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Title:

PNGS-A Storage with Surveillance Plan

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PNGS-A Storage with Surveillance Plan**NA44-PLAN-00960-00001-00**

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Revision Summary

Revision Number	Date	Comments
R000	2024-12-02	Initial issue.

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1.0 INTRODUCTION

The Ontario Power Generation (OPG) Pickering Nuclear Generating Station (PNGS) consists of PNGS-A, U1 - U4 and PNGS-B, U5 - U8. Within PNGS-A:

- U2 and U3 have been in Storage with Surveillance (SWS), part of the Execution of Decommissioning Stage, since 2010 [R-38], and
- In 2024, U1 was shut down and U4 is planned to be shut down and undergo transition activities from operations to Storage with Surveillance (SWS), currently planned from 2024 to 2028.

The SWS Plan is a subset of the Detailed Decommissioning Plan (DDP) for PNGS-A facilities [R-5]. The SWS Plan describes the requirements for care and maintenance of the facility equipment and substances until decontamination and dismantling actions are performed. Along with the DDP, within five years of submission, the SWS Plan will be reviewed and updated as required, per REGDOC-2.11.2 [R-3]. The current SWS Plan details systems that are expected to remain active or partially active post Stabilization, and are necessary for the SWS period, planned continued operation of PNGS-B, or anticipated to be required for decontamination and dismantling activities at PNGS.

Figure 1 details the stages for the entire lifecycle of a nuclear facility including the SWS, Dismantlement and Site Restoration phases as outlined in Canadian Nuclear Safety Commission (CNSC) REGDOC-3.5.1 [R-2].

This plan was prepared to meet the requirements of REGDOC-2.11.2 [R-3] and Canadian Standards Association (CSA) N294:19 [R-4] and is based on the safety assessment that was completed for activities occurring during the SWS period [R-28]. A regulatory compliance matrix is included in Appendix B.

1.1 Stabilization

Prior to reaching SWS, PNGS-A will go through a Stabilization period as detailed in Figure 1: Deferred Decommissioning Phases which is an excerpt from REGDOC-3.5.1 [R-2].

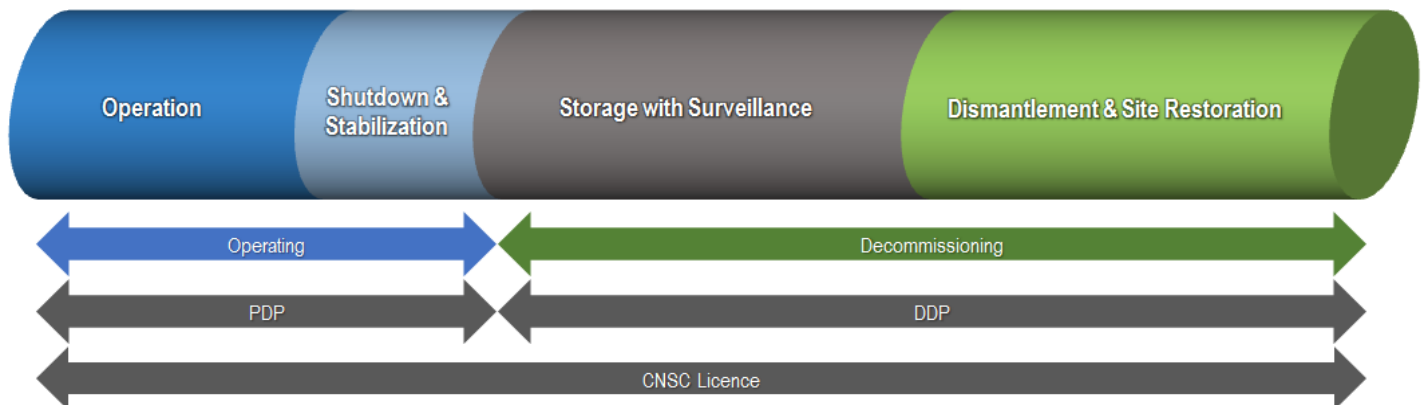


Figure 1: Deferred Decommissioning Phases

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This period of Stabilization is governed by the Stabilization Activity Plan (SAP) [R-1].

1.1.1 Stabilization Activity Plan

The purpose of the SAP [R-1] is to describe the arrangements and activities that ensure a safe and efficient transition (Stabilization) from the end of commercial operation of PNGS-A to the SWS state. The SAP addresses the following activities:

- (a) Assessing systems, structures or components (SSCs) to determine the following:
- SSCs that are necessary to continue operating during the SWS period to protect the environment, workers and the public,
 - SSCs anticipated for future use in Decommissioning activities,
 - SSCs that will be required to support planned continued operation of PNGS-B, U5 - U8 facilities, and
 - SSCs that can be abandoned post Unit 1 and 4 shutdown.
- (b) Producing System End State Declarations for each SSC associated with U1 and U4.
- (c) Updating operational and maintenance procedures, including the Master Equipment List and Asset Suite 9, to reflect ongoing maintenance and monitoring requirements post Stabilization leading into SWS.

NOTE

U2 and U3 have already undergone the Stabilization process and have been in SWS since 2010.

1.1.2 End State Declarations

System End State Declarations (SESDs) document the as-left configuration of the system to ensure that the end state as defined in the End State Determination Report (ESDR) [R-6] has been accurately achieved. SESDs, once completed, will be submitted to the CNSC as the work progresses. SESDs document the final configuration of the SSC at the end of Stabilization and the beginning of SWS. See Appendix A for a list of SSCs that will remain active or partially active at the beginning of the SWS period.

1.2 Risk Reduction Activities During SWS

Consistent with REGDOC 2.11.2 [R-3], OPG may execute risk reduction activities during the SWS phase. Anticipated risk reduction activities are discussed in the Program Overview DDP Volume 0 [R-5]. Other risk reduction activities may be identified as the work progresses. Any

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emergent risk reduction activities will be planned and executed in accordance with the Pickering licence.

1.3 Irradiated Fuel Bays

The Irradiated Fuel Bay 'A' (IFB-A) and Auxiliary Irradiated Fuel Bay (AIFB) will remain in operation for portions of the SWS phase. Details of the ongoing activities to empty the Irradiated Fuel Bays (IFBs) are included in the Program Overview DDP Volume 0 [R-5]. The systems required to support the IFBs are discussed in Section 4.2 of this SWS Plan. Once the IFBs are emptied, drained and dried, some of the systems being maintained under this SWS plan can be end stated and made available for decommissioning. These details will be covered in future submissions of the DDP and SWS Plan.

The state of the irradiated fuel bays at the beginning of SWS is described in their respective ESDRs:

- Pickering A – Auxiliary Irradiated Fuel Bay Facility (P-ESR-29500-00001)
- Irradiated Fuel Storage Bay 'A' (P-ESR-34400-00001)
- Irradiated Fuel Bay Shipping Facility (P-ESR-35600-00001)
- Irradiated Fuel Bay Inspection and Storage (P-ESR-35500-00001)

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2.0 RESPONSIBILITIES

OPG's nuclear organizational structure have been described in the Program Overview DDP Volume 0 [R-5].

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3.0 FACILITY CHANGE OR MODIFICATION PROCESS

All facility modifications will follow OPG's existing Nuclear Management System (NMS) as outlined in Program Overview DDP Volume 0 [R-5]. This includes the process to place SSC into inactive/abandoned status as well as managing active SSCs during SWS.

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4.0 FUNCTIONAL SYSTEMS

4.1 General

This section describes the functional systems at PNGS-A that will remain operational at the end of Stabilization and to support activities during the SWS phase.

In addition to ongoing maintenance and monitoring of operational SSCs within the station, the activities that are planned to continue during SWS are as follows:

- Ongoing fuel transfers from IFBs to dry storage as outlined in the Program Overview DDP Volume 0 [R-5],
- Stored resin removal (Section 4.2.24),
- Storage of heavy water during the planned refurbishment of PNGS-B (Section 0), and
- Risk reduction activities in accordance with section 8.1 of REGDOC 2.11.2 [R-3].

SSCs within PNGS-A will be subject to ongoing monitoring to ensure the safety of workers, the public and the environment. See Section 5.0 for more information about maintenance, inspection, and surveillance during SWS.

See Appendix A: ESDRs for Active Systems Supporting SWS.

