NAVIGATING FOR
EXCELLENCE

POINT LEPREAU NUCLEAR GENERATING STATION

APPLICATION TO RENEW THE PLNGS POWER REACTOR OPERATING LICENCE

JUNE 2021

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Executive Summary

New Brunswick Power Corporation (NB Power) is appearing before the Canadian Nuclear Safety Commission (CNSC) to seek renewal of the Point Lepreau Nuclear Generating Station (PLNGS) Power Reactor Operating Licence. The current licence for PLNGS expires on June 30, 2022. NB Power is requesting renewal of the PLNGS Nuclear Power Operating Licence for a term of 25 years until June of 2047.

Safety is NB Power's top priority with a goal to safely and reliably operate PLNGS in a way that minimizes the risk to our employees, our community, the public and the environment in which we operate. While nuclear safety remains our top focus, conventional, radiological, and environmental performance is at the core of all activities at PLNGS. NB Power maintains highly qualified, skilled, and competent personnel to operate the Station safely and reliably.

NB Power is committed to fostering a strong safety culture, which is the foundation of our performance. Regular nuclear safety culture assessments are conducted, consistent with industry standards, showing a strong nuclear safety culture that values nuclear safety over other competing priorities such as production.

NB Power continues to invest in and strive for excellence in safety at PLNGS, as demonstrated by the significant upgrades to the Station's Emergency Management Facilities. The Station's Incident Command and Planning section has been updated with the addition of a more user-friendly layout and additional IT infrastructure to allow better integration with all emergency management applications. In 2018, PLNGS transitioned into a new Off-site Emergency Operations Center located outside the 20km planning zone. This new facility houses all off-site response agencies required to support a coordinated response to a radiological event at the Station. The facility also houses all the response equipment maintained by the NBEMO in support of the Point Lepreau Off-site Emergency Plan and is used as a training facility for response agencies on this equipment. In addition, the facility serves as a dedicated back up to the on-site Emergency Management Facilities with a 72-hour self-sufficient power supply with dedicated IT and communications equipment.

In 2020, PLNGS conducted an update of its Environmental Risk Assessment (ERA). The site-wide study investigated human and non-human receptor exposure to conditions on and surrounding the site, including air, soil, sediment, groundwater, and surface water (freshwater and seawater). The ERA consists of site characterization, human health risk assessment and ecological risk assessment. The results of the updated ERA were consistent with that of the previous risk assessments completed showing minimal impacts. The ERA is updated on a five-year frequency, with the recommendations identified being used to further strengthen the environmental program.

Executive Summary, Continued

In support of the ERA, a thermal plume assessment of the cooling water discharge from the Station was also conducted. The objectives of this study were to delineate the horizontal and vertical dimensions of the thermal plume, temperature change over ambient of the thermal plume at PLNGS, and provide a list of recommended ecological receptors (e.g., indicator species) that were used as an input to the ecological risk assessments. The results of the thermal plume assessment indicated that the overall temperature of the thermal plume was typically less than one degree Celsius above ambient conditions which would cause minimal effects to the surroundings and is consistent with previous assessments.

NB Power is committed to the protection of the environment and the surrounding community in which we operate. The ERA and supporting Thermal Plume Assessment further this commitment and allow us to fully understand the impacts of the Station's operation on the surrounding environment.

In the Fall of 2018, NB Power, supported by the Province of New Brunswick, neighbouring jurisdictions, federal and international agencies, conducted a two-day full-scale integrated exercise called Synergy Challenge 2018. The exercise simulated a beyond design basis accident occurring at PLNGS and represented the first time a Canadian nuclear power plant had tested the recovery phase as part of the emergency management cycle. The exercise challenged more than 35 organizations and demonstrated the on-going dedication to enhancing interoperability and coordinated response to a nuclear event. The lessons learned from Synergy Challenge 2018 have been used to further enhance and strengthen all respective emergency response plans.

In the Fall of 2021, NB Power, supported by the Province of New Brunswick, neighbouring jurisdictions, federal and international agencies, will be conducting another two-day, full-scale radiological exercise, Synergy Challenge 2021. The aim of this exercise will be around enhancing interoperability and coordinated response to a nuclear event.

PLNGS's relationship with the surrounding community remains strong through regular engagement with community members, organizations and government agencies. In addition, NB Power and representatives of the First Nations community meet regularly to discuss projects, operations, and First Nations interests. PLNGS is committed to ensuring a welcoming and supportive environment of respect, recognition and inclusion that embraces and values diversity.

Executive Summary, Continued

NB Power remains committed to sustaining high levels of performance. In the CNSC staff's most recent assessment of Canadian nuclear power plant performance in 2019, PLNGS received a satisfactory rating in all of the Safety and Control Areas (SCAs). In the Fall of 2019, the Station was also recognized for improved performance by the World Association of Nuclear Operators (WANO). This review resulted in a rating consistent with strong performing Stations throughout the industry.

During refurbishment, PLNGS completed major life extension activities, the scope of which included the replacement of the reactor core assembly components. This was done to ensure on a long-term basis, the continued safe, reliable, and sustainable operation of the Station. To ensure the health of the reactor core assembly components, the fuel channel management and fitness for service programs are continually assessed against modern industry codes and standards, and updated using inspections, internal and external operating experience, joint industry project findings, and research and development.

PLNGS has comprehensive programs in place to ensure that Systems, Structures and Components (SSCs) important to safety are fit for service, are effectively maintained and to ensure that these SSCs continue to provide safe performance over the life of the Station. Processes such as Long-Term Asset Management, Equipment Reliability, and System Health Monitoring ensure that Station systems and components are regularly reviewed, and that appropriate maintenance and testing is completed. NB Power is committed and will continue to invest in the Station to ensure PLNGS continues to meet or exceed industry standards to ensure continued long-term safe reliable operation.

To ensure the continued safe operation, a Periodic Safety Review (PSR) was conducted for a validity period of (2022-2032). From the PSR, an Integrated Implementation Plan (IIP) was completed which reflects that the Station has completed major safety improvements to ensure safe operation through this period. These plans build on the results of the Global Assessment Report (GAR) and considered any residual risk of safety-significant findings. To ensure the safe reliable operation through a longer licensing period, NB Power is committed to complete additional Periodic Safety Reviews prior to the end of each validity period.

Executive Summary, Continued

NB Power is committed to and values open and transparent reviews of PLNGS operations. Forums such as the annual Regulatory Oversight Report along with routine Status Report updates on Power Reactors ensure continuous reviews of PLNGS performance. This is further supported by regular reviews and updates of the Station's License Conditions Handbook (LCH) which ensures that the most current codes and standards are reflected in the Station's licensing basis.

As demonstrated throughout this Commission Member Document (CMD), NB Power assures that:

- Nuclear safety is our top priority; ensuring that personnel, the public and the environment are protected.
- NB Power will continue to invest in and improve safety at PLNGS.
- Systems, structures, and components at the Station are fit to safely continue operation and that inspection programs will ensure fitness-for-service during the next licence period.
- NB Power will continue to invest in staff and ensure they are qualified and competent to operate the Station.
- Transparency and regular community engagement with First Nations, surrounding community and the public will continue.
- NB Power is committed to fostering a healthy safety culture, which is a foundation of our performance.
- NB Power will engage with CNSC on revisions to the Licence Conditions Handbook on a continuous frequency over the requested licence term.

In summary, NB Power has and will continue to demonstrate a sustained commitment to ensuring the safe reliable long-term operation of PLNGS to support the generation of low carbon energy for the province of New Brunswick. This will be done by maintaining the highest standards to operate PLNGS while ensuring our priority continues to be protecting the health, safety and environment of the people and communities we serve. On the basis of this CMD, and associated documentation, NB Power is confident with the granting of a 25-year operating licence; PLNGS will remain compliant with all regulatory requirements and will sustain another period of safe, reliable and quality performance.

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1.0 Introduction

1.1 Identification and Contact Information

Current Licence Number

PROL 17.01/2022

Applicant's Name

New Brunswick Power Corporation
Point Lepreau Nuclear Generating Station

Head Office Address

New Brunswick Power Corporation
515 King Street
Fredericton, NB
E3B 4X1
Canada

Mailing Address

New Brunswick Power Corporation
122 County Line Road
P.O Box 600
Lepreau, New Brunswick
E5J 2S6

1.1 Identification and Contact Information, Continued

Authority to Interact with CNSC

Those persons responsible for the management of licensed activities are:

• President and Chief Executive Officer	Keith Cronkhite
• Vice President Nuclear and Chief Nuclear Officer	Brett Plummer
• Site Vice President	Mark Power
• Station Director	Joel Armstrong
• Director of Engineering	Jennifer Lennox
• Chief Nuclear Engineer	Andy Hayward
• Director of External Affairs and Deputy Chief Nuclear Officer	Jason Nouwens
• Director of Continuous Improvement and Emergency Services	Krista Ward

Proof of Legal Status

New Brunswick Power Corporation/ Société d'énergie du Nouveau-Brunswick (NB Power) was originally established in 1920 as The New Brunswick Electric Power Commission through enactment of the New Brunswick *Electric Power Act* by the government of the Province of New Brunswick. A corporate restructuring occurred in 2004 after the *Electricity Act* was amended to reorganize NB Power into a holding company with several divisions, one of which was the New Brunswick Power Nuclear Corporation. A new *Electricity Act* came into force in New Brunswick on October 1, 2013, which provided for the amalgamation of the group of companies created in 2004, including the nuclear division, into a new Crown corporation called New Brunswick Power Corporation/ Société d'énergie du Nouveau-Brunswick. Further details are available through the New Brunswick Corporate Affairs Registry Database, Reference Number 22248.

1.1 Identification and Contact Information, Continued

Responsibility for Management and Control of Licensed Activity

Those with authority to act for New Brunswick Power Corporation in dealing with the Canadian Nuclear Safety Commission are:

President and CEO	Keith Cronkhite
Chief Legal Officer	Jamie Petrie
Vice President Nuclear and Chief Nuclear Officer	Brett Plummer
Site Vice President	Mark Power
Station Director	Joel Armstrong

From time to time, alternate staff may accompany any of the above.

Billing Contact

All Invoices and Statements regarding licencing fees should be forwarded to:

Brett Plummer, VP Nuclear and CNO
Point Lepreau Nuclear Generating Station
P.O. Box 600 Lepreau, New Brunswick
E5J 2S6

Legal Signing Authority

The Vice President Nuclear and Chief Nuclear Officer acts as the applicant authority. Correspondence should be addressed as follows:

Brett Plummer, VP Nuclear and CNO
Point Lepreau Nuclear Generating Station
P.O. Box 600 Lepreau, New Brunswick
E5J 2S6

1.2 Facility and Activities to be Licensed

Licence Period

July 2022 until June 2047.

