handling systems, and routes shall be defined before the start of dismantling work; and<br>i) federal, provincial/territorial and/or municipal requirements. | These requirements are relevant for detailed decommissioning planning and execution, as such, not applicable for this PDP.<br>2.5, 2.6.2 |
| 8.1.9.1 | Surveys during decommissioning shall be performed to comply with<br>(a) worker occupational safety and radiation protection programs;<br>(b) environmental monitoring criteria; and<br>(c) processes to release materials and equipment from the site. | 2.5, 2.6, 2.7 |
| 8.1.9.2 | At the completion of a decontamination or dismantling work package, a survey shall be performed, if required, to demonstrate that the planned end-state has been achieved. The results of the survey shall be documented in a report that includes<br>a) the criteria used to define the end-state;<br>b) the methods and procedures used to ensure that the criteria were met; and<br>c) the measurement data, including appropriate statistical analysis and systematic approaches. | 2.5, 2.10, 2.11 |
| 8.2 | Where decommissioning of the facility is to take place in discrete stages, an interim end-state report shall be prepared when each planned interim end state is achieved. | N/A |

| Section in CSA N294:19 | Requirement in CSA N294:19 | Section in this PDP |
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| 8.3 | A plan for surveillance, monitoring, physical protection, and maintenance of the facility during such periods shall be developed and implemented to<br>(a) maintain the facility in a safe state;<br>(b) control the release of materials to the environment; and<br>(c) prevent access by unauthorized persons; and<br>(d) mitigate infestations of vermin and other organisms. | N/A |
| 8.4 | Lands associated with a facility or a standalone site that might have been impacted by previous nuclear activities shall be remediated to the degree required to meet the end-state criteria. | N/A |
| 8.5 | At the completion of this phase, final surveys of residual radioactive and hazardous materials shall be performed and documented to demonstrate that the final end-state for remaining equipment, structures, and the site has been achieved in accordance with the criteria specified in the DDP. The results of the final survey shall be documented in a report that includes<br>a) the criteria used to define the end-state;<br>b) the methods and procedures used to ensure that the criteria were met; and<br>c) the measurement data, including appropriate statistical analysis and systematic approaches. | 2.10 |
| 9.1 | Following the completion of decommissioning, a final end-state report shall be prepared and retained.<br>Where a decommissioning program involves completing a number of separately approved decommissioning projects, interim end-state reports shall be submitted for each project. | 2.5, 2.10, 2.11 |

| Section in CSA N294:19 Annex A | Requirement in CSA N294:19 | Section in this PDP |
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| A.2 (a) | A PDP may include the following:<br>a description of the location of the facility, including<br>(i) a map of the facility and its specifications;<br>(ii) geographic information;<br>(iii) details regarding the surrounding environment;<br>(iv) land uses; and<br>(v) illustrations and maps of the facility in relation to the municipality; | 2.1 |
| A.2 (b) | Purpose and description of the facility, including<br>(i) primary components and systems;<br>(ii) building type and construction, including location of any hazardous building materials (e.g., asbestos, PCBs);<br>(iii) building services (e.g., power, heating, ventilation, sewer, water, fire protection);<br>(iv) laboratories and other hazardous handling areas;<br>(v) type, quantity, and form of radioactive and hazardous materials stored, produced, or used during operation; and<br>(vi) design features used to reduce the spread of contamination and facilitate decontamination and dismantling; | 2.2 |
| A.2 (c) | Post-operational conditions, including<br>(i) a summary of the shutdown process, including planned removal of stored inventories of hazardous materials or radioactive materials;<br>(ii) the predicted nature and extent of contamination remaining in the primary systems and components (in list or table format with reference to applicable illustrations);<br>(iii) the predicted nature and extent of contamination on floors, walls, work surfaces, ventilation systems, etc.; and<br>(iv) the identification of any separate planning envelopes; and<br>(v) an overview of the principal hazardous conditions anticipated to exist | Items i), ii), iii) and iv) N/A<br><br>(v) 2.6 |
| A.2 (d) | The decommissioning strategy, including<br>(i) the final end-state objective;<br>(ii) rationale for<br>(1) the decommissioning strategy selected;<br>(2) interim end states;<br>(3) periods of storage with surveillance; and<br>(4) in-situ decommissioning concepts;<br>(iii) the requirements for long-term institutional controls; and | 2.4, 2.10 |

| Section in CSA N294:19 Annex A | Requirement in CSA N294:19 | Section in this PDP |
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| | (iv) the assessment of alternative strategies (or a rationale for why alternatives do not exist or do not warrant consideration); | |
| A.2 (e) | A plan of the decommissioning work, including<br>i) a work breakdown structure;<br>ii) a summary of the main steps for decontamination/disassembly/removal of each of the systems (preferably grouped into work packages);<br>iii) for each work package, identification of those types of activities that could pose a significant hazard to workers, the public, or the environment;<br>iv) the role of existing operational standard procedures for radiation protection, hazardous materials handling, industrial safety, and environmental protection in managing hazards;<br>v) specific activities for which additional protection/mitigation procedures will be required at the detailed planning stage;<br>vi) a summary of the final dismantlement of the structures; and<br>v) a conceptual schedule showing the approximate year of facility shutdown and the approximate sequencing and duration of the decommissioning work packages and, where relevant, storage periods; | 2.5<br>2.5.2<br>2.6<br>2.7, 2.6.2<br>2.5.1, 2.6<br>2.10<br>Figure 2.5-1 |
| A.2 (f) | Radiological monitoring and survey commitments, including<br>(i) a program for conducting periodic contamination surveys and the recording of contamination events during facility operation;<br>(ii) a commitment to conduct detailed post-operation surveys in support of DDP development;<br>(iii) a commitment to develop plans and protocols acceptable to the AHJ at the detailed planning stage for monitoring<br>(1) work hazards during decommissioning;<br>(2) personnel dosimetry;<br>(3) environmental emissions and effluents; and<br>(4) materials, sites, and structures to be cleared from regulatory control; | 2.5.1, 2.6 |