4.1.1 Systems Required to Remain Functional During SWS Phase

The following systems will need to be maintained during the SWS phase:

- Fire Protection, Section 4.2.1,
- Common Water Systems, Section 4.2.2,
- Service Water Systems, Section 4.2.3,
- Demineralized Water, Section 4.2.4,
- Domestic Water and Sewer, Section 4.2.5,
- Heating and Ventilation, Section 4.2.6,
- Instrument Air, Section 4.2.7,
- Service Air, Section 4.2.8,
- Breathing Air, Section 4.2.9,
- Drainage, Section 4.2.10,

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- Liquid Effluent Monitoring and Sampling System, Section 4.2.11,
- Electrical Power Distribution System, Section 4.2.12,
- Monitoring and Control, Section 4.2.13,
- Site Instrumentation Systems, Section 4.2.14,
- Stack Monitoring, Section 4.2.15,
- Communication Systems, Section 4.2.16,
- IAEA Safeguards Equipment, Section 4.2.17,
- Control Centre Equipment (MCR & CER), Section 4.2.18,
- Cranes, Hoists and Associated Equipment, Section 4.2.19,
- Emergency Mitigating Equipment, Section 4.2.20,
- Radioactive Liquid Waste Management System, Section 4.2.21,
- Heavy Water Storage, Section 4.2.23, and
- Resin Handling System and Radioactive Waste Management, Section 4.2.24.

4.1.2 Planned PNGS-B Refurbishment

There are several common systems that are interconnected between PNGS-A and PNGS-B which will retain some interconnection during SWS. See section 4.2 for more details:

- Electrical / Standby Power / Site Electrical System (SES), including Class IV power,
- Breathing Air,
- Service Water,
- Domestic Water,
- Demineralized Water,
- Fire Protection,
- Instrument Air,
- Heating System,
- Radioactive Liquid Waste Management System, and

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- Liquid Effluent Monitoring and Sampling System.

There are several common systems that will be separated and limited to PNGS-B to allow independent decommissioning activities to continue at PNGS-A following the planned refurbishment of PNGS-B. Plant modifications associated with the separation activities are currently being assessed during stabilization [R-1], and are not part of DDP/SWS scope. The state of the systems at the beginning of SWS are described in their respective ESDRs:

- Reactor Building Containment (P-ESR-21100-00001)
- Emergency Coolant Injection System (P-ESR-33350-00001)
- Vacuum Building and Ducts (P-ESR-25000-00001)

Several common systems located within the PNGS-A powerhouse will be transferred fully to Common Services operations following the planned refurbishment of PNGS-B. The state of the systems at the beginning of SWS are described in their respective ESDRs:

- Heavy water (D₂O) Ion Exchange Cleanup System(P-ESR-34970-00001)
- Nitrogen System (P-ESR-75700-00001)

The boundary between PNGS-A for SWS and PNGS-B for operations will be defined by the AB Gate (see Section 4.1.3).

4.1.3 AB Gate: Defining Usage Boundaries during Storage with Surveillance

Should there be a decision to refurbish PNGS-B, there is a need to define the boundary between PNGS-A (U1 to U4) and PNGS-B (U5 to U8). It is expected that there will be different lifecycle phases occurring at PNGS:

- PNGS-A will enter the decommissioning phase of the lifecycle after Stabilization, and will initially be put into a period of SWS prior to demolition; and
- PNGS-B is planned for refurbished (pending regulatory approval) and continue to be in the operational phase of the lifecycle.

The separation of PNGS-A and PNGS-B is denoted by the concept of an AB Gate, which is illustrated in Figure 2 and has been defined for planning purposes, denoting the separation between the operational side and the decommissioning side. See the Program Overview DDP Volume 0 [R-5] for additional details on the criteria that is being used to guide the location of the gate and the extent of physical modifications required. The planned engineering and physical modifications are addressed in the SAP and are excluded from the scope of this DDP/SWS Plan.

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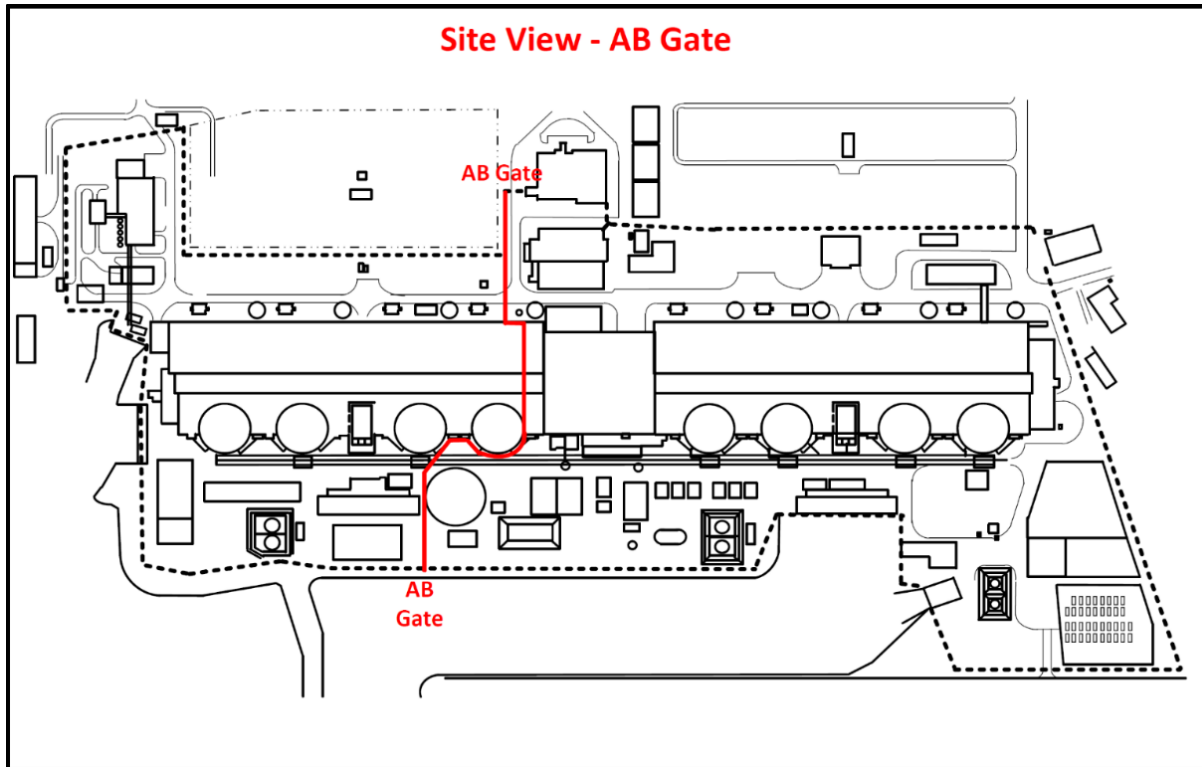


Figure 2: AB Gate to Differentiate between PNGS-A and PNGS-B

4.2 Detailed Description of SSCs Remaining Functional to Support SWS

The following sections provide a brief description of SSCs necessary for the SWS period and anticipated for decontamination and dismantling activities. These systems will remain active or partially active during SWS phase. The end state of an SSC is outlined in its most current ESDR and reflected here. Any required system modifications during the SWS period will be executed in accordance with approved OPG Nuclear Management System (NMS) procedures as outlined in the Program Overview DDP Volume 0 [R-5].

4.2.1 Fire Protection Systems

The PNGS-A fire protection system, consisting of the Fire Detection and Alarm, and Fire Suppression systems, provides equipment for detection and suppression of fires to comply with the requirements of the National Fire Code (NFC) [R-7], the National Building Code of Canada (NBCC) [R-8], and CSA N293 [R-9].

During SWS, design modifications will be completed for new fire detection and alarm equipment where new detection is required based on the results of the SWS Fire Hazard Assessment and Code Compliance Review. Similarly, existing equipment will be removed from service if it is no longer required based on the results of the SWS Fire Hazard Assessment and Code Compliance Review.

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The Fire Protection Assessment documents are made up of Code Compliance Review (CCR) [R-11] and Fire Hazard Assessment (FHA) [R-10] and will be maintained during SWS. These documents are required to confirm the fire protection requirements based on facility end-state configuration, including hazard levels, staffing, and fire response strategies. During SWS, these documents will be reviewed and revised as required by CSA N293 [R-9].

4.2.1.1 Fire Detection and Alarm Systems (67140)

The state of the Fire Detection and Alarm systems at the beginning of SWS is described in P-ESR-67140-00001 [Appendix A].

The PNGS-A Fire Detection and Alarm Systems provide central and local fire alarms, including control room annunciation, for personnel and equipment protection throughout the station. The system will remain active during the SWS phase.

As a result of activities during SWS, the fire load will be reduced within the station, and consideration can be given to isolating portions of the systems that are no longer required to support the FHA [R-10]. A future end-state could occur when the PNGS-A system can be disconnected from the PNGS fire system and removed from service. Any end-stating of fire detection within PNGS-A will be determined and validated by the FHA and CCR per CSA N293 requirements.

The PNGS-A Fire Detection and Alarm System annunciations that are currently routed to the control rooms will be routed to the centralized Pickering A Monitoring Centre once it is in service, see section 4.2.13.