Main Purpose

NB Power is requesting the renewal of the PLNGS PROL for a term of 25 years.

This application provides the information required to demonstrate that the PLNGS meets or exceeds all of the requirements of the *Nuclear Safety and Control Act* (NSCA) and the associated regulations.

The PLNGS safely and reliably generates non-emitting, low-carbon electricity for the wholesale market. Commissioned in 1982/1983, the unit was the first CANDU-6 to begin commercial operation.

Figure 1: Point Lepreau Nuclear Generating Station

Description of Site

PLNGS is a CANDU-6 Pressurized Heavy Water Reactor type nuclear power plant supplying steam to a turbine generator set delivering an electrical output of 705 MW(e). 45 MW(e) electrical power is consumed to operate equipment within the Station; therefore, providing a net output of 660 MW(e) to the New Brunswick Grid.

1.2 Facility and Activities to be Licensed, Continued

Description of Site, Continued

The Station is located in New Brunswick on the Lepreau Peninsula, 40 km southwest of Saint John on Route 790, off Highway 1. The property is located in the counties of Saint John and Charlotte, in the Province of New Brunswick, comprising parts of original Crown Grant Number 1 to Henry Corr, Crown Grant Number 2 to Thomas Loveday, Crown Grant Number 3 to John Greenwood, Crown Grant Number 4 to Manse & A. Gould, Crown Grant Number 5 to Catherine Gould, Crown Grant Number 6 to Edward Mooney, and parts of lands formerly reserved for Lighthouse and other public purposes shown in:

- Drawing No. 0086-10200-3001-001-SP-E, Point Lepreau Generating Station Site Plan, July 3, 2019 (Reference 1),
- Drawing No. 0086-10200-3001-002-SP-E, Point Lepreau Generating Station Site Plan, July 3, 2019 (Reference 2), and
- Drawing No. 0086-10200-3001-003-SP-E, Point Lepreau Generating Station Site Plan, July 3, 2019 (Reference 3).

The instrument numbers are registered in the Registry Offices for the counties of Saint John and Charlotte for the parcels of land owned by NB Power that comprise and/or are associated with PLNGS.

These subject parcels of land are identified with property identification (PID) numbers 00471136, 55062665, 55010086, 00427138, 55062640, 01231323, 00274910, 00276592, 55094429, 55003248, 55001911, 55062657.

Also located on the site, and covered under the *PROL 17.01/2022, Point Lepreau Nuclear Generating Station Power Reactor Operating Licence* (Reference 4), is the Solid Radioactive Waste Management Facility (SRWMF). This facility is operated and maintained by PLNGS staff and provides safe interim storage of solid radioactive waste, including spent nuclear fuel, and retube waste.

The SRWMF occupies an area of approximately 83,000 square meters, about 1,200 meters north of the reactor building, as shown on Drawing No. 0087-10200-3002-01-GA-E, Site and Improvements Site Layout Site General Location (Reference 5).

1.2 Facility and Activities to be Licensed, Continued

Description of Site, Continued

The licensed facility consists of:

- Phase I, comprised of concrete vaults, filter storage pipes, and quadricells, shown in Drawing No. 0087-79100-2001-001-GA-D, Operational Flowsheet Solid Radioactive Waste Management Facility Phase One, (Reference 6).
- Phase II, comprised of concrete canisters for spent fuel dry storage, shown in Drawing No. 0087-79100-2001-002-GA-D, Operational Flowsheet Solid Radioactive Waste Management Facility Phase II, (Reference 7).
    - Preliminary engineering is currently underway for the Phase II Extension, for which NB Power intends to seek approval in accordance with license requirements when applicable.
- Phase III, comprised of 5 concrete Retube Canisters and 2 concrete storage vault structures as shown in Drawing No. 0087-79100-2001-003-GA-D, Solid Radioactive Waste Management Facility Phase III, (Reference 8).

The original waste storage facility (Phase I) began operations in 1983. Spent fuel dry storage capability (Phase II) was added to the facility in 1990/1991, and the Retube waste storage (Phase III) was added prior to the 2008 refurbishment outage.

Further details on the description of the Station is provided in Part 1 of the *Point Lepreau Nuclear Generating Station 2021 Safety Report,* (Reference 9), while further details on the SRWMF can be found in the *Solid Radioactive Waste Management Facility Safety Report*, (Reference 10).

Please see *Sections 16.1* and *16.2* for information related to Nuclear and Hazardous Substances.

1.2 Facility and Activities to be Licensed, Continued

Activities to be Licensed

1. Operate the Point Lepreau Nuclear Generating Station (hereinafter "the nuclear facility") and the Point Lepreau Solid Radioactive Waste Management Facility (hereinafter "the waste storage facility") at a site located in Charlotte County and Saint John County, Province of New Brunswick;

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

3. Possess, transfer, import, use, package, manage and store the sealed and unsealed sources and the prescribed equipment;

4. Transport Category II nuclear material by road vehicle from the nuclear facility spent fuel bay to the onsite waste storage facility;

5. Possess and use prescribed equipment and prescribed information that are required for, associated with, or arise from the activities described in 1, 3 and 4.

Permits, Certificates and Other Licences

- Point Lepreau Nuclear Generating Station Nuclear Power Operating Licence - *PROL 17.01/2022*.
- Point Lepreau Generating Station Dosimetry Service Licence No. 14910-1-24.3.
- Fredericton Site Nuclear Substances and Radiation Devices Licence No. 14910-2-25.0.
- Petroleum Product Storage Licence No. 2984.
- Industrial Wastewater Treatment Approval to Operate Licence No. I-11307.
- Domestic Wastewater Works Approval to Operate S-3271.
- Pressure Boundary Certificate of Registration Licence No. 591360.
- Certificate of Registration for Owner-User for Shop and in-situ Repair of Pressure Relief Devices at PLGS Site No. 566621.
- Post-Closure of the Decommissioned Point Lepreau Waste Disposal Facility No. I-10779.
- Pressure Vessels – various (*complete list available upon request*).
- Elevator Permits – various (*complete list available upon request*).

1.2 Facility and Activities to be Licensed, Continued

Safety and Control Area Ratings

PLNGS has attained an overall integrated plant rating of Satisfactory from the CNSC for the safety and control areas. Examples of excellent safety performance, and instances of meeting and/or exceeding regulatory requirements in 2019 were noted. This aligns with our corporate mandate that the safety of the public, employees and environment is our top priority.

Table 1: CNSC Safety and Control Area Rating

Safety and control area - rating	**2016**	**2017**	**2018**	**2019**
Management system	SA	SA	SA	SA
Human performance management	SA	SA	SA	SA
Operating performance	SA	SA	FS	SA
Safety analysis	FS	FS	FS	SA
Physical design	SA	SA	SA	SA
Fitness for service	SA	SA	SA	SA
Radiation protection	SA	SA	SA	SA
Conventional health and safety	FS	FS	FS	SA
Environmental protection	SA	SA	SA	SA
Emergency management and fire protection	SA	SA	SA	SA
Waste management	SA	SA	SA	SA
Security	SA	SA	SA	SA
Safeguards and non-proliferation	SA	SA	SA	SA
Packaging and transport	SA	SA	SA	SA
Integrated plant rating	**SA**	**SA**	**SA**	**SA**

NOTE

Per *Section 3.7* of the Regulatory Oversight Report for Canadian Nuclear Power Generating Sites for 2019, "CNSC staff did not assign fully satisfactory ratings at the SCA level (this contrasts with the regulatory oversight for 2018, where Point Lepreau received multiple fully satisfactory ratings). This was strictly because of the lack of opportunity (due to the COVID-19 pandemic) for staff to assure the consistent applications of criteria for fully satisfactory ratings across all SCA's. It does not reflect, in itself, a decline in safety at Point Lepreau in 2019".

2.0 Management

2.1 Management System

The PLNGS Management System is the foundation of our organization. It is a combination of the culture and interrelated activities that are used to direct and perform work. It includes the management and support of personnel to enable them to implement the documented processes and ensure that the performance objectives are achieved safely, consistently, and efficiently. The Management System is also how we ensure compliance to *CSA N286-12, Management System Requirements for Nuclear Facilities.*

The *NMM-00660, Nuclear Management Manual* (Reference 11) describes the Management System and the high-level policies, principles, and processes through which the Station achieves its goals and performance objectives. The NB Power Mission, Vision and Core Values are described within the NMM.

The process that controls the overall architecture of the Management System is *DM-5, Manage Processes*, including the process model (Figure 2) and process interfaces. The purpose of the *PRR-00660-DM-05* (Reference 12) is to control the overall architecture and maintain the integrity of the Management System process model, including process interfaces and methodology for developing and improving processes and procedures.

Improvements continue to be made to strengthen our Management System processes including, but not limited to; the adjustment of ownership levels, implementation of monthly process health metrics, delivering training, performing observation and coaching, revising the DM-5 process, implementing process model changes, revising process documentation, tracking regulatory requirements, streamlining the document change process, and developing the Management System SharePoint Site. Details are as follows:

- Adjustment of Ownership Levels - Directors, now Process Owners, have been actively involved in developing their Process Reference (PRR) documents and Managers, now Document Owners, can understand, manage, and revise the documents specific to their area of expertise regardless of the process where they reside.
- Monthly Process Health Metrics - The monthly process health metric establishes a way to operationalize the Management System by having Document Owners evaluate effectiveness and adherence to processes. Through completing the process health metric, Document Owners identify areas for improvement and initiate plans to close gaps. The process health metric is also used to assess the effectiveness of the Management System.

2.1 Management System, Continued

- Training - Training has been provided to Process Owners, Document Owners, and Authors. Details are as follows:
    - Process/Document Owner Training: The Process/Document Owner Training discusses the purpose and value of the Management System and the responsibilities for Process Owners and Document Owners. This training has been a catalyst for a noticeable improvement in behaviours, attitudes, and engagement throughout the organization.
    - Author Training: Author Training discusses the purpose and value of the Management System, the responsibilities for Authors, and the structure and documentation of the Management System.
    - Computer-Based Training was also developed to provide Station-wide awareness of the Management System. Relevant PLNGS employees and contract staff have participated to date.
- Observation and Coaching - Management System Support team members perform observation and coaching discussions with document users. The observation and coaching discussions are used to validate the process health metric, discuss the importance of procedure use and adherence, and provide feedback to the Document Owners on improvement opportunities within their process.
- Re-write of the *DM-5* Process - The *DM-5, Manage Processes* documentation has been updated to:
    - ensure processes and procedures meet Station goals and objectives
    - plan and control changes to processes
    - ensure requirements of acts, regulations, licences, codes, and standards applicable to each process are identified
    - provide guidance on process improvement
    - improve the process for communicating document changes.
- Process Model Changes - During the Management System Improvement Project, processes were realigned, and the process model was updated to reflect the new Point Lepreau branding.
- Process Documentation Review and Revision - To ensure we have an integrated and well communicated Management System, Process Owners and Document Owners, with support from the Management System Support team, have undertaken an initiative to review and revise all process documentation. The intent is to provide processes that are consistent, effective, and easy to follow.