| Section in CSA N294:19 Annex A | Requirement in CSA N294:19 | Section in this PDP |
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| A.2 (g) | A waste management strategy specifying<br>(i) the approximate quantities and characteristics of radioactive and chemically hazardous wastes expected to arise from the decommissioning (tied to specific work packages, if possible);<br>(ii) the anticipated final disposition of radioactive and chemically hazardous materials; and<br>(iii) a commitment to segregate as much material as possible for reuse and recycling; | 2.7 |
| A.2 (h) | A commitment to prepare a DDP for regulatory approval prior to dismantling and demolition; | 2.8 |
| A.2 (i) | a commitment to periodically review and update the PDP until a DDP is prepared, in accordance with Clause 6.2.2; | 2.9 |
| A.2 (j) | The physical state of the facility at<br>(i) the end of operations; and<br>(ii) the start of decommissioning; | 2.3, 2.5 |
| A.2 (k) | The records required for decommissioning, including a description of the facility operational records that will be maintained to periodically update the PDP and prepare the DDP(s); and | 2.11 |
| A.2 (l) | A public consultation plan, including a public information program and avenues for public participation. | 2.12 |
| A.2 (m) | An Indigenous engagement plan as per the requirements and guidance of CNSC REGDOC-3.2.2; and | 2.13 |
| A.2 (n) | The cost and a financial guarantee, specifying<br>i) an estimate of the total present-value cost of the decommissioning;<br>ii) a reasonable basis for how cost estimates were derived; and a description of how the required funds will be provided; | 2.14 |

| Section in CSA N294:19 Annex I | Requirement in CSA N294:19 | Section in this PDP |
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| I.2.2 | When the decision is made to permanently shut down and physically decommission the reactor, a planned process shall be followed to render the reactor to a predetermined final end state condition, release the reactor from licence control, and implement any required institutional controls. | 2.10 |
| I.3.2 | The management accountable for each life-cycle phase shall<br>(a) consider the impact of their activities on the eventual decommissioning;<br>(b) ensure that the reactor conforms to the design basis; and<br>(c) preserve documents and records relevant to decommissioning. | 2.3, 2.4, 2.5, 2.11 |
| I.4.3.1 | The level of planning detail builds up through the life cycle. During operation a stand-alone plan is required. Management shall perform the necessary planning, based on the results from assessments, the design and the safety analysis, to establish the objectives, the strategies and the cost estimates for the decommissioning of the reactor. | 2.9 |
| I.4.3.2 | In addition to Clause 6.2.1, the plan shall include<br>a) a description of the site, including all of the facilities on the site and adjacent to the site;<br>b) a description of the reactor and its auxiliary facilities;<br>c) a description of the common and interdependent SSCs and work;<br>d) identification of:<br>i) the planning assumptions;<br>ii) proposed end-state criteria;<br>iii) uncertainty and degree of conservatism; and<br>iv) the planned decommissioning strategy;<br>e) an outline of the proposed scope of work and schedule to complete the decommissioning. This includes a description of the proposed start date, end date, and milestones.<br>f) identification of the expected inventory of waste and surplus items that will result from decommissioning and their final disposition. | 2.1.1, 2.1.3<br>2.2<br>2.2.6<br>1.3<br>2.10<br>2.15<br>2.4<br>2.5<br>2.7 |
| I.5.1.1.1 | The reactor shall be safely shut down and its SSCs shall be placed in a safe state in preparation for decommissioning. | N/A |

| Section in CSA N294:19 Annex I | Requirement in CSA N294:19 | Section in this PDP |
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| I.5.1.1.2 | During final shutdown, the following actions shall be performed:<br>(a) Implementing the defueling, dewatering and waste management plan;<br>(b) Establishing operating controls for the SSCs that will remain in operation during the remaining stages of decommissioning (e.g., the used fuel system);<br>(c) Placing each SSC in a pre-defined interim end-state. | N/A as reactor will never been operated.<br>2.5, 2.7 |
| I.5.1.1.4 | Additionally, programs in place during operations shall be reviewed, revised, and/or eliminated to ensure that requirements for the remaining stages of decommissioning are covered. Such examples include, but are not limited to, environmental monitoring, emergency response, and fire protection. | 2.5.1 |
| I.5.1.2.1 | SWS (sometimes referred to as “storage with surveillance”) shall include the period when the reactor is under surveillance while the radioactivity decays and/or until the prerequisites for dismantling and demolition are achieved. | N/A |
| I.5.1.2.2 | During this stage, the following actions shall be performed:<br>(a) Conducting planned surveys;<br>(b) Removing the nuclear fuel from the spent fuel bay to dry storage;<br>(c) Placing the spent fuel bay and auxiliaries in a pre-defined end state for future decommissioning; and<br>(d) Ongoing removal of radioactive waste. | N/A |
| I.5.2 | During this stage, the reactor shall be subjected to the planned decontamination, dismantling and demolition, and any resulting materials will either be<br>a) decontaminated to meet release criteria; or<br>b) disposed of into a waste facility. | 2.5, 2.6, 2.7 |
| I.5.3 | Site restoration shall include<br>a) disposing of hazardous substances;<br>b) restoring the topography (for example, by restoring the landscape);<br>c) restoring vegetation;<br>d) removing the licence and making the site available for other use; and<br>e) preparing the final end-state report in accordance with Clause 9.1 and Annex E. | 2.5, 2.7, 2.10 |