Existing monitoring, inspection, and maintenance activities will continue during the SWS period. A system or portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.1.2 Fire Water Supply (71410)

The state of the Fire Water Supply system at the beginning of SWS is described in P-ESR-71400-00001 [Appendix A].

The Fire Protection Water supply circuit distributes water throughout the station. The system will remain active during SWS to provide fire protection in areas of the station that may be occupied or contain combustible materials.

As a result of activities during SWS, the fire load will be reduced within the station, and consideration can be given to isolating portions of the systems that are no longer required to support the FHA [R-10]. A potential future modification may involve using PNGS-B to supply fire water to PNGS-A, at which point the diesel fire water pumps in the PNGS-A greenhouse can be removed from service. Any proposed end-stating for specific areas of the station will be determined and validated by the FHA and CCR per CSA N293 requirements.

Existing monitoring, inspection, and maintenance activities will continue during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

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4.2.2 Common Water System (71100)

The state of the Common Water System at the beginning of SWS is described in P-ESR-71100-00001 [Appendix A].

The Common Water System (CWS) supplies screened lake water to PNGS-A. This water is used to supply the Condenser Cooling Water System (CCW) and the Service Water Systems. Through the common water system, the Screenhouse also supplies the Fire Water System (71410) to PNGS-A and PNGS-B and the PNGS-A Fire Protection System (71400).

The CWS screenhouse will remain partially in service to support the delivery of lake water to required loads during SWS, including:

- PNGS-A Service Water, including supply to IFB-A and AIFB,
- Unit 1 CCW pump operation (see 4.2.21), and
- Firewater diesel backup water supply for PNGS-A and PNGS-B.

Portions of the CWS can be end-stated once the systems they supply are removed from service and the entire system can be end-stated and abandoned once no systems requiring water from the CWS remain in service.

Monitoring, inspection, and maintenance will be required of the Screenhouse, service loads, and pump operations during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.3 Service Water System (71300)

The state of the Service Water System at the beginning of SWS is described in P-ESR-71300-00001 [Appendix A].

The Service Water system supplies cooling water and other service loads to PNGS-A. The system is made up of Low-Pressure service water (71310), High Pressure service water (71340), Lawn Water (71350), Emergency Water (71380), Emergency storage (71330), and Chlorination (71650).

Service Water will need to remain partially active to provide cooling water to required PNGS-A loads during SWS:

- IFB-A and AIFB operation,
- Heating, Ventilation, and Cooling (HVAC) system cooling,
- Unit 1 CCW pump cooling,
- Air systems compressor cooling, and

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- Station System Transformers (SSTs) oil cooling.

Service water will be provided to support the following functions that are shared with PNGS-B, until such time that the system is no longer required, or a separation modification is implemented to provide a supply from PNGS-B:

- Vacuum Building (VB) and associated systems,
- D₂O Upgrading Processing Plant (UPP) B and Sulzer B,
- Dilution of Liquid Active Waste Management System effluents,
- Service Wing HVAC, and
- Steam Supply System for Building Heating (electrode boiler) during planned PNGS-B refurbishment.

As modifications are implemented to supply PNGS-B systems, the associated service water loads on PNGS-A can be isolated from and removed from service. This is anticipated to occur early in the SWS phase.

Portions of the service water system can be end-stated once the systems they supply are removed from service, and the system can be end-stated and abandoned once no systems requiring service water remain in service.

Monitoring, inspection, and maintenance will be required of the chlorination system, service loads, and pump operations during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.4 Demineralized Water System (71620)

The state of the Demineralized Water System at the beginning of SWS is described in P-ESR-71620-00001 [Appendix A].

Demineralized water system supplies systems where the normally strained service water is not suitable. The system includes a high-pressure (HP) demineralized water system to supply systems where the pressure available from the low-pressure demineralized water system is limited.

The demineralized water system will remain active for the following systems during the SWS phase, and will only be a small fraction of the nominal station operating loads:

- AIFB for make-up water and for decontamination system spraying/flushing,
- IFB-A for make-up water to the bay,

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- Heating and Ventilation Systems for building heating through water-based heaters (including electrode boilers for the period of planned PNGS-B refurbishment),
- Resin Handling and Spent Resin Storage systems for spent resin transfer operations,
- Active Drainage System for dilution and flushing,
- Chemical Control Labs for performing lab activities,
- Class I & Class II Batteries for battery top-ups, and
- PNGS-B Demineralized Water supply via inter-station tie valve.

Power to the HP demineralized water pumps is supplied from PNGS-A, and modifications to transfer power supplies from PNGS-A to PNGS-B are part of the separation package to be implemented during the planned PNGS-B refurbishment.

Active portions of the demineralized water system can be end-stated once the systems they supply are removed from service, and the system can be end-stated and abandoned once no systems requiring demineralized water remain in service.

Monitoring, inspection, and maintenance will be required for the portions of the system that will remain in service during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.5 Domestic Water and Sewer System (71500/71730)

The state of the Domestic Water and Sewer System at the beginning of SWS is described in P-ESR-71500-00001 [Appendix A].

The domestic water system supplies the protected area with potable water from the municipality. The sewage system collects and transports sewage from domestic water sources to the municipal sewer main.

In areas of PNGS-A that will remain heated and inhabited during SWS, the domestic water system will continue to provide potable water to sinks, toilets, urinals, fountains, and emergency eyewash and shower stations, as well as to provide cooling water for equipment that will remain in service in SWS (e.g., breathing air compressors). The domestic sewer system will remain in service in areas of PNGS-A that will remain heated and inhabited during SWS.

The bulk of the domestic water supply system lies on PNGS-B (See Section 4.1.3) and will be operated and maintained by Common Services Operations until a modification is implemented to move these services to a new supply from PNGS-B. For the early stages of the SWS phase, the domestic water system will be a common system connected across the PNGS.

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Throughout SWS and as decommissioning progresses, portions of the distribution system will be end-stated as various outbuildings and plant equipment are removed from service. Once all service water and sewage supplies have been removed from service and end-stated, and a new supply to PNGS-B domestic water has been established, the remainder of the supply system on the PNGS-A can be end-stated and the system abandoned.

Monitoring, inspection, and maintenance will be required for the portions of the system that will remain in service during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.6 Heating and Ventilation (73000)

Steam, electricity, and hot water are used for station heating, and heating of facility outbuildings. These are supplied by separate systems, each with specific requirements during the SWS phase.

4.2.6.1 Powerhouse Steam Distribution and HVAC Systems

The state of the Powerhouse Steam Distribution and HVAC Systems at the beginning of SWS is described in P-ESR-73000-00001 [Appendix A].

The Powerhouse Ventilation and Steam and Condensate Return/Heating Steam systems provide heat and fresh air throughout the Turbine Auxiliary Bay (TAB), Turbine Hall (TH), and Powerhouse basement.

The Powerhouse Ventilation System will remain active and available for use on an as required basis for summer month air circulation and humidity control. The Powerhouse Steam & Condensate Return/Heating Steam systems will remain active to provide building heat throughout SWS. Early in the SWS phase, prior to completion of the planned PNGS-B refurbishment, building heating steam will be provided by electrode boilers installed in Unit 2 for this purpose [R-1]. After planned refurbishment, PNGS-B will provide heating steam and the electrode boilers will be decommissioned.

Existing monitoring, inspection, and maintenance will be maintained for the in-service heating and ventilation equipment during the SWS period. Portions of the system not in operation do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.6.2 RB & RAB Heating and Ventilation

The state of the RB & RAB Heating and Ventilation Systems at the beginning of SWS is described in P-ESR-71620-00002 [Appendix A].

All portions of the Reactor Building (RB) & Reactor Auxiliary Building (RAB) Heating and Ventilation system will remain active throughout SWS:

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- Reactor Vault Atmosphere System (73120) and RB Ventilation System (73130) will be de-powered and isolated, and available to be operated manually under local control prior to an RB entry by applying procedural controls,
- RAB Heating & Cooling (73140) and RAB Ventilation System (73150) will be in service to provide heating within the RAB,
- Spent Fuel Storage Bay Ventilation System (73170) will be in service, and
- RAB Air Conditioning Systems (73190 - F.A.D. Stack Monitoring Building) will be in service for planned PNGS-B extended operation.

Based on SWS needs, other portions of the system may be taken out of operation to reduce system operational loads. However, no part of the system is planned to be retired or abandoned.

Existing monitoring, inspection, and maintenance will be maintained for the in-service heating and ventilation equipment during the SWS period. Portions of the system not in operation do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.6.3 Class I / II Battery and Electrical Enclosure Room HVAC

The state of the Class I / II Battery and Electrical Enclosure Room HVAC Systems at the beginning of SWS is described in P-ESR-73000-00006 [Appendix A].