2.1 Management System, Continued

- Tracking Regulatory Requirements - The Management System is Point Lepreau's quality program and must comply with the requirements of *CSA N286-12* as well as other regulatory standards defined in the Licence Conditions Handbook. It is important to have a mechanism that allows us to track where in the Management System we meet these requirements. A plan is in place to determine the process to track and update regulatory requirements in the Management System, so it is visible.
- Streamlining the Documentation Change Process - The Management System Group in conjunction with Document Control has implemented an e-form to streamline the documentation change process and automate revisions. The e-form has been available for revisions to Management System documents since the beginning of March 2018. Awareness sessions have been provided on the Controlled Document E-Form for all Station staff. In general, the feedback on the e-form is very positive.
- Management System SharePoint Site - Communication is important to the successful implementation of the Management System. The DM-5 Management System Support Team has developed a Management System SharePoint site and continues to populate the site with information that is important to help Process Owners, Document Owners, and Authors develop and sustain their processes.

The *SU-9, Provide Documents and Records* process *PRR-00660-SU-09* (Reference 13) governs the production and control of documents and records at PLNGS. The process for developing, revising, controlling, and distributing documents, drawings, forms, and templates ensures personnel have access to current versions of documents and specified processes and practices are used.

PLNGS is in the process of implementing a new Document Management System. This system will allow for improved storage, management, and tracking of electronic documents and records, including; centralizing content to a single platform using OpenText Content Server, implementing process automation for the creation and revision of documents and records, improving search capabilities, and improving regulatory requirement tracking.

2.1 Management System, Continued

Figure 2: PLNGS Management System Model

2.2 Organization

The organizational structure for PLNGS, together with a description of specified staff functional responsibilities is provided in the *NMM-00660, Nuclear Management Manual* (Reference 11).

This document identifies the high-level responsibilities and authorities of the positions associated with PLNGS operations as shown in the respective organization chart (Figure 3). Additionally, each member of PLNGS management is responsible for establishing worker qualifications, ensuring that adequate training is provided, and only qualified workers are assigned to tasks.

2.2 Organization, Continued

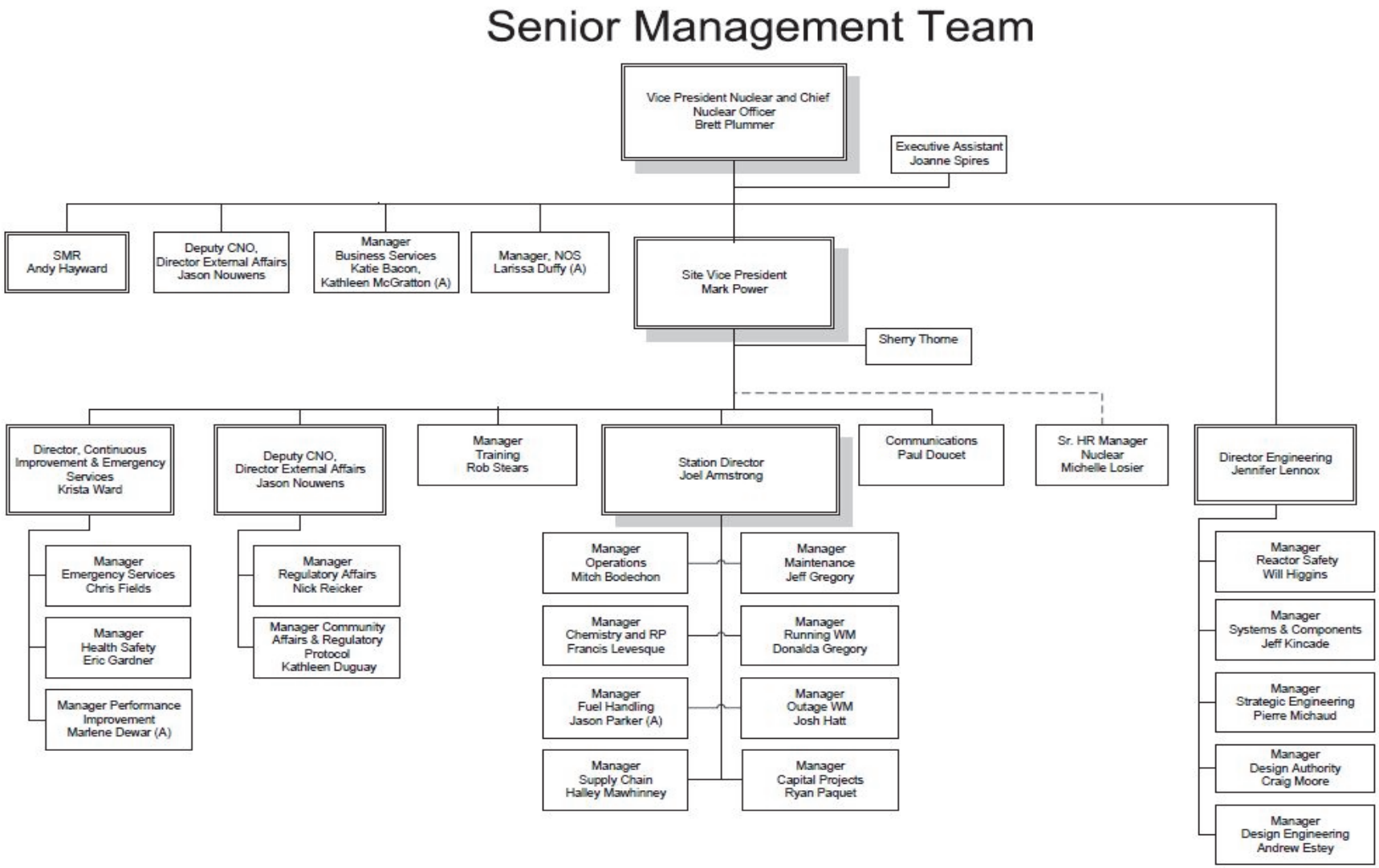

Figure 3: Organizational Chart – Leadership Team

Available upon request

2.2 Organization, Continued

PLNGS ensures that people with the required knowledge, skills, formal education, and behaviours are available to effectively implement Station processes through *PRR-00660-SU-01, Provide Human Resources,* (Reference 14).

The following are the key activities for this process:

- Identify human resource and organizational development strategies.
- Ensure the succession planning process meets organizational requirements.
- Develop and implement approved policies and programs.
- Monitor and evaluate program effectiveness.
- Establish and maintain the Collective Agreement.
- Establish and maintain organizational plans.
- Prepare position descriptions and staff positions.
- Manage employee issues.
- Administer compensation and benefits programs.
- End employment relationships.

Throughout the next licencing period we are working on the continuous improvement of:

- New employee onboarding website.
- Succession planning to Manager and Supervisor levels.
- Maturing work force planning process.
- Maturing employee performance management.

NB Power Human Resources ensures that staffing levels remain adequate into the future with a focus on the recruitment of new and the retention of existing licenced staff.

Figure 4: Control Room Team

2.2 Organization, Continued

The relationship between NB Power and Local 37 of the International Brotherhood of Electrical Workers for the Generation Nuclear Operational Group is long-standing. The result of this collective bargaining has allowed the staff and corporation to continuously focus on safety and quality. The support given by both parties to our shared goals, such as accident prevention and COVID-19 response, are examples of this.

PLNGS has developed a Plan of Establishment, which includes the total complement of regular and term positions needed to support the safe operation of the Station.

NB Power and PLNGS continue to improve in the areas of leadership development and effectiveness. As part of our overall improvement plan, all leaders participated in an assessment process recognizing strong performance and providing individualized development areas. This process is also used as an input to our succession planning process to ensure leaders are ready to assume future roles.

Additional learning and development activities have been increased throughout the current licence period and include:

- The internal development and implementation of an Advanced Operations Overview for Managers (AOOM) course, which focuses on advanced technical systems knowledge for current and future leaders.
- Participation in nuclear industry-based training programs for all levels of leadership.
- Corporate Executive participation in an advanced nuclear technical leadership program provided by the Massachusetts Institute of Technology.
- The development and implementation of two Nuclear specific internal leadership development programs. One course for PLNGS employees and one for leaders in corporate or divisional supporting roles throughout NB Power.

Extensive hiring has occurred over the last several years to ensure continuity of knowledge and skills. Multi-year staffing plans have been developed to support hiring decisions going forward and ensure essential knowledge and skills are maintained throughout the life of the Station. Areas that have unique demographic challenges or talent shortages are proactively addressed and are monitored at the senior management executive, and board level to ensure hiring and training requirements are met.

2.3 Performance Assessment, Improvement and Management Review

Self-Assessment

Self-assessments are an internal evaluation of the effectiveness of programs, processes, or performance areas. Self-assessments are structured in an objective process where PLNGS confirms that work activities meet the requirements of the PLNGS Management System as well as identify opportunities for improvement. The intent of a self-assessment is to improve based on best practices or address potential issues in a proactive manner. The self-assessment process is defined in *SI-01365-A062, Self Assessments and Benchmarking* (Reference 15).

Benchmarking

Benchmarking is the active learning from other organizations. It is a practice of comparing products, processes and practices against internal and external organizations in order to achieve continuous improvement. Through the use of benchmarking, PLNGS can identify opportunities for improvement, provide continuous improvement and correct performance gaps by observing and learning from other organizations. It also provides a fresh perspective and lessons learned from other organizations that can be applied to PLNGS. The benchmarking process is defined in *SI-01365-A062, Self Assessments and Benchmarking* (Reference 15).

Nuclear Oversight Group

Independent Nuclear Oversight provides the organization with an ongoing perspective of performance, with a principal focus on nuclear safety, Station reliability, and emergency response effectiveness. Through evaluations, investigations, audits, and assessments of performance, independent nuclear oversight verifies that nuclear safety standards and regulatory requirements are met and promotes continual improvement. These are conducted through:

- Internal compliance audits
- Surveillances
- Performance assessments
- Functional area monitoring.

These activities are defined in *SI-01365-A88, Performing Internal Independent Nuclear Oversight* (Reference 16). Nuclear Oversight has conducted more than 94 internal independent oversight evaluations since 2016.

2.3 Performance Assessment, Improvement and Management Review, Continued

In 2018, the Chief Nuclear Officer (CNO) approved the development and implementation of a Nuclear Oversight (NOS) compliance audit schedule which is a risk-based auditing approach, whereby the PLNGS Management system process audits typically would not exceed a four-year frequency.

The intent is that processes and programs assessed to be of higher significance based on past performance and process health, will be audited more frequently than those assessed to be of lower risk.

The Nuclear Oversight Group maintains a close connection with industry peers through the Nuclear Quality Management Leadership group and WANO, which has enabled the PLNGS Nuclear Oversight staff to participate in training, conferences, benchmarking, and external assessments. Nuclear Oversight also depends on industry peers to evaluate our process and determine if it is adequately developed, documented, and effectively implemented. In 2018, Nuclear Industry Evaluation Program (NIEP) performed an evaluation and determined that the PLNGS independent oversight functions are effective. The next evaluation is scheduled for the fall of 2021.

External Nuclear Oversight

External nuclear oversight is provided through the Nuclear Safety Review Board (NSRB) and Corporate Nuclear Oversight Team (CNOT). The NSRB and CNOT are established to ensure that the requirements and objectives of the NB Power Management System are being achieved.

The NSRB performs the following activities:

- Provides the Chief Nuclear Officer (CNO) with an external assessment of activities at PLNGS that may impact nuclear safety and performance.
- Observes and reviews any aspect of nuclear performance related to safety, productivity, human performance, material condition and reliability.
- Reports on the effectiveness of the nuclear oversight function including the effectiveness of nuclear oversight audits by identifying risks to Station performance improvement.
- Communicates directly with NB Power personnel on matters of NSRB interest.
- Provides advice on lessons learned and good practices from the nuclear industry, as applicable and makes recommendations on improving nuclear safety and performance.
- Provides results of assessments, including recommendations, to improve performance to senior management.

2.3 Performance Assessment, Improvement and Management Review, Continued

External Nuclear Oversight, Continued

The CNOT performs the following activities:

- Monitors and provides oversight of PLNGS with the goal of ensuring long-term safe and reliable operation.
- Ensures there are appropriate processes and procedures developed and fully implemented to deal adequately and effectively with the following:
  - Nuclear safety
  - Nuclear safety culture
  - Conventional safety
  - Quality management
  - Risk identification and management
  - Regulatory matters including licences
  - Station reliability
  - Personal human performance.
- Engages and receives advice from corporate nuclear peers as appropriate.
- Ensures processes and procedures used at PLNGS are consistent with external corporate policies and expectations to ensure PLNGS is comparing itself to world-class performance.
- Participates in meetings and time on-site to provide oversight.

External nuclear oversight is defined in *SI-01365-A234, Providing Nuclear Safety Oversight* (Reference 17).

CNSC Staff

The CNSC ensures compliance to the Nuclear Safety and Control Act (NSCA) through Application Assessments, the Annual Compliance Report (ACR), Type I, Type II, Desktop and Field Inspections.

Application Assessments are reviewed by the CNSC to ensure the applicant is compliant with the NSCA and regulations. These cover new licence applications, amendment requests or renewal applications.

PLNGS submits the Annual Compliance Report by outlining the activities performed, including such information as transfers, purchase, disposal of nuclear substances and radiation devices; dosimetry information; and inventory changes in the radiation protection program.

2.3 Performance Assessment, Improvement and Management Review, Continued

CNSC Staff, Continued

The CNSC staff performs Inspections of licensee programs and processes in a systematic manner that ensures all safety areas are reviewed within a given timeframe. This systematic review process ensures that the CNSC can report on the performance of the licensees annually to the Commission. The findings of inspections are recorded in regulatory reports and sent to the licensees under formal correspondence and tracked to closure with specific Action Item numbers.

Figure 5: CNSC Inspection

Correspondence from a Regulator is entered into the PLNGS Corrective Action Program (CAP) and assigned to a department to track a commitment or Action Item. PLNGS evaluates resolution options and assesses the impact of the resolution strategy on Station resources. PLNGS prepares and forwards a formal response to the Regulator. To track the progress of Action Items and commitments, Action Item Leads, Managers and the CNSC engage in Bi-Annual Action Item Progress Meetings.

2.4 Operating Experience (OE)

Corrective Action Program

To ensure that PLNGS is a learning organization, it is essential that events and event precursors are investigated, and appropriate actions implemented in a timely manner.

By using a systematic process of event investigation to identify the causes of events, the process significantly contributes to the Station's continual improvement initiatives in the areas of safety, quality, and reliability. The CAP is defined in *SI-01365-A063, Implementing the Corrective Action Process* (Reference 18).

Station events may be formally reportable to the CNSC or other Regulatory Agencies or may simply be an undesirable occurrence that was not planned or expected. All staff in the organization report and record events through the Corrective Action Program (CAP). Implementation of associated corrective actions minimizes the potential for recurrence of similar events. The identification of events, or possible business process opportunities also serves as the basis for a strong Nuclear Safety culture.

Trending

Trending identifies degrading or potentially degrading Station conditions based on the analysis of previous events and Station data. These low-level issues can be viewed as precursors to more significant events. The objective of trending is to proactively identify an adverse trend so that appropriate actions can be directed to prevent a significant event. Corrective actions that address these deficiencies are implemented through the CAP.

Performance Metrics

The CAP Health Index is the main metric for evaluating performance improvement and the CAP. The index is a monthly compilation of four inputs. The inputs include:

- Effectiveness reviews
- Timeliness of corrective actions
- Timeliness of condition evaluations
- Trending program.

2.4 Operating Experience (OE), Continued

Performance Metrics, Continued

Oversight of the CAP is provided via the Corrective Action Review Board (CARB), Department Corrective Action Review Board (DCARB) and the Management Review Meeting (MRM).

The focus and oversight have been and continues to be on our corrective action timelines to ensure risk is mitigated and managed. PLNGS has made improvements to our indicator over the licencing period to further challenge ourselves on continuous improvement regarding timelines and product quality.

Operating Experience Program

The Operating Experience (OE) Program is designed to learn from industry experience, Station events, best practices, and results of research and development. The objective is to prevent the reoccurrence of Station and industry events through the effective sharing and use of industry operating experience. The OE Program enhances safety and reliability at PLNGS by encouraging communication between all levels of Station operations and the nuclear industry.

Evaluation of PLNGS and industry operating experience provides an opportunity to capitalize on lessons learned. The Operating Experience Group screens both PLNGS and industry experience to identify these opportunities.

Lessons learned are communicated to PLNGS staff and relevant external contacts. The Operating Experience program is defined in *SI-01365-T032, Using Operating Experience* (Reference 19).

2.5 Change Management

PLNGS has processes in place to ensure that change is controlled, including the revision, updating, or addition of processes, procedures, and practices to ensure that safety and regulation implications are considered. These processes establish a framework through which changes to the organization, processes, designs, materials, and documents are identified, justified, reviewed, approved, and implemented.

Improvements to the Change Management process have been implemented to reflect industry best practice, ensuring changes are implemented efficiently and effectively. Change Management is directed from *PRR-0060-DM-01, Direct and Manage the Business*, (Reference 20) and *SI-01365-A076, Managing Change* (Reference 21).

2.6 Safety Culture

Nuclear Safety is the primary focus of Station activities. NB Power recognizes the need to promote nuclear safety excellence. In support of its Nuclear Safety Policy, NB Power continues to actively monitor its nuclear safety culture and challenge itself to continuously improve.

Figure 6: Procedural Adherence

The mechanisms for fostering and continually strengthening a healthy safety culture cascade throughout the management systems within the Corporation.

NB Power periodically evaluates its safety culture to recognize positive attributes and identify areas for further improvement. External evaluations that help to monitor the overall health of the safety culture include industry evaluations and evaluations by teams such as the NSRB and CNOT. Internal mechanisms such as nuclear oversight audits, self-assessments, industry benchmarking, behavioural observations, the CAP, and site performance trends are also used.

These process inputs are assessed in an ongoing review of the health of the safety culture, and formal management oversight mechanisms are designed to monitor and assess the health of the safety culture in an integrated fashion. A healthy safety culture underpins high levels of performance in all 14 CNSC Safety and Control Areas. Safety culture is assessed at PLNGS through *SDP-01368-A044, Conducting Nuclear Safety Culture Assessment and Nuclear Safety Culture Monitoring Panel* (Reference 22).

2.6 Safety Culture, Continued

REGDOC 2.1.2, *Safety Culture* was published in April 2018. PLNGS provided an implementation plan to the CNSC which will be fully implemented in 2021.

NB Power conducted a comprehensive nuclear safety culture self-assessment in the late fall of 2016. The assessment was carried out in two parts: a survey of NB Power employees; and an interview process to validate the survey responses and gain additional insights.

The 2016 assessment revealed there is a healthy nuclear safety culture that values nuclear safety over other competing priorities such as production. NB Power utilizes 10 nuclear safety culture "action statements" derived from the Institute of Nuclear Power Operators (INPO) document, *Traits of a Healthy Nuclear Safety Culture*. The action statements provide information on what the traits mean to all employees at NB Power.

The 2016 assessment results showed significant improvements in almost every area in comparison to the 2014 assessment, even in the areas where the 2016 assessment had identified as issues to monitor. The improvement was driven by:

- The organization has become more focused and self-aware.
- Previous improvements had time to become embedded in the culture.
- The organization has been self-critical and striving for change.

Some of the assessment areas that were identified as focus areas included:

- Equipment reliability
- Capability and experience
- Hiring process.

Actions taken by NB Power to address these focus areas include:

- ERI guideline adoption to Revision 4 which sets more challenging targets for sub-indicators and maintaining alignment with industry.
- Increased focus on succession planning as well as targeted AOOM training for management.
- Hiring process changes where inputs are now weighted differently than in the past.

NB Power is scheduled to conduct another safety culture assessment in 2021.

2.7 Configuration Management

PLNGS has established the following processes (References 23, 24, 25) to assure that the Station is operated and maintained within the limits prescribed by the design and licence basis:

- *PRR-00660-OP-01, Control and Monitor Station Equipment*
- *PRR-00660-MA-02, Provide Planning and Scheduling Services*
- *PRR-00660-MA-03, Perform Maintenance.*

These processes ensure that Station status changes are controlled and apply to changes in Station status resulting from operations, maintenance, or temporary design modifications, including all work that requires work authorization and meets the criteria for a Plant Status Change Record.

The Station uses the SAP® software package, *Work Clearance Application* for configuration management when maintenance is performed on Station equipment. In addition to configuration control for maintenance and operations purposes, this software addresses work planning, authorization, safe working environment, testing requirements, and documented auditable records and work history. The configuration of equipment manipulated outside of the maintenance process is controlled using approved operating procedures (Operating Manual Test, Standard Operating Sequences, or Operating Orders).