The Class I/II Battery and Electrical Enclosure Rooms HVAC system provides cooling for batteries and electrical equipment within each enclosure room. Most PNGS-A Class I and Class II batteries, rectifiers, and inverters will remain active during SWS, requiring the associated HVAC systems to remain in service.

Portions of the HVAC system can be end-stated and abandoned once the batteries and equipment in the rooms are removed from service and cooling is no longer required.

Existing monitoring, inspection, and maintenance will be maintained for the in-service HVAC equipment during the SWS period. Performance and status of heating and cooling circuits can be controlled via current monitoring systems (i.e. walkdowns). Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.6.4 Control Rooms and CERs HVAC

The state of the Control Rooms and Control Equipment Rooms (CERs) HVAC Systems at the beginning of SWS is described in P-ESR-73000-00004 [Appendix A].

The Control Room and CERs HVAC system provides ventilation and cooling to the personnel and computer systems within the control rooms. During SWS, several Air-Cooling Units and chiller trains will be left in service to maintain conditions in the Control Room and Control

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Equipment Rooms to allow monitoring of the IFB and AIFB as well as control of some environmental monitoring systems.

Once all system monitoring is end-stated or transferred to a common monitoring center (see Section 4.2.13), the remaining control room and CER HVAC equipment can be end-stated and abandoned.

Monitoring and inspection will be maintained for the portions of the system that remain in service or available for service, with repairs completed as needed for any failed equipment. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.6.5 Service Wing HVAC

The state of the Service Wing HVAC System at the beginning of SWS is described in P-ESR-73000-00005 [Appendix A].

The Service Wing HVAC will be maintained throughout SWS to keep all areas of the Service Wing habitable to support all PNGS activities.

4.2.6.6 Miscellaneous and Outside Buildings HVAC

The state of the Miscellaneous and Outside Buildings HVAC Systems at the beginning of SWS is described in P-ESR-73000-00009 [Appendix A].

HVAC systems are in place to provide climate control and ventilation in facilities and outbuildings outside the PNGS Powerhouse. During SWS, HVAC systems are expected to be maintained to support the PNGS-A Screenhouse, AIFB, Standby Generator Pumphouse, and West Annex for as long as those buildings and facilities are in operation. Areas used for chemical storage, or where risk of radon build-up exists, will require continued ventilation or their ventilation systems will be maintained as available to be reactivated prior to personnel entry until the hazard is no longer present.

HVAC systems in each facility and outbuilding can be end-stated and abandoned once climate control and ventilation are no longer required.

Existing monitoring, inspection, and maintenance will be maintained for the in-service HVAC equipment during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.7 Instrument Air (75100)

The state of the Instrument Air System at the beginning of SWS is described in P-ESR-75120-00001 [Appendix A].

The Instrument Air system supplies both low-pressure and high-pressure instrument air to systems throughout PNGS-A. Initially during SWS, instrument air will remain active to supply loads in the following areas:

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- Pickering A Screenhouse,
- IFB-A,
- AIFB,
- Vacuum Building/Relief Duct,
- Service Wing,
- Sulzer/D₂O Upgrading Plant,
- Ion Exchange Clean-up (IXCU),
- Administration Building,
- West Annex, and
- Helium Tank D₂O inlet valve.

Instrument air supplies for most other areas, including the RB and RAB, will be de-energized, drained, isolated, and abandoned in place prior to SWS. If instrument air is needed in these areas to support decommissioning activities, portable instrument air compressors may be used in place of the abandoned station systems.

Vacuum building instrument air is currently supplied via a tie-in to the PNGS-A system. To ensure PNGS-A separation from the VB prior to return to service of PNGS-B, a new instrument air line will be installed to re-route the VB supply from PNGS-B instrument air system. This will be implemented early in SWS, prior to planned return to service of the VB to support PNGS-B operation.

Reduced demand for air is anticipated with the units in SWS phase, and as load reduces due to systems that are no longer required, modifications may be undertaken to supply local loads with stand alone air supplies that can be routinely recharged as required.

A future end-state could occur when the fuel bays are emptied and end-stated, at which point portions of the delivery system supplying the IFB-A, AIFB, and PNGS-A Screenhouse can be isolated, and end stated.

Monitoring, inspection, and maintenance will be required of the parts of the instrument air system that remain in service during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.8 Service Air (75110)

The state of the Service Air System at the beginning of SWS is described in P-ESR-75110-00001 [Appendix A].

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The service air system is supplied by air-cooled compressors located in the powerhouse. Most service air supplies will remain available for use during all phases of decommissioning including SWS. Important loads continuing to require service air include:

- IFB-A,
- AIFB,
- Screenhouse,
- IXCU,
- Service Wing,
- UPP,
- West Annex,
- PNGS-B Service Air and Common Instrument Air, and
- PNGS-A RB, RAB, TH, and TAB.

Vacuum building service air is currently supplied from the PNGS-A system. To ensure PNGS-A separation from the VB prior to planned return to service of PNGS-B, a new service air line will be installed to transfer the VB supply to PNGS-B service air system. This will be implemented early in SWS, prior to return to service of the VB.

A future end-state could occur when the fuel bays are emptied and end-stated, at which point portions of the delivery system supplying the IFB-A, AIFB, and PNGS-A Screenhouse can be isolated. The service air supply pipework to these locations could remain available to support decommissioning activities if required.

Monitoring, inspection, and maintenance will be required of the parts of the service air system that remain in service during the SWS period, including parts of the system that are isolated and not in use but remain available to be put in service if needed. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.9 Breathing Air (75140)

The state of the Breathing Air System at the beginning of SWS is described in P-ESR-75140-00001 [Appendix A].

The breathing air system consists of compressors, receivers, and distribution network supplying personnel needing breathing air protection across PNGS-A. During SWS, breathing air will remain available for the following areas:

- IFB-A,

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- AIFB,
- Spent Resin Storage Tanks,
- Areas storing D₂O on site:
 - Heavy Water Addition and Transfer
 - UPP & UPP Expansion Feed Storage Area,
- Connection to PNGS-B Breathing Air,
- RB Airlocks,
- Main Control Room (MCR),
- Pressure Relief Duct (PRD), and
- Reactor Buildings.

A future end-state could occur when fuel is removed from the fuel bays and/or D₂O is no longer stored in PNGS-A, at which point portions of the delivery system supplying these locations can be isolated and breathing air compressors which are not being used can be end-stated. The breathing air supply pipework will remain available to support decommissioning activities if required.

Monitoring, inspection, and maintenance will be required of the parts of the breathing air system that remain in service during the SWS period, including parts of the system that are isolated and not in use but remain available to be put in service if needed. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.10 Drainage Systems (71700)

The station drainage system is subdivided into:

- Inactive drainage, and
- Active drainage.

4.2.10.1 Inactive Drainage (71710)

The state of the Inactive Drainage System at the beginning of SWS is described in P-ESR-71710-00001 [Appendix A].

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The Inactive Drainage system collects drainage throughout the station and surrounding yard. Most of the Inactive Drainage system will remain in service during SWS to cater to spills, ground water seepage and precipitation.

As plant conditions evolve through SWS, portions of the inactive drainage system in areas where water is no longer expected to collect will be end-stated to reduce the system footprint. Consideration will be given to reducing the number of pumps in station sumps and utilizing existing station procedures to plug TH/TAB floor drains where they are not required.

To aid in managing groundwater infiltration, the inactive drainage path in the TH basement will remain in service until structural demolition. Much of the current yard drainage system will remain in-service until site remediation is completed.

Effluent stream monitoring will continue for each drainage path until such time as that the release path is end-stated, and approval has been obtained to discontinue monitoring.

Monitoring, inspection, and maintenance will be required of the inactive drainage system pumps during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.10.2 Active Drainage (71720)

The state of the Active Drainage System at the beginning of SWS is described in P-ESR-71720-00001 [Appendix A].

The Active Drainage system collects potentially contaminated liquid waste and directs to the receiving tanks of the radioactive liquid waste management system. The Active Drainage system will remain in service to support SWS for the following plant locations:

- PNGS-A RABs,
- IFB-A and AIFB,
- West Annex, and
- Common facilities shared with PNGS-B (VB, Service Wing, D₂O Upgrader, Sulzer Plant, Laundry Facility).

As plant conditions evolve through SWS, portions of the active drainage system in areas where contaminated liquid is no longer expected to collect will be end-stated to reduce the system footprint. A future end-state could occur when all potential sources of active liquid wastes have been removed from PNGS-A, including from IFB-A and AIFB, at which time the PNGS-A active drainage system could be isolated from Radioactive Liquid Waste Management System (RLWMS), end-stated, and abandoned. See Section 4.2.21.