Field equipment and systems, including software, are assigned a unique identification to assure that operations activities are correctly implemented, verified, and recorded. This identification ensures effective support for operational configuration management.

Operating staff are trained to operate systems and equipment in accordance with the design and licence basis. Processes and procedures are in place to safely maintain configuration control during Station operation and to accommodate permanent and temporary Station changes. Design Configuration is addressed in *Section 6.1*.

PLNGS has several initiatives in place to improve performance. The following improvement initiatives are ongoing:

- Observation and Coaching programs for coaching and correcting. This also includes coach the coach “paired” observations to help with leader mentoring.
- Focused observations on procedure use and adherence and pre-job briefs.
- Crew report cards are utilized for crew level reporting, accountability, and improvements.
- Leadership training has been conducted for all supervisory positions.
- Operator fundamentals are utilized to measure and improve performance.

2.7 Configuration Management, Continued

- A standing Work Protection Steering Committee is in place to improve the Work Protection process.
- Outstanding Operator Burdens and Operator Workarounds have become a Station focus with mitigating measures in place.
- A cross-functional review and revision of the Work Protection process with a focus on human factors has been completed.
- A previously certified incumbent in the capacity of Work Protection Supervisor has been employed.
- Plant Status Control records are incorporated into the SAP program.

Forthcoming improvement initiatives include the following:

- Continue with Human Performance initiatives including more training and dynamic learning activities.
- A flowsheet revision backlog reduction initiative.

2.8 Records Management

The production and control of PLNGS documents and essential records is done through the *PRR-00660-SU-09, Provide Documents and Records* process (Reference 13). The process for developing, revising, controlling, and distributing documents, drawings, forms, and templates ensures personnel have access to current versions of documents and specified processes and practices are used. Improvements continue to be made to strengthen our Records Management process through focused communication efforts, improved document review process, and improvements in our documentation to ensure records are identified correctly.

The SU-*9, Provide Documents and Records* process will be greatly impacted by the OpenText Content Server Implementation Project with the introduction of automation to enhance our Records Management process.

2.9 Management of Contractors

When requesting materials or services from outside vendors, PLNGS specifies the technical and quality requirements and selects vendors capable of satisfying these requirements. The process that governs these activities is *PRR-00660-SU-12, Provide Materials and Services* (Reference 26) and in accordance with the New Brunswick Procurement Act (S.N.B. 2012, c20).

2.9 Management of Contractors, Continued

PLNGS provides oversight to supplemental personnel to ensure they receive adequate orientation, training, support, and direction in order to carry out their work assignments and ensures that the actions of supplemental personnel conform to the standards and expectations defined in the PLNGS Management System. This is covered in *SDP-01368-PD09, Providing Oversight of Supplemental Personnel* (Reference 27) in the SU-10 process. In addition to this, there are other independent means to ensure compliance, which includes but is not limited to:

- *SI-01365-A085, Assessing and Monitoring Supplier Performance* (Reference 28) in SU-11 through the Vendor Quality Assurance group
- *PRR-00660-DM-03, Manage Independent Nuclear Oversight* (Reference 29) through the Nuclear Oversight group
- *SI-01365-A131, Human Performance Process (*Reference 30*)* through the Performance Improvement group.

Figure 7: Supplemental Personnel

2.10 Business Continuity

Business continuity at PLNGS encompasses a broad range of processes to address various natural, human, and technical threats. These risks are continuously reviewed to ensure proper risk management and the ability for PLNGS to recover from disruptions. Annual drills and exercises are conducted against the various scenarios.

SI-01365-EP02, Emergency Response Plan (Reference 31) describes the process and arrangements in place for responding to a contingency at PLNGS in a timely, effective, and coordinated manner. This process invokes coordination with the New Brunswick Emergency Measures Organization (NB EMO) and various levels of government to ensure the safety of the public.

2.10 Business Continuity, Continued

SDP-78660-0001, Pandemic Response Plan (Reference 32) defines the plan for recognizing and managing an influenza pandemic, maintaining essential services, and reducing the economic and social impact.

A pandemic outbreak has the potential to compromise NB Power operations due to a large number of employees out sick, or caring for sick family members, combined with possible disruptions to the movement of goods and services. The NB Power Pandemic Response Plan is intended to mitigate the impact of a pandemic outbreak and help meet NB Power's commitment to providing a reliable supply of electricity to our customers while protecting the safety of our workforce, their families and our business contacts.

Recently, in light of the COVID-19 pandemic, PLNGS has been using this plan in addition to risk management processes and procedures specific to COVID-19 that align with all provincial public health guidance. PLNGS has shown the ability to continue to safely and reliably provide electricity to its customers while minimizing the risk to its employees, community, and the public.

Shift complement is defined in *SDP-01368-P036, Meeting Operations Staffing Requirements* (Reference 33). The Emergency Response Team (ERT) requirements are also covered in this document. This procedure defines complement numbers and staff certification that is required.

3.0 Human Performance Management

3.1 Human Performance Program

The Human Performance Program defines how PLNGS plans, implements, detects, and corrects human performance-related activities to ensure safety is the paramount consideration guiding decisions and actions.

In addition to the human factors program, PLNGS management recognizes that an understanding of the role of human performance in safety, supported by leadership and employee behaviours, will help prevent of human error-related events. Human Performance standards and expected behaviours are defined, established, and incorporated in our process, procedures and training delivered by *SI 01365-A131, Human Performance Process* (Reference 30). This is supported by a Human Performance Steering Committee. It includes the following elements:

3.1 Human Performance Program, Continued

- Delivering human performance training.
- Conducting timely analysis or investigations of human performance issues.
- Learning from events in order to improve human performance.
- Maintaining up-to-date knowledge of human performance developments in the industry, regulatory, and international environments.
- Responding to Performance Indicator trends.
- Observing and coaching field activities, which mitigates risk to employees and the business by reinforcing high standards and expectations.
- Identifying and reporting problems.
- Using a human performance simulator for dynamic learning in error prevention techniques.
- Improving continually through our excellence plans as a learning organization.

The improvements are then implemented though the CAP, which has seen many changes throughout the licence period:

- PLNGS goals focused on decreasing Station and Department clock resets.
- Implementation of a new group learning process in accordance with *SDP-01368-CA04, Screening a PICA* (Reference 34).
- What Excellence Looks Like (WELL) sheets were expanded and improved.
- Weekly Human Performance tool of the week program combined with weekly Human Performance focus hours.
- Implementation of an Outage Standards Team utilizing observation and coaching to ensure high standards of conduct for staff at PLNGS during planned maintenance outages.
- Mission Station Handbook Human Performance tool information added for quick reference for all Station staff.
- Attendance at HU conferences.

The primary intention of a Human Performance Program is to create continuous improvement within the organization and to reduce the potential for human error through the use of appropriate analysis methods or techniques. The advantages of this are in improved safety, quality, and efficiency.

PLNGS practices contribute to excellence in human performance by integrating aspects into the Management System.

It was noted in a 2019 Type II Inspection Report (GPLRPD-2019-02486) that NB Power went beyond the expected implementation of human performance tools, and observation and coaching in the field. Efforts for continual improvement included trend analysis, self-assessments, consideration of a range of performance metrics, and benchmarking with other Nuclear Power Plants (NPPs).

3.1 Human Performance Program, Continued

One measure used to evaluate the overall health, reliability and robustness of the Station's Human Performance Program is the Site Event Free Clock Resets (SEFCR). In 2020, PLNGS achieved its best performance in regard to SEFCR reaching 1071 days since our last reset putting us at top quartile performance. PLNGS has also focused on improving its Department Event Free Clock Reset (DEFCR). Reducing our SEFCRs, DEFCRs and focusing on lower-level group learning continues to improve our performance. The Station's performance over the past licencing period speaks to the improvements implemented under the human performance excellence plans and engagement from Station Staff.

Planned Improvements

Further initiatives are being progressed focusing on observations in the field. Through field observations, PLNGS reinforces standards and behaviours. In addition, PLNGS identifies low-level behaviours that could act as leading indicators. This will support proactively identifying trends for areas to focus on reducing the likelihood of human error and events.

Further to this, driven from our excellence plan, activities will be progressed in the area of predictive indicators learning from the previous running and planned outage operating experience targeting specific behaviours, activities, and area of focus. Continuation of leadership training activities will also focus on reinforcement of what good looks like in the area of human performance.

Figure 8: Observations in the Field

3.2 Personnel Training

Employees receive *initial* and *continuing* training pertinent to their position. Details of the PLNGS Systematic Approach to Training (SAT) are defined in *PRR-00660-SU-03, Provide Training* (Reference 35). This document, in combination with internal training procedures, defines the key activities involved in our training process and is compliant with *REGDOC 2.2.2, Personnel Training.*

Figure 9: Personnel Training

To ensure training programs are continuously evaluated and maintained current due to physical changes during operation or changes to an operational state, training oversight committees consisting of training and line representation are established.

These Training Oversight Committees are:

- The Curriculum Review Committees (CRC*)* – is a working level committee with the primary role to review changes that may affect training and to review department performance to determine opportunities for improving performance through training.

- The Training Review Groups (TRG) – evaluates the respective training program effectiveness based on online performance and reviews the training program health (using Health of Training (HoT) Reports), student/instructor feedback, observation and coaching data, and corrective action trends. The TRG ensures training program shortfalls are identified, assessed, and corrected and verifies that training achieves expected results.

3.2 Personnel Training, Continued

- The Senior Training Council (STC) – is a forum for senior leaders to examine training programs and to provide direction. This Council is a strategic committee for optimizing training in order to improve Station performance. The STC provides this oversight to ensure early detection of training program shortfalls and sustainability of corrective actions.

The site has a full-scope simulator used by operations to support certified initial and continuing training programs. Additional details are outlined in *3.3 Personnel Certification* section below. The site also has a Fuel Handling simulator which is used in initial and continuing training for Fuel Handling Panel Operators.

Over the last licence period we have completed the following initiatives:

- Revised the process documents for the implementation of SAT to align with the industry best practices. The basis of this revision was the INPO *NISP-TR-01, Systematic Approach to Training* document. See *SI-01365-TR25, Systematic Approach to Training Process* (Reference 36*)*. This revision has simplified the process for the end-users in the training department.

- Implemented a Learning Management System (LMS). This modern LMS program is in place for the tracking of qualifications, providing automatic updates via email for upcoming scheduled training and identifying expiring qualifications and is an upgrade from our previous qualification tracking system. LMS also hosts our Computer Based Training (CBT) courses and will update records automatically on successful completion.

- The Control Room Operator Initial Training Program is comprised of: General Science Fundamentals, Station Specific Knowledge, Radiation Protection and Simulator Training. We have made several improvements including the selection process, updated training material and candidate preparation in order to improve candidate throughput.

  Other important improvements planned going forward include:

- Align with the Industry practice of using a multiple-choice question test for the Science Fundamental certification exam for the 2021 class of trainees, resulting in improved evaluation of candidate knowledge and efficiency in exam preparation and grading.

3.2 Personnel Training, Continued

- Development of a Control Room Operator internship training program. This pilot training program selects candidates with relevant post-secondary education and provides them with the required pre-requisite training and on-the-job experience necessary to being Certification Training as outlined in the *REGDOC 2.2.3, Personnel Certification* requirements.

- Development and Implementation of additional Computer-Based Training courses. Analysis of existing non-CBT courses will be completed to determine which courses can be converted over to CBT to reduce the amount of classroom and instructor time required to maintain qualifications.

Management and Leadership

PLNGS offers a Management Development Program (MDP) designed to develop leadership, managerial, and administrative skills for frontline and mid-level leaders. The program provides up-to-date knowledge and tools supervisors require for managing their operational and people resources while creating an environment centred on employee engagement, employee well-being, and performance.

The MDP provides those who supervise or manage the work of others with a framework of learning opportunities centred on the necessity of corporate direction, alignment, engagement of others to drive results, performance management, and use of active management behaviours such as coaching and feedback. The MDP program also establishes the framework to provide the expectation for the use of skills, knowledge, and tools to be applied in the work environment to manage day-to-day operations and sustain achievements. Yearly schedules have been developed and staff continue to progress through the program.

3.3 Personnel Certification

The Certified Staff Training Program is based on the Systematic Approach to Training as required by *REGDOC 2.2.3, Personnel Certification.* Certified Staff Training Programs are described in the following (References 37, 38, 39):

- *TPD-97170-01, Control Room Operator Candidate Training Program Description*
- *TPD-97177-01, Shift Supervisor Incremental Training Program Description*
- *TPD-97179-01, Certified Staff Continuing Training Program Description*.

3.3 Personnel Certification, Continued

Initials Certification training is divided into Control Room Operator and Shift Supervisor training. Both Control Room Operator and Shift Supervisor "initials" training is comprised of knowledge-based training in combination with on-the-job and simulator training before co-piloting in the position under the direction of a Certified incumbent. All aspects of knowledge and performance are evaluated in accordance with *REGDOC 2.2.3, Personnel Certification*.

Continuing Certification training for Control Room Operators and Shift Supervisors is comprised of knowledge and simulator training followed by evaluations that confirm candidate performance. Continuing training sessions are conducted a minimum of six weeks a year.

Continuing training sessions include both design basis and beyond design basis scenarios. Cross-functional training activities are utilized with Emergency Response organizations to evaluate and improve proficiency.

Figure 10: Certified Staff Training

3.4 Initial Certification Examinations and Requalification Tests

PLNGS verifies that persons seeking certification or renewal of a certification by the CNSC for a position referred to in the licence are qualified to carry out the duties of that position in accordance with the Nuclear Safety and Control Act and the regulations as described in *REGDOC 2.2.3, Personnel Certification*. Testing requirements are conducted in accordance with:

- *EG1: Requirements and Guidelines for Written and Oral Certification Examinations for Shift Personnel at Nuclear Power Plants*
- *EG2: Requirements and Guidelines for Simulator-Based Certification Examinations for Shift Personnel at Nuclear Power Plants*
- *Requirements for the Requalification Testing of Certified Shift Personnel at Nuclear Power Plants.*

Qualified Examiners design, develop, conduct, and grade Certification Examinations in accordance with *REGDOC 2.2.3, Personnel Certification*. Rigorous standards and processes are in place to verify that Certified incumbents have the required knowledge and skills necessary to safely operate the Station utilizing approved procedures.

Senior Health Physicist

PLNGS also has a certification training program for the Senior Health Physicist based on the requirements specified in *REGDOC 2.2.3, Personnel Certification* and Station-specific Job and Task Analysis results.

PLNGS meets these requirements for the Senior Health Physicist by the following defined training program captured in:

- *TPD-97215-01, Senior Health Physicist Certification Training Program Description,* (Reference 40)

3.5 Work Organization and Job Design

Minimum Shift Complement

The minimum shift complement refers to the minimum number of qualified workers required to be on-site to support safe unit operation and respond to design basis events. PLNGS uses a computer-based scheduling system that ensures compliance with the minimum complement requirements and enables the Station to maintain historical auditable data. *SDP-01368-P36, Meeting Operations Staffing Requirements* (Reference 33) documents how PLNGS meets the requirement for minimum shift complement and complies with *RD-01364-L03*, *Operating Policies and Principles (OP&Ps) Section 0.05* (Reference 41) and meets *REGDOC 2.2.5, Minimum Staff Complement*.

3.6 Fitness for Duty

Fitness For Duty

A Fitness for Duty Program is a set of planned activities and processes coordinated by employees, supervisors, and Human Resources to ensure that personnel are capable of performing duties and responsibilities associated with their position.

The Fitness for Duty Program at PLNGS is an integrated approach to holistic wellness. PLNGS has a team dedicated to positive wellness programming, monitoring and support. Fitness for Duty is a physical and mental health status that permits the performance of essential job duties in an effective manner and protects the health and safety of other workers and the public.

In addition, the Continuous Behaviour Observation Program (CBOP) provides guidance to employees, contractors, and supervisors to detect negative behavioural changes by an individual that may warrant a change in permissions to the Station and possible action by Human Resources and/or Security.

Hours of Work

PLNGS hours of work limitations ensure that the time worked by Station staff does not cause levels of fatigue that compromise the:

- Safety of the public
- Safety of those performing work
- Safe operation of equipment
- Quality of the work performed.

Workers on full shift assignments routinely monitor themselves and co-workers for signs of fatigue. Symptoms of fatigue and strategies for preventing fatigue are governed in *SDP-01368-A031, Implementing the Fitness for Duty Program* (Reference 42).

As part of PLNGS' commitment to safety within human factors, *SI-01365-A106, Controlling Hours of Work for Regular Shift Workers* (Reference 43) and *SI-01365-A045, Controlling Hours of Work for Regular Day Workers* (Reference 44) identify the following:

- Responsibilities of staff and Station leadership
- Limitations
- Approval for Exceptions
- Monitoring for Symptoms of Fatigue
- Monitoring Effectiveness of Limits.

3.6 Fitness for Duty, Continued

Hours of Work, Continued

A refresher for staff and leadership of expectations is communicated for Controlling Hours of Work for both Regular Day Workers and Regular Shift Workers prior to planned maintenance outages.

NB Power has implemented a new shift schedule at the beginning of the year 2021 in accordance with the REGDOC 2.2.4, *Volume 1, Managing Worker Fatigue*. This schedule supports the requirement of additional employees added to the impacted departments, providing support to maintain the minimum compliment requirements.

Managing Alcohol and Drug Use

NB Power is committed to providing a safe environment for all employees. *REGDOC 2.2.4, Fitness for Duty, Volume II: Managing Alcohol and Drug Use*, outlines requirements and guidance for managing worker fitness for duty with respect to alcohol and drug use. Since 2017, NB Power has been collectively working with a team of professionals and industry through the CANDU Owners Group, to establish a framework and change management plan to implement and become compliant with the provisions of this *REGDOC*. These provisions include an alcohol and drug testing program on-site, and NB Power has committed to becoming compliant to the requirements of *REGDOC 2.2.4* except for random testing in 2021. Full compliance with random testing requirements will be completed by early 2022.

Workplace Total Health

NB Power is committed to addressing the health needs of employees and their families before, during and after the occurrence of issues that may affect their overall wellness. Total health includes both our mental and physical well-being and is interdependent on one another. The primary goal for mental and physical fitness is prevention and therefore the focus is on providing employees with the necessary education and supporting the initiative to enable them to proactively manage their own health.

In the event that an employee does become ill or injured, NB Power supports creative and holistic approaches to early intervention, specifically designed for each individual, fostering an increased awareness of total wellness. This strategy has proven to both reduce recovery time and facilitate a far more seamless re-integration into the workplace; while at the same time promoting a better informed, more engaged workforce with an increased interest in making healthy choices.

3.6 Fitness for Duty, Continued

Workplace Total Health, Continued

Total Health at NB Power includes:

- Prevention: Employee and Organizational Health Education
  - Employee and Family Assistance
  - Workplace Mental Fitness
  - Health Lifestyles.

- Early Intervention: Employee Absence and Disability
  - Short Term Sick Leave
  - Long Term Disability.

- Support: Accommodation
  - Timely Recovery and Return-to-Work.

Managing Relationships in the Workplace

The Relationship Management Program is intended to improve relationships between employees and supervisors with a vision of employees and teams performing at their best. Supervisors learn what the employee requires to be successful, the skills and knowledge they bring to the table, as well as any barriers to performance. Employees have the opportunity to discuss their department vision, as well as discuss their professional aspirations or topics of interest. Stronger relationships lead to stronger teams.

Prevention Programs

To help achieve NB Power's vision of Healthy Employees in a Healthy Environment, the Workplace Total Health Strategy for NB Power focuses on learning and support and addresses the needs of employees and their families before, during and after issues that may affect their well-being. By implementing a comprehensive, integrated well-being strategy, employees are:

- offered programs to identify health risk
- assisted in their recovery if they become ill or injured
- offered learning opportunities to enhance their total well-being (e.g., flu clinics, blood pressure measurement, blood sugar clinics, physical activity programs, ergonomic assessments)
- offered physical fitness instruction to ensure individuals continued ability to meet physical requirements of the job, where such requirements exist.

3.6 Fitness for Duty, Continued

Supportive Programming

NB Power employees play an integral role in achieving high standards. Their regular attendance is necessary for employee and employer success. NB Power is committed to assisting employees to achieve and maintain a high standard of attendance that emphasizes the value that is placed on each individual and a healthy work force. This program identifies the potential for risk in attendance and offers assistance to individuals and supervisors. With early intervention, the seriousness of a condition may be minimized.

Accommodation

Regardless of lifestyle, employees may require assistance in recovery or accommodation in the workplace due to a medical, physical, or mental condition. This is a structured program to assist employees in reaching optimal well-being. It is a voluntary program to help employees recover from illness, injury, or surgery at home through participation in alternate work or learning. Permanent accommodation may be necessary when an employee's previous level of functioning is not possible. Successful accommodation initiatives require the cooperation, input, and support of all parties: the employer, the employee seeking accommodation, the medical advisors, bargaining agents, and the employees in the workplace community.