Monitoring, inspection, and maintenance will be required of the active drainage system pumps and tanks during the SWS period. Portions of the system in the abandoned state do not

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require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.11 Liquid Effluent Monitoring and Sampling System (71750)

The state of the Liquid Effluent Monitoring and Sampling System at the beginning of SWS is described in P-ESR-71750-00001 [Appendix A].

The Liquid Effluent Monitoring and Sampling (LEMS) system monitors discharges to the lake from PNGS-A. LEMS will remain in service in its current configuration during SWS (see Section 10.0).

As systems and equipment are phased out during SWS, the station's reconfigured footprint may allow for relaxed monitoring and sampling requirements. Once the drainage or flows and equipment in the associated drainage/flow areas have been end-stated and no longer contain monitored parameters, LEMS equipment can be made inactive for the remainder of SWS. Details for making the system inactive will be assessed closer to the time of removal from service, utilizing the appropriate process [R-21].

Current existing monitoring, inspection, and maintenance of LEMS will continue during the SWS period (see Section 5.0).

4.2.12 Electrical Power Distribution System (51000)

The state of the PNGS-A Electrical Power Distribution at the beginning of SWS is described in [Appendix A]:

- Main Power Output System: P-ESR-51000-00001
- Class III Electrical System: P-ESR-54100-00001
- Class I and Class II Electrical Systems: P-ESR-55100-00001
- Electrical Auxiliary Systems: P-ESR-58000-00001

The PNGS-A Electrical Power Distribution System provides electrical power throughout the station. During Stabilization of PNGS-A and preparation for the planned refurbishment of PNGS-B, detailed electrical load analyses will be completed based on which systems would be required to remain in service as well as planned system modifications. Distribution on each of the PNGS-A units will vary based on the remaining loads which may be amalgamated to reduce the switchgear requirements.

During SWS, the Main Power Output System will be partially active. The Main Output Transformer and the Generator Service Transformer on all PNGS-A units will be end-stated, and all four SSTs are expected to remain in service. The SSTs will remain operational to provide Class IV power to PNGS-A and to support PNGS-B planned refurbishment, as well as to provide power to the electrode boilers for building heating (see Section 4.2.6.1).

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Portions of the Class III Electrical Distribution System will be in service to supply Class III, Class II, and Class I loads to systems that are required to remain active. The grounding system will remain active for grounding electrical equipment during SWS.

Current monitoring, inspection, and maintenance will be required of the portions of the system that are operational during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.13 Digital Control System (66400) and Pickering A Monitoring Centre

The state of the Digital Control System at the beginning of SWS is described in P-ESR-66400-00001 [Appendix A].

The state of the Data Extraction System at the beginning of SWS is described in P-ESR-66450-00001 [Appendix A].

The Digital Control Computer (DCC) provides the MCR operators with the ability to monitor and control plant systems and respond to alarms. The DCC system and its subordinate systems will remain in service initially during SWS to provide required monitoring and control functions for plant systems that will be operation.

Due to the DCC components reaching end of life, a modification will be implemented to replace the DCC with a new system [R-1], the Pickering A Monitoring Centre (PAMC). The PAMC will replace the functionality of the existing MCRs and DCCs with one centralized monitoring centre located within the Protected Area, to continue to monitor SSCs remaining in service and transmit critical alarms both within the station and off-site. Once the PAMC has been installed and declared in service, the DCC and subordinate systems can be removed from service and abandoned.

The Unit 1 Data Extraction System (DES) will remain in service initially during SWS for monitoring of common station functions. After the PAMC has been installed and declared in-service, the DES can be removed from service and abandoned.

Current surveillance, inspection and maintenance programs will continue to apply to DCC systems that will remain in service. Once installed, the PAMC will require similar monitoring, inspection, and maintenance, which will be detailed in the design package for the new system.

4.2.14 Site Instrumentation Systems (61000)

The state of the Site Instrumentation Systems at the beginning of SWS is described in P-ESR-61000-00001 [Appendix A].

Components of the PNGS-A Seismic Monitoring System must remain in service in SWS for as long as there is a risk of an accidental radiological release originating from IFB-A and AIFB. All other Site Instrumentation System equipment is required for the planned continued operation of PNGS-B and must remain in service (i.e., Lake Current, Meteorological, and Pickering B Seismic and Radiological monitoring).

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Current monitoring, inspection, and maintenance requirements continue to apply for equipment that is remaining in service during the SWS period (see Section 5.0).

4.2.15 Stack Monitoring (67876)

The state of the Stack Monitoring System at the beginning of SWS is described in P-ESR-67876-00001 [Appendix A].

Stack Monitoring will continue to remain in service to support building locations that may contain radioactivity during SWS (see Section 10.0).

Stack Monitors will remain in service until the stack monitor shutdown is approved, as per the applicable process [R-19].

Current existing monitoring, inspection, and maintenance of the stack monitoring system will continue during the SWS period (see Section 5.0).

4.2.16 Communication Systems (60200)

The state of the Communication Systems at the beginning of SWS is described in P-ESR-60200-00001 [Appendix A].

The Communication Systems provides personnel with the ability to perform routine and emergency communications, through a Public Address System, Telephone System, Closed Circuit TV System, Wireless Systems, Suit Communications, Emergency Communications System, and Emergency Preparedness Portable & Mobile Radios. During SWS, these systems will remain in service in their existing configuration to continue to provide both site-wide and station-specific communications to personnel working within PNGS-A.

In the long term, PNGS-A communications systems will be end-stated in areas where the communications are no longer required or demolition activities require the removal of communications components.

Current existing monitoring, inspection, testing, and maintenance of the communication systems will continue during the SWS period (see Section 5.0).

4.2.17 IAEA Safeguards Equipment (35570)

The state of the IAEA Safeguards Equipment at the beginning of SWS is described in P-ESR-35570-00001 [Appendix A].

The Safeguards Equipment installed in PNGS-A belongs to the International Atomic Energy Agency (IAEA) and will remain active in a configuration to be determined by the IAEA and/or CNSC throughout SWS.

Based on OPEX from Units 2 and 3, it is assumed that the core discharge monitors, and fuel bundle counters will be removed from Units 1 and 4 after defueling and dewatering and that seals may be installed on end fittings and fuelling machine bridges, which will remain in place until dismantling and removal of the reactor components (after SWS).

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All PNGS-A safeguards will be maintained until IAEA concurrence that they are no longer required, including power supplies to the IAEA equipment and bay lighting.

Common Services Operations will provide required support for inspections and maintenance conducted by IAEA personnel, in accordance with the system Operating Manual [R-44].

4.2.18 Control Centre Equipment (MCR & CER) (66000)

The state of the Control Centre Equipment at the beginning of SWS is described in P-ESR-66000-00001 [Appendix A].

The Control Centre Equipment in the MCRs and CERs and subordinate systems will remain in service initially during SWS. Once all equipment associated with a given Control Centre panel is end stated and retired, the panel itself may be end stated.

Monitoring, inspection, and maintenance will be required for the panels that will remain in service during the SWS period. Panels in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.19 Cranes, Hoists and Associated Equipment (76100)

The state of the Cranes, Hoists, and Associated Equipment at the beginning of SWS is described in P-ESR-76100-00001 [Appendix A].

Cranes and hoists will be required well into the SWS phase to provide a means for routine handling of process equipment, maintenance equipment, and other material, as well as to execute decommissioning component removals, throughout PNGS-A. The requirements for each crane or hoist vary based on location and support function.

Several cranes have been identified as required frequently during the SWS phase to support activities such as:

- Loading and processing used fuel dry storage containers,
- Movement and inspection of fuel in the IFBs,
- Waste processing activities, including removal of resins and moving shipping containers,
- Maintenance work areas, and
- General SWS and decommissioning work within the work areas of the building support cranes, including Turbine Bay Crane, TAB Crane, and RAB Hatchway Cranes and Hoists.

The lifting equipment supporting these activities will be maintained in Active status, and their operating inspection requirements will be kept. Lifting equipment in areas where little work or maintenance is ongoing during SWS will be set to Conditional operational status, in which it is

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conditionally available pending an assessment and maintenance by qualified crane maintenance personnel.

In addition to the cranes and hoists, specialized equipment is required for the rigging, hoisting, and supporting of the heavy loads generally associated with turbines, generators, and transformers. These assets will remain available for use during SWS and maintained as per the requirements of each support function and piece of equipment.

All common services cranes and hoists that support PNGS-A and/or PNGS-B activities such as Service Wing cranes, Pickering In/Out Transfer System cranes, Maintenance shop cranes, and UPP cranes will be kept Active, as required.

Potential for changes to the crane strategy based on evolution of decommissioning planning will continue throughout the SWS phase, which could impact the long-term planning for cranes, hoists, and associated equipment. Any modification will be outlined in future revisions of the SWS plan.

4.2.20 Emergency Mitigating Equipment (09013)

The state of the Emergency Mitigating Equipment at the beginning of SWS is described in P-ESR-09013-00001 [Appendix A].