Employee and Family Assistance Program (EFAP)

The Employee and Family Assistance Program (EFAP) is a support program developed jointly between NB Power and the International Brotherhood of Electrical Workers (IBEW). It is a voluntary, confidential, short-term counselling, advisory and information service for employees and dependent family members. The EFAP can help with personal problems affecting the employee's family life, work-life, or general well-being. The EFAP provides access to confidential counselling services, an informative wellness website, a mobile app, manager support, legal consults, financial consults, workshops on smoking cessation, stress management and depression and so much more.

Records Legal

NB Power employs Occupational Health Nurses**.** These professionals respect the right of people to have control over the collection, access, use, and disclosure of their personal information. Reasonable measures are taken when conversing with a person receiving care to protect confidential information. The collection, use, storage, and disclosure of health information are in accordance with *Chapter P-7.05, Personal Health Information Privacy and Access Act Service New Brunswick*. NB Power respects policies that protect and preserve people's privacy, including safeguarding information and medical files. Personal Health Records are kept up to 100 years from the date of the last entry.

4.0 Operating Performance

4.1 Conduct of Licensed Activity

Operations Program

PLNGS implements and maintains an Operations Program, comprised of a series of standards, processes and procedures that ensure the safety of the public, environment, Station personnel and Station equipment as well as high levels of equipment reliability during both normal operation and potential accident conditions.

This program establishes safe operating practices and processes that provide nuclear professionals with the ability to ensure that PLNGS facilities are operated in a manner consistent with *PROL 17.01/2022, Power Reactor Operating Licence* (Reference 4*); RD-01364-L03, Operating Policies and Principles (OP&Ps)* (Reference 41); *RD-01364-L23, Solid Radioactive Waste Management Facility Operating Policies and Principles* (Reference 45); and the Safe Operating Envelope (SOE) limits. These are, in turn, compliant to *CSA N290.15, Requirements for the Safe Operating Envelope of Nuclear Power Plants* and other applicable regulations and standards. In abnormal operating conditions, PLNGS has Abnormal Plant Operating Procedures, Emergency Operating Procedures, Emergency Mitigating Equipment (EME) Guidelines and Severe Accident Management Guidelines (SAMG) in place.

Nuclear Safety is paramount to NB Power; therefore, PLNGS must ensure that nuclear safety is maintained at all times. To accomplish this, NB Power has adopted the *defence-in-depth* concept where multiple overlapping engineered, administrative and people-based barriers are in place to protect the public, environment, and Station personnel.

Engineered barriers begin by having a robust design and highly reliable and well-maintained processes and safety systems. Administrative barriers include robust programs and processes as well as high-quality procedures that define quality operation and support. PLNGS ensures that both certified and non-certified staff are well-trained and engaged in operating our facilities in accordance with the traits of a healthy nuclear safety culture. The Operator Fundamentals are consistently applied and understood to ensure a foundation of Operational Excellence and event-free operation.

PLNGS monitors Station performance through the use of industry best practice performance indicators. The indicators measure Station performance in comparison to industry performance. Regular WANO peer reviews identify areas of strength that can be shared with other operators around the world, and areas where we can learn from others to improve our own performance.

In addition, operating performance was rated Satisfactory over the last licencing period by the CNSC.

4.1 Conduct of Licensed Activity, Continued

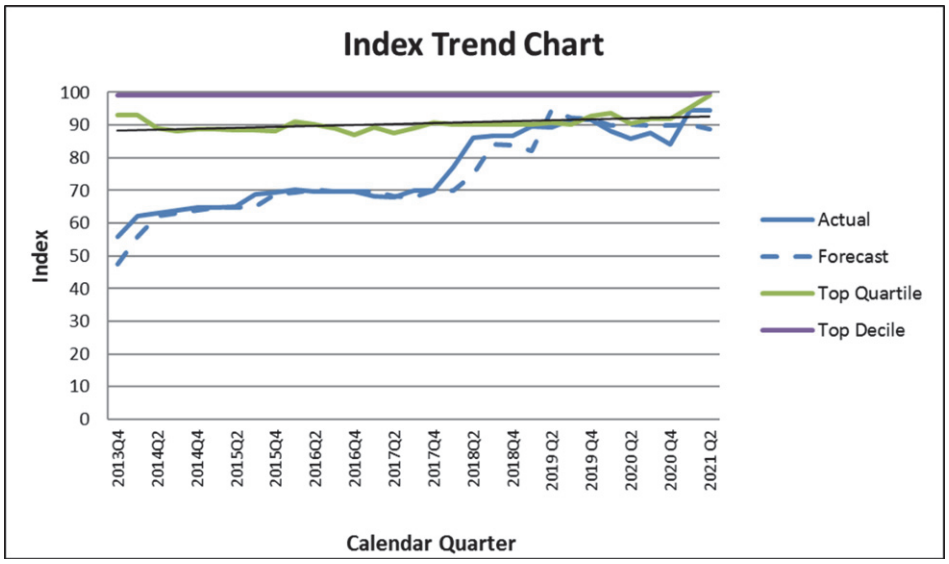

Figure 11: Index Trend Chart

PLNGS follows an industry-leading Performance Indication Index which is comprised of 10 individual metrics which sums to 100 total points. The Performance Indication Index is a measure of Station performance in comparison to industry performance.

The index focuses attention on overall Station performance and does not place undue emphasis on any single indicator.

As with any indicator, the index must be considered in the context of individual performance indicator values and trends as well as other Station performance information. Additionally, since the index is based on historical data, it typically lags current Station performance.

4.2 Procedures

Standardized procedures are essential for both safety and operational effectiveness as they support and guide employee's interactions with various systems and their response to safety-related events as well as regular work evolutions. Our focus regarding procedures is to ensure there are appropriate processes in place for the development, validation, verification, modification, and implementation of these procedures, taking into consideration human factors and performance. Procedural adherence is built into the process to ensure there are consistently demonstrated behaviours regarding procedural use and adherence at PLNGS.

4.2 Procedures, Continued

NB Power has a well-developed and defined process regarding procedure preparation, review, validation, and issuance for either newly created or revised documentation. The organization and format of the various operating procedures are based on procedure writer's guides and have been enhanced through process improvements. The procedures are verified through a rigorous review process for technical accuracy, and when deemed required are validated by a simulator, walkthrough or tabletop exercise to ensure these procedures can be performed in the field as intended while ensuring that all technical requirements of the task can be achieved. PLNGS continues to identify opportunities to enhance and improve this process to continually improve the operations procedures going forward.

4.3 Reporting and Trending

PLNGS meets the requirements of *REGDOC 3.1.1, Reporting Requirements for Nuclear Power Plants* for reporting to the CNSC and trending programs through the PLNGS Management System. The PLNGS main executive processes that govern the regulatory reporting requirements are:

- *PRR-00660-DM-04, Assess and Improve Performance* (Reference 46)
- *PRR-00660-DM-02, Manage External Relationships* (Reference 47)
- *SI-01365-A063, Implementing the Corrective Action Process* (Reference 18)
- *SI-01365-P095, Maintaining IAEA Safeguards* (Reference 48).

These processes address the obligations identified in Acts, Regulations, Licences, and Regulatory Standards that apply directly to PLNGS activities while ensuring performance measures against management, regulatory, and industry standards and expectations are identified and corrected promptly. A collection of industry-best techniques is employed for assessments, cause analysis, the use of Operating Experience, trending, audits, and corrective/commitment action management.

Trending

PLNGS submits various annual and quarterly compliance monitoring reports and performance indicators as defined in *REGDOC 3.1.1, Reporting Requirements for Nuclear Power Plants.* Trending permits both the CNSC and PLNGS to proactively determine if decreases in performance are occurring.

4.3 Reporting and Trending, Continued

Significant Events

There were no significant events at PLNGS over the duration of the current licence as recorded in the Canadian National Report for the Convention of Nuclear Safety (8th Report) and presented to the International Atomic Energy Agency (IAEA) as a signatory of the *Convention on Nuclear Safety.* Significant events are also presented to the Commission during public meetings/hearings.

4.4 Outage Management Performance

Planned outages are conducted at the PLNGS to perform inspections and undertake preventive and corrective maintenance of Station equipment that can only be performed when the unit is offline. Major scope is based on program plans, inspections, and maintenance activities ensuring that the unit runs safely and efficiently until the next planned outage.

Safety and quality are top priorities in outage planning and are paramount to successful outage execution. Outages are planned and executed focusing on nuclear, radiological, and industrial safety as well as schedule discipline. From a production perspective, three main considerations are scope, cost, and duration. The right work needs to be in scope, properly resourced to execute within a defined budget and timeframe. This is achieved through a series of formal milestones established well before the outage begins. Outage preparation and execution involve many Station organizations and individuals working together and, as such, require high levels of coordination. The overall responsibility for this coordination has been assigned to the Outage Management Department.

An Outage Management Process is in place for managing planned outages. The process includes management oversight, milestone preparation, scope identification, scope freeze and control, planning, scheduling, initiating, and executing, testing, Readiness for Service (RFS) and closing the activities that are undertaken during the planned outage.

PLNGS has implemented the standards for outage heat sink management as defined in *CSA N290.11-13, Requirements for reactor heat removal capability during outage of nuclear power plants.*

SI-01365-P074, Managing Planned Outages (Reference 49) is the procedure that governs outage preparation and execution, which falls under the *PRR-00660-MA-02, Provide Planning and Scheduling Services* (Reference 24).

4.4 Outage Management Performance, Continued

Planned Outage

Prior to planned outage execution, PLNGS establishes a timeframe for submitting outage plans and schedules to the CNSC. The level of detail in the issued schedules increases as the outage approaches, and may include:

- A listing of regulatory undertakings and commitments for the outage, and prompt written notification of any required changes to regulatory undertakings and commitments
- Outage plans that detail all major work to be undertaken
- A schedule for the submission of outage completion assurances.

The outage management program includes provisions to ensure that, following a restart of the reactor, an outage completion assurance statement is submitted to the CNSC to confirm that all regulatory undertakings and major work on Systems, Structures and Components (SSC) important to safety have been successfully completed and that the nuclear facility is safe for operation. It includes designated criteria that PLNGS will follow to confirm that planned and discovery work has been satisfactorily completed.

PLNGS has implemented a planned outage cycle of a 24-month frequency. The first of which begins in 2022. The Outage 12-year plan has been updated to reflect this change. This plan has been instituted to optimize overall outage durations, scheduling, outage preparation and aligns with current industry best practices.

Over the last licencing period, PLNGS completed a total of 417 consecutive days online between outages, beating a 26-year record.

Unplanned Outage

An unplanned outage is any unplanned or unscheduled shutdown of the Station. The purpose of the forced outage plan is to have high-priority activities pre-planned, ready to implement, and scheduled, in order to maximize the safety and efficiency of the work performed during the outage as per *PRR-00660-MA-02, Provide Planning and Scheduling Services* (Reference 24).