Emergency Mitigating Equipment (EME) includes portable equipment such as pumps, generators, support equipment, and telecommunications, and is used in conjunction with existing station systems via EME connection points in Beyond Design Basis Accidents.

The portion of the system that supports the IFB-A and AIFB will be active during SWS until all irradiated fuel is removed from the bays, after which the remaining EME can be removed from service and end-stated.

4.2.21 Radioactive Liquid Waste Management System (79200)

The state of the Radioactive Liquid Waste Management System at the beginning of SWS is described in P-ESR-79200-00001 [Appendix A].

The state of the Condensing System at the beginning of SWS is described in P-ESR-42000-00001 [Appendix A].

The Radioactive Liquid Waste Management System (RLWMS) is located in the Service Wing and handles liquid waste from both PNGS-A and PNGS-B. The RLWMS will remain fully in service during SWS to handle waste generated by PNGS-A as well as to support the planned continued operation of PNGS-B.

During the planned refurbishment of PNGS-B, the dilution flow for RLWMS will be provided by the Unit 1 Condensing System CCW pumps. Monitoring, inspection, and maintenance of these pumps will be required during this period (see Section 5.0).

The RWLMS is a common system located within the PNGS-B operating envelope; thus any monitoring, inspection, and maintenance of the system is outside the scope of SWS. PNGS-A

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will be separated from the RWLMS when no more radioactive liquid wastes are being generated by PNGS-A systems.

4.2.22 D₂O Upgrading Processing Plant

The state of the D₂O Upgrading Processing Plant for A and B Side at the beginning of SWS is described in P-ESR-34600-00001 [Appendix A].

The state of the D₂O Upgrading Plant Sulzer Process and Controls at the beginning of SWS is described in P-ESR-34930-00001 [Appendix A].

The D₂O Upgrading Processing Plant (UPP) is expected to remain in operation early in SWS. During operation, monitoring, inspection, maintenance will be the responsibility of Common Services Operations and is outside the scope of this SWS plan.

A future end-state of the UPP can occur once the facility is no longer required to process heavy water. The facility will be shut down and end-stated for the remainder of SWS. At that future point, monitoring, inspection, and maintenance will be required for the any equipment remaining in service. Equipment in the abandoned state does not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

4.2.23 Heavy Water Storage (38000)

The state of the Heavy Water Storage System at the beginning of SWS is described in P-ESR-38000-00001 [Appendix A].

The state of the D₂O Addition and Transfer System at the beginning of SWS is described in P-ESR-34960-00001 [Appendix A].

The Heavy Water Storage systems will remain active to receive, store, and transfer D₂O removed from PNGS-A during Stabilization prior to transfer to a heavy water management facility.

The common portion of the D₂O Addition and Transfer System will remain in service to support PNGS-B operation, including transfer lines that traverse PNGS-A connecting common systems.

A future end-state of the heavy water storage system can occur once all the D₂O has been removed from PNGS-A. The heavy water system would be shut down and end-stated for the remainder of SWS.

Monitoring, inspection, and maintenance will be required for the portions of the system that will remain in service during the SWS period. Portions of the system in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

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4.2.24 Resin Handling (34500/79000)

The state of the Resin Handling System at the beginning of SWS is described in P-ESR-34500-00001 [Appendix A].

The state of the Radioactive Waste Management System at the beginning of SWS is described in P-ESR-79000-00001 [Appendix A].

The Resin Handling System removes resin from station systems and transports it to resin storage tanks. The spent resin storage tanks will remain active, and transfer of resin from the spent resin tanks using the transfer skids is expected to continue during SWS.

A future end-state could exist during SWS where the spent resin storage tanks may be emptied and end-stated for the remainder of SWS. For Unit 2, the system should only be made inactive once the IFB-A has been end-stated and is no longer generating spent resin.

Existing monitoring, inspection, and maintenance will be required for as long as the spent resin storage tanks remain in service. Portions of the systems in the abandoned state do not require any special considerations except for routine operator rounds for general surveillance (see Section 5.0).

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5.0 MAINTENANCE INSPECTION AND SURVEILLANCE

Maintenance, inspection and surveillance activities during the SWS phase will continue to be planned and executed using the NMS described in the Program Overview DDP Volume 0 [R-5]. The established operations, maintenance, engineering and safety-related programs have the required processes and procedures to enable the safe management of Units 1 to 4 during this phase. This is demonstrated by the U2 and U3 SWS activities that have been in place since 2010.

During Stabilization of U1 and U4, operational and maintenance procedures, including the Master Equipment List (MEL) and Asset Suite 9, will be updated to reflect maintenance and monitoring requirements for the units during SWS. Any changes to requirements will be controlled using OPG's Nuclear Engineering Change Control program, where applicable. If required, changes to existing Programs and governing documents of the NMS will follow the established process. See the Program Overview DDP Volume 0 [R-5].

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6.0 QUALITY ASSURANCE

Quality assurance during SWS phase will follow OPG Nuclear Management System, see Program Overview DDP Volume 0 [R-5].

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7.0 QUALIFICATION AND TRAINING PROGRAM

Qualification and training programs during SWS phase will follow OPG Nuclear Management System, see Program Overview DDP Volume 0 [R-5].

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8.0 HAZARDS IDENTIFICATION AND MITIGATING MEASURES

8.1 Decommissioning Safety Assessment

A decommissioning safety assessment has been performed in accordance with the methodology detailed in the Program Overview DDP Volume 0 [R-5]. Each work package scope systematically identifies potential hazards and evaluate associated risks. The identified hazards and their corresponding mitigation measures have been discussed in the Safety Assessment Report [R-28]. The identified hazards and corresponding mitigation measures are summarized in the table below:

Hazard Category	Hazard/Events Description	Mitigation Measures
Radiological	Potential tritiated exit signs	Characterize the material as needed, remove following OPG Radiation Protection Program [R-18]
	Direct radiation sources from residual water in system	Compliance with OPG Radiation Protection Program [R-18]
	Radioactive liquid spill	Compliance with OPG Radiation Protection Program [R-18] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Loose beta-gamma contamination	Compliance with OPG Radiation Protection Program [R-18] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Fixed contamination in system piping	Compliance with OPG Radiation Protection Program [R-18]
	Failure of radioactive work ventilation during cutting operation	Compliance with OPG Radiation Protection Program [R-18] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
Environmental	Spills from residual oil in tanks and lines, during removal and due to incorrect capping/packaging during lifts and transport	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-21] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
Non-Radiological	Hot work hazards from cutting pipes and equipment	Compliance with OPG's Control Of Ignition Sources And Hot Work Activities [R-46] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Inadequately disconnected circuits from building power supply.	Adequate Safe Work Planning and Pre-Job Briefing [R-29]

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Hazard Category	Hazard/Events Description	Mitigation Measures
	PCBs from lights	Compliance with OPG's Management of Designated Substances procedure [R-31]
	Lead paint	Compliance with OPG's Management of Designated Substances procedure [R-31]
	Mercury in switches and light fixtures	Compliance with OPG's Management of Designated Substances procedure [R-31]
	Animal wastes, bird droppings	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-21] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Working at heights	Compliance with OPG's Working at Heights procedure [R-32] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Inadequate illumination and ventilation in the work area	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-21] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Degraded or degrading structures, systems, and components	Adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Falling objects	Compliance with OPG's Falling Material Control procedure [R-33] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Heavy equipment traffic	Adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Building Collapse	Adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Noise	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-21]
	Dust	Compliance with OPG's Environment Health and Safety Managed Systems Program [R-21]
	Dangerous or faulty equipment	Adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Pinch points	Adequate Safe Work Planning and Pre-Job Briefing [R-29]

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Hazard Category	Hazard/Events Description	Mitigation Measures
	Confined space work	Compliance with OPG’s Confined Space Procedures [R-34]
	Fire and explosion hazards from flammable materials and compressed gasses	Compliance with OPG’s Control Of Ignition Sources And Hot Work Activities [R-46] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Work area congestion, traffic, proximity to other work areas and facilities	Adequate Safe Work Planning and Pre-Job Briefing [R-29]
	Buried Services	Compliance with OPG’s Identification of Buried Or Embedded Services [R-47] and adequate Safe Work Planning and Pre-Job Briefing [R-29]
Unexpected Event	PNGS-B Emergencies	Emergency Management plan [R-23]
	Surveys find radiological material	Characterize the material as needed, cut out and remove following OPG Radiation Protection Program [R-18]
	Asbestos found in insulation or other building materials	Compliance with OPG’s Asbestos management procedure [R-45]
	Building collapse	Adequate Safe Work Planning and Pre-Job Briefing [R-29]

Table 1 Hazard Assessment with Mitigation Measures

For any emergent work identified during the DDP/SWS implementation period, the existing NMS change control process will be utilized to evaluate whether the work falls within the existing safety assessment envelope. If the emergent work presents new or different hazards not previously considered, or if risk levels exceed those analyzed in the current safety assessment, an update to the DDP/SWS Safety Assessment will be required prior to proceeding with the work.