4.5 Safe Operating Envelope

The PLNGS Safe Operating Envelope (SOE) is defined as "the set of limits and conditions our Station must be operated within to ensure compliance with the safety analysis upon which reactor operation is licensed and which can be monitored by or on behalf of the operator and can be controlled by the operator".

The SOE consists of a number of parameters:

- Safe Operating Limits
- Conditions of Operability
- Actions and action times
- Surveillances.

The safe operating limits are derived, either implicitly or explicitly, from the safety analysis limits. The SOE parameters are documented within various Station documents including Basis documents, Implementation reports, Impairments Manuals, Operating Manual Tests, Routines and Surveillance activities.

The collective of requirements from *CSA N290.15, Requirements for the Safe Operating Envelope for Nuclear Power Plants* are contained within these documents.

The impairments manuals were derived from safety analysis limits that are collected in the various SOE documents. They serve as a bridge between those important safety parameters, which are adjusted to include uncertainties within the SOE, and how operations respond once certain limits are reached. They provide varying degrees of clear and concise responses for operations depending on the extent to which the Station approaches or exceeds the documented SOE limits.

4.6 Severe Accident Management and Recovery

PLNGS has a strong emergency management program in the area of Severe Accident Management, which ensures the safety of the public, environment, Station personnel and the Station during a highly unlikely Beyond Design Basis event. The program consists of governing documents for Severe Accident Management, Training of the Emergency Response Organization, and maintaining qualified staff that can respond to and manage any event at the Station. *REGDOC 2.3.2, Severe Accident Management Programs for Nuclear Reactors* has been implemented at PLNGS.

To support the transition from Design Basis to Beyond Design Basis events, including highly unlikely severe accidents, the Station has structured documentation that includes: Abnormal Plant Operating Procedures, Emergency Operating Procedures, Emergency Procedures, Emergency Mitigating Equipment Guidelines and Severe Accident Management Guidelines. These procedures are developed and maintained based on analyzed Design and Beyond Design Bases.

4.6 Severe Accident Management and Recovery, Continued

This guidance enhances PLNGS's ability to manage risks associated with conditions that the Station was not originally designed or intended to operate within.

Emergency Operating Procedures have been developed to provide additional Operator strategies when Abnormal Plant Operating Procedures are not effective. EOPs are entered when specific entry criteria are satisfied. Critical safety parameters are monitored, and strategies adjusted as necessary, such as the deployment of emergency mitigating equipment, in an effort to prevent the declaration of a severe accident should the latter entry criteria be met. Once a severe accident is declared, severe accident management guidelines are employed in accordance with meeting fundamental safety principles to protect our workers and the public.

To support the management of events, PLNGS has incorporated the Incident Command System (Figure 14). This system consists of the Incident Command Staff, Planning Section Staff and the Operations Section staff. The Operations Section is staffed 24/7, with the Incident Command and Planning Section having a 24/7 on-call rotation. This system supports and enhances the Station's ability to implement an "all-hazards" approach to emergency management and response.

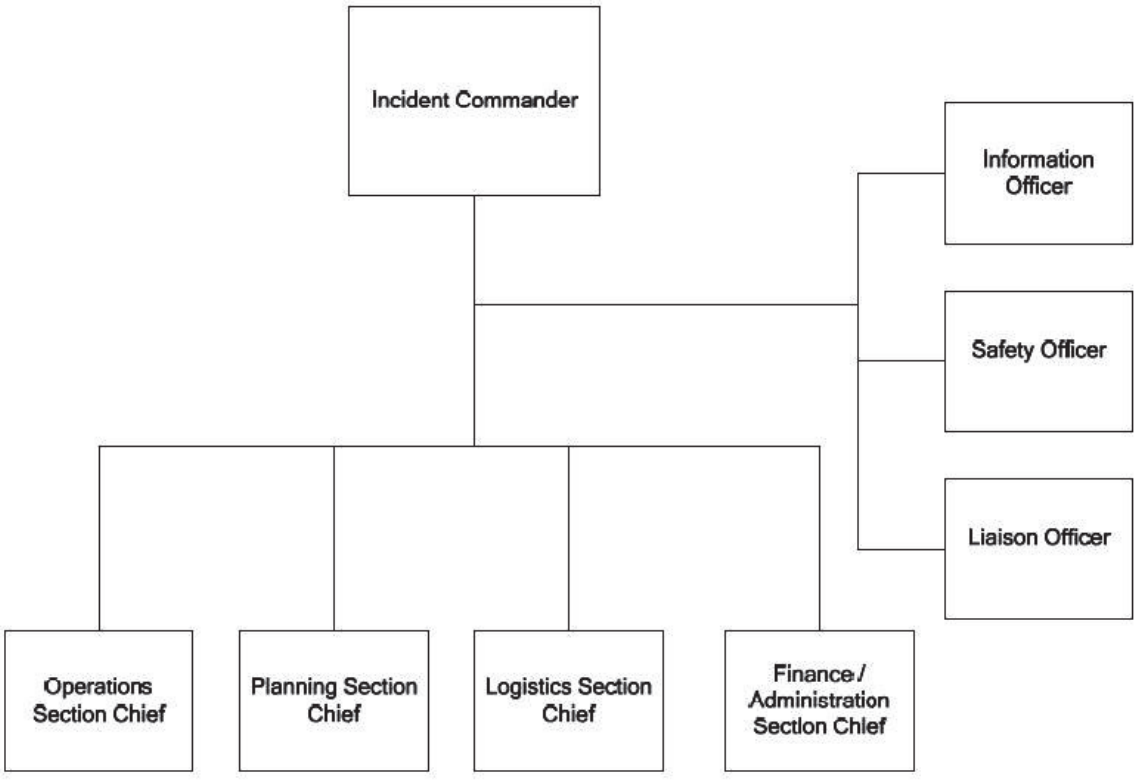

Figure 12: Incident Command Structure

4.6 Severe Accident Management and Recovery, Continued

Incident command staff provide the interface to the NB Power Corporate Emergency Response Organization, New Brunswick Emergency Response Organization (NBEMO), regulatory or other agencies, and the media/public. The Operations Section operates the Station, and the Planning Section utilizes the Severe Accident Management Guidelines to provide direction to the Operations Section in the event of a highly unlikely severe accident. During less severe events, such as a design basis accident, the Planning Section provides support as needed to the Operations Section and monitors key Station parameters.

To ensure the Station's Emergency Response Organization is adequately prepared to respond to any Design and Beyond Design Basis event, annual training and exercises are conducted with Operations, Incident Command and the Planning Section staff.

Figure 13: EME Training

The level II Probabilistic Safety Analysis (PSA) includes analysis of severe accidents and beyond design basis events (section 5.5). The severe accident analyses identify the key opportunities and timing where action can be taken to either mitigate or terminate the progression of a severe accident including, but not limited to, restoring heat sink, preserving reactor core integrity, managing containment conditions and preserving containment integrity to protect our workers and the public. Utilizing this information, additional modifications such as the calandria vault makeup line, containment emergency filter vent, main control room filter, and severe accident monitoring and sampling system were installed during the refurbishment outage to address these types of events.

4.6 Severe Accident Management and Recovery, Continued

In response to the Fukushima lessons learned, PLNGS has implemented Emergency Mitigating Equipment (EME) to enhance the Station's ability to provide greater depth and flexibility to respond to and mitigate the effects of severe accidents. This equipment allows additional depth and flexibility in supporting nuclear safety (e.g., control, cool and contain) through the use of back-up portable power generators; a portable water pump; and a portable filtered air supply unit for the secondary control area (SCA) along with other measures to ensure Operator habitability and accessibility to key Station areas. To support the deployment and operation of the emergency mitigating equipment, the Station has trained staff from Operations, Security, and the Emergency Response Team to support these roles. The emergency mitigating equipment includes:

- (Two) 545 kW portable diesel generators
- (Two) 275 kW portable diesel generators
- (One) 2500 US gallon per minute portable diesel water pump
- (One) Debris removal vehicle
- (One) Equipment hauler trucks
- (One) 2250 litre re-fueling trailer
- (One) Hose trailer
- (One) Portable filtered air supply unit.

PLNGS ensures high-status emergency equipment readiness through its preventative maintenance items, tests, and checks (Figure 18). The radiation planning basis supporting on-site and off-site emergency response is derived from the source terms determined from analysis of design basis accidents (*Section 5.1*) and severe accidents (*Section 5.5*) and applies the principles of *IAEA Safety Standard GSR Part 7* for ensuring effective protective actions. The radiation planning basis underpins the emergency action and intervention levels, and determination of emergency planning zone sizes, for the off-site nuclear emergency response plan administered by the NBEMO. The timing from key severe accident analyses (*Section 5.5*) phenomena has also been utilized in establishing critical performance objectives to confirm successful emergency mitigating equipment deployment response times during drills and exercises. Triennial full-scale exercises demonstrate the effectiveness and feasibility of emergency planning arrangements, which gives PLNGS a high degree of confidence that it can manage and mitigate any postulated accident.

PLNGS has addressed all of the CNSC post-Fukushima Action Items related to enhancing emergency response and assessing emergency plans. All related Station specific actions have been completed.

5.0 Safety Analysis

5.1 Deterministic Safety Analysis

As an important aspect of maintaining the design and safety basis, PLNGS performs deterministic analyses, which are summarized in the PLNGS Safety Report (Reference 9). The PLNGS deterministic safety analyses and processes:

- Confirm that the as-built design meets design and safety requirements
- Derive or confirm operational limits and conditions that are consistent with the design and safety requirements
- Assess the impact of Station ageing
- Assist in establishing and validating accident management procedures and guidelines
- Assist in demonstrating that acceptance criteria and dose limits are met.

The initial selection of Postulated Initiating Events (PIEs) was developed by the Station designer and covered events that were included in Regulatory Guides of the time. All new deterministic safety analyses are now performed in accordance with *REGDOC 2.4.1, Deterministic Safety Analysis* to address a broad range of PIEs which are categorized as anticipated operational occurrences, design basis accidents and less probable events beyond the design basis according to their predicted frequency of occurrence. Additional events less or more likely than design basis events may be selected for detailed analysis in accordance with a graded approach taking into account their importance to safety. Safety analyses are performed for inaugural core conditions as well as ageing core conditions to ensure the analysis remains valid throughout the lifecycle of the Station. The level of applied conservatism in the safety analysis is dependent on the classification of the event where anticipated operational occurrence and beyond design basis accident apply a less conservative, or more realistic, approach compared to analysis of design basis accidents where a much more conservative, limit of the operating envelope, approach is applied.

As part of our design process, changes are reviewed for their impact on nuclear safety, including the SOE. These can include changes to fuel design, nuclear