8.2 Hazard Control Measures

During SWS, hazards and mitigating measures identified in the Safety Assessment will be managed using existing OPG programs and processes. In particular, the following Programs will continue to be implemented:

- Environmental Health & Safety Managed Systems [R-21] for the management of environmental and conventional hazards,
- Radiation Protection (RP) Program [R-18] for control of radioactive materials,

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- Fire Protection Program [R-30] to minimize the risks and consequences of fires, and
- Work Protection Program [R-36] to ensure worker safety and establishing appropriate barriers from energy sources when completing work.

8.2.1 Transient Hazardous Materials Tracking and Controls

OPG's Environmental Health and Safety Managed Systems [R-21] implements a rigorous process to identify, label, track, store and dispose of all hazardous materials [R-12]. This program will remain in effect throughout the SWS phase to manage any remaining transient hazardous material in the facility [R-12][R-13].

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9.0 ACCESS CONTROL AND ZONING

The RP Program [R-18] shall continue to be implemented during the SWS period. Any changes to radiological zones will be performed in accordance with the RP program and more specifically the process described in Radiological Zoning and Personnel/Material Monitoring [R-17][R-41][R-42][R-43].

RP Equipment will be required throughout the SWS for contamination control and monitoring purposes as radioactive hazards will remain on-site. The state of the RP Equipment at the beginning of SWS is described in P-ESR-78700-00001 [Appendix A].

During SWS, access control will continue to be executed in accordance with Access Control [R-15]. Entry into Unit 2 or Unit 3 Reactor Building [R-16] will be revised to include Unit 1 and 4 once they have been end-stated as part of the SAP [R-1]

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10.0 ENVIRONMENTAL MONITORING AND PROTECTION

The current Environmental Monitoring Program (EMP) [R-19] will continue to be implemented during the SWS period, per the Pickering Nuclear Radioactive & Hazardous Emissions Monitoring Plan [R-20]. As systems are isolated and end-stated and it has been determined that an effluent no longer meets the criteria for inclusion, an emissions monitoring modification will be submitted to remove the monitoring stream, as per the EMP.

Site groundwater monitoring at PNGS is guided by Environment Health and Safety Managed System [R-21] and adheres to Groundwater Protection and Monitoring Program [R-22], and will continue to be managed under this program for the SWS phase.

OPG is undertaking a Predictive Environmental Risk Assessment to determine the impact of the decommissioning of PNGS-A as well as the planned refurbishment of PNGS-B (see DDP Volume 0 [R-5]).

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11.0 EMERGENCY PLAN AND PROCEDURES

The current Consolidated Nuclear Emergency Plan (CNEP) [R-24] shall continue to be implemented during SWS. Its purpose is to provide a written basis to document the concepts, roles, and capability to protect the public, employees, and the environment in the event of a nuclear emergency. It provides a framework for interaction with external authorities and defines OPG commitments under the Provincial Nuclear Emergency Response Plan (PNERP) [R-25].

Site instructions to implement requirements of the CNEP are described in OPG Emergency Response Manual [R-23] for Pickering.

12.0 WASTE MANAGEMENT

Waste Management during SWS will be performed in accordance with OPG's Environment Health and Safety Managed System [R-21], Management of Waste and Other Environmentally Regulated Materials Standard [R-14], the Nuclear Waste Management Program [R-39], and the Radioactive Material Transportation Program [R-40]. The programs and standard outline the requirements for management of radiological and conventional waste streams, as well as other environmentally regulated materials within OPG ensuring compliance with all Federal and Provincial requirements.

DDP Volume 0 discusses the waste management plan including all activities necessary to remove waste generated or reduce hazards at the facility during the SWS period. DDP Volume 0 also covers the SWS IFB activities and the expected waste associated with that work is provided in Table 2 [R-37].

	LLW (m ³)	ILW (m ³)
IFB-A	1,559	22
A-FIB	369	14
Total	1,928	36

Table 2: Estimated LLW & ILW Volumes for Work Package 1-4 for IFBA and AFIB

Waste generated in maintaining the SSCs during SWS are estimated to be 15m³/ year of LLW consisting of personal protective equipment, replaced equipment, and other consumables generated from SWS activities.

During SWS, risk reduction activities may be undertaken to reduce risks and/or hazards at the facility; this includes activities in DDP Volume 1 [R-26] and Volume 2 [R-27]. The Program Overview DDP Volume 0 [R-5] includes details on risk reduction activities contemplated for this SWS period.

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13.0 RECORDS

See the Program Overview DDP Volume 0 [R-5] for the process used for records during the SWS period.

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14.0 REFERENCES

- [R-1] OPG, Pickering NGS Stabilization Activity Plan (SAP), P-PLAN-00990-00007-R0004
- [R-2] CNSC, Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills, REGDOC 3.5.1, Version 2
- [R-3] CNSC, Decommissioning, REGDOC-2.11.2
- [R-4] CSA, Decommissioning of Facilities Containing Nuclear Substances, CSA N294:19
- [R-5] OPG, Pickering A Detailed Decommissioning Plan – Program Overview, Volume 0, NA44-PLAN-00960-00004
- [R-6] OPG, P-INS-00990-00002-R004, Preparation of System End-State Determination Report for Safe Storage
- [R-7] CCBFC, National Fire Code of Canada 2020
- [R-8] CCBFC, National Building Code of Canada 2020
- [R-9] CSA, Fire Protection for Nuclear Power Plants, CSA N293:23
- [R-10] OPG, Fire Hazard Assessment – Pickering A Nuclear Generating Station, NA44-REP-71400-10003
- [R-11] OPG, Fire Protection 2019 Code Compliance Review - Pickering Nuclear Generation Station A And B, P-REP-71400-00014
- [R-12] OP OPG, Hazardous Materials Management, OPG-PROC-0126
- [R-13] OPG, Request for Approval of Hazardous Materials, OPG-FORM-0086
- [R-14] OPG, Management of Waste and Other Environmentally Regulated Materials, OPG-STD-0156
- [R-15] OPG, Access Control, NA44-OM-014-20300
- [R-16] OPG, Entry into Unit 2 or 3 Reactor Building, NA44-OP-21000-0001
- [R-17] OPG, Radiological Zoning, Personnel/Material Monitoring, N-PROC-RA-0014
- [R-18] OPG, Radiation Protection, N-PROG-RA-0013

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- [R-19] OPG, Management of the Environmental Monitoring Programs, N-PROC-OP-0025
- [R-20] OPG, Pickering Nuclear Radioactive and Hazardous Emissions Monitoring Plan, P-PLAN-03480-00001
- [R-21] OPG, Environment Health and Safety Managed Systems, OPG-PROG-0005
- [R-22] OPG, Groundwater Protection and Monitoring Program, N-STD-OP-0046
- [R-23] OPG, Index – Emergency Response Manual 5, P-MAN-03490-00005
- [R-24] OPG, Consolidated Nuclear Emergency Plan (CNEP), N-PROG-RA-0001
- [R-25] Ontario, Provincial Nuclear Emergency Response Plan (PNERP), 2017
- [R-26] OPG, Pickering A Detailed Decommissioning Plan; Planning Envelope A - Volume 1, NA44-PLAN-00960-00005
- [R-27] OPG, Pickering A Detailed Decommissioning Plan; Planning Envelope B - Volume 2, NA44-PLAN-00960-00006
- [R-28] OPG, Integrated Report for Pickering A Decommissioning Safety Assessment, NA44-REP-00960-00431
- [R-29] OPG, Safe Work Planning and Pre-Job Briefing, OPG-PROC-0129
- [R-30] OPG, Fire Protection Program, N-PROG-RA-0012
- [R-31] OPG, Management of Designated Substances Other Than Asbestos, OPG-PROC-0125
- [R-32] OPG, Working At Heights, OPG-PROC-0137
- [R-33] OPG, Falling Material Control, OPG-PROC-0136
- [R-34] OPG, Confined Space Management, OPG-PROC-0122
- [R-35] OPG, Ontario Power Generation Emergency Management Program, OPG-PROG-0030
- [R-36] OPG, Work Protection, N-PROG-MA-0015
- [R-37] OPG, Removal of Waste And Draining LLLW and ILW in IFB-A and AIFB Conceptual Design Report, P-REP-34400-00009

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- [R-38] OPG, Correspondence, "Pickering 'A' Unit 2 and 3 Notification of Safe Storage Declaration, 21st September 2010., NA44-CORR-00531-06518
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- [R-40] OPG, Radioactive Material Transportation, W-PROG-WM-0002
- [R-41] OPG, Miscellaneous Equipment 254'-0" Floor Fixed Contamination Monitor Location General Arrangement Drawing, NA44-DRAW-67874-10001
- [R-42] OPG, Miscellaneous Equipment 274'-0" Floor Fixed Contamination Monitor Locations General Arrangement Drawing, NA44-DRAW-67874-10002
- [R-43] OPG, Miscellaneous Equipment 294'-0" Roof 317'-6" Floor Fixed Contamination Monitor Locations Drawing, NA44-DRAW-67874-10003
- [R-44] OPG, Pickering Nuclear Generating Centre Safeguards, P-OM-018-00513
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- [R-46] OPG, Control of Ignition Sources And Hot Work Activities, N-PROC-RA-0057
- [R-47] OPG, Identification Of Buried Or Embedded Services, OPG-PROC-0138

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15.0 ACRONYMS

Acronym	Definition
AIFB	Auxiliary Irradiated Fuel Bay
CCR	Code Compliance Review
CCW	Condenser Cooling Water
CER	Control Equipment Rooms
CNEP	Consolidated Nuclear Emergency Plan
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CWS	Common Water System
D ₂ O	Heavy Water
DCC	Digital Control Computer
DDP	Detailed Decommissioning Plan
DES	Data Extraction System
EME	Emergency Mitigating Equipment
EMP	Environmental Monitoring Program
ESDR	End State Determination Report
ESR	End State Report
FHA	Fire Hazard Assessment
HP	High Pressure
HVAC	Heating, Ventilation and Cooling
IAEA	International Atomic Energy Agency
IFB	Irradiated Fuel Bay
IFB-A	Irradiated Fuel Bay for PNGS-A
ILW	Intermediate Level Waste
IXCU	Ion Exchange Clean-up
LEMS	Liquid Effluent Monitoring and Sampling

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Acronym	Definition
LLW	Low Level Waste
MCR	Main Control Room
MEL	Master Equipment List
NBCC	National Building Code of Canada
NFC	National Fire Code
NMS	Nuclear Management System
OPEX	Operating Experience
OPG	Ontario Power Generation
PAMC	Pickering A Monitoring Center
PNERP	Provincial Nuclear Emergency Response Plan
PNGS	Pickering Nuclear Generating Station
PNGS-A	Pickering Nuclear Generating Station A
PNGS-B	Pickering Nuclear Generating Station B
PRD	Pressure Relief Duct
RAB	Reactor Auxiliary Building
RB	Reactor Building
REGDOC	Regulatory Document
RLWMS	Radioactive Liquid Waste Management System
RP	Radiation Protection
SAP	Stabilization Activity Plan
SES	Site Electrical System
SESD	System End State Declaration
SSC	System, Structure or Component
SST	Station Service Transformers
SWS	Storage With Surveillance
TAB	Turbine Auxiliary Bay

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Acronym	Definition
TH	Turbine Hall
U1	Pickering Unit 1
U2	Pickering Unit 2
U3	Pickering Unit 3
U4	Pickering Unit 4
U5	Pickering Unit 5
U8	Pickering Unit 8
UPP	Upgrading Processing Plant
VB	Vacuum Building

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Appendix A: ESDRs for Active Systems Supporting SWS

Document Number	ESDR Title
P-ESR-09013-00001	Emergency Mitigating Equipment
P-ESR-25000-00001	Pickering End State Determination Report Vacuum Building and Ducts
P-ESR-29500-00001	Pickering A - Auxiliary Irradiated Fuel Bay End State Determination Report
P-ESR-32000-00001	Pickering End State Determination Report for Safe Storage. Moderator And Auxiliaries
P-ESR-33350-00001	Pickering End State Determination Report - Emergency Coolant Injection for All Units
P-ESR-34400-00001	Pickering A - Irradiated Fuel Storage Bay
P-ESR-34500-00001	Pickering A Resin Handling System End State Determination Report
P-ESR-34600-00001	D ₂ O Upgrading Processing Plant for A and B Side
P-ESR-34930-00001	D ₂ O Upgrading Plant Sulzer Process and Controls
P-ESR-34970-00001	D ₂ O Ion Exchange Cleanup System End State Determination Report
P-ESR-35500-00001	Irradiated Fuel Inspection and Storage
P-ESR-35570-00001	IAEA Safeguards Equipment
P-ESR-35600-00001	Irradiated Fuel Bay Shipping Facilities
P-ESR-38000-00001	Heavy Water
P-ESR-42000-00001	Pickering ESDR - Units 1 And 4 Condensing System
P-ESR-51000-00001	Main Power Output System
P-ESR-54100-00001	Class III Electrical System
P-ESR-55100-00002	Pickering A - Class I And Class II
P-ESR-58000-00001	Electrical Auxiliary Systems
P-ESR-60200-00001	Communication Systems
P-ESR-61000-00001	Pickering A And B Site Instrumentation Systems
P-ESR-66000-00001	Control Centre Equipment MCR-CER

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P-ESR-66450-00001	Pickering A - Data Extraction System ESDR
P-ESR-67140-00001	Pickering A - Fire Detection and Alarm System
P-ESR-67876-00001	Stack Monitoring
P-ESR-71100-00001	Pickering 018 - Common Water System
P-ESR-71300-00001	Service Water System
P-ESR-71400-00001	Fire Water Supply Configuration
P-ESR-71500-00001	Domestic Water and Sewer
P-ESR-71620-00001	Demineralized Water System
P-ESR-71710-00001	Inactive Drainage System
P-ESR-71720-00001	Pickering A and B Active Drainage
P-ESR-71750-00001	Liquid Effluent Monitoring and Sampling System for PNGS-A And PNGS-B
P-ESR-73000-00001	Powerhouse Steam Distribution and HVAC System (TH And TAB)
P-ESR-73000-00002	RB RAB Heating and Ventilation
P-ESR-73000-00004	Control Rooms and CERS HVAC
P-ESR-73000-00006	HVAC - Battery and Electrical Enclosure Rooms - Pickering End State Determination Report
P-ESR-73000-00009	Miscellaneous And Outside Buildings HVAC
P-ESR-75110-00001	Pickering A Service Air
P-ESR-75120-00001	Pickering 014 Low- and High-Pressure Instrument Air
P-ESR-75140-00001	Pickering 018 - Breathing Air System
P-ESR-75700-00001	Pickering - Nitrogen System End State Determination Report
P-ESR-76100-00001	Cranes and Hoists
P-ESR-78700-00001	Radiation Protection Equipment
P-ESR-79000-00001	Radioactive Waste Management
P-ESR-79200-00001	Radioactive Liquid Waste Management System

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Appendix B: Compliance Matrix

REG DOC 2.11.2 Section	REG DOC Section Requirement Description	CSA N294:19 Section	CSA Requirement Description	SWS Section
N/A	N/A	Annex B.1	Introduction	Section 1.0
N/A	N/A	Annex B.2	Responsibilities	Section 2.0
7.3 (1 st Bullet)	A description of the SSCs necessary for the storage with surveillance period, and anticipated for decontamination and dismantling activities	Annex B.3	Functional services and systems	Section 4.0
7.3 (2 nd Bullet)	The process to ensure that changes or modifications to SSCs are controlled	Annex B.10	Facility change or modification process	Section 3.0
7.3 (3 rd Bullet)	Maintenance, inspection, and surveillance activities	Annex B.4	Maintenance inspection and surveillance	Section 5.0
7.3 (4 th Bullet)	The identification (nature and source) of hazards, both radiological and non-radiological, and procedures or technologies proposed to mitigate them	Annex B.5	Hazard Identification	Section 8.0
		Annex B.6	Hazard Control Measures	Section 8.0
7.3 (5 th Bullet)	A description of the zoning, and means to ensure access control	Annex B.7	Access control and zoning	Section 9.0
7.3 (6 th Bullet)	Environmental protection measures that will be employed to mitigate and monitor environmental effects	Annex B.8	Environmental monitoring & protection	Section 10.0
7.3 (7 th Bullet)	Waste management activities necessary to remove waste from operations or to reduce hazards at the facility during the storage with surveillance period, including any secondary wastes	Annex B.11	Waste management	Section 12.0
7.3 (8 th Bullet)	Applicable programs (e.g., management system, training program, emergency preparedness program)	Annex B.9	Emergency plan and procedures Qualification and training program	Section 11.0

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REG DOC 2.11.2 Section	REG DOC Section Requirement Description	CSA N294:19 Section	CSA Requirement Description	SWS Section
		Annex B.12	Quality Assurance	Section 6.0
		Annex B.13	Qualification and Training Program	Section 7.0
7.3 (9 th Bullet)	A description of the records that will be maintained to periodically update the storage with surveillance plan	Annex B.14	Records	Section 13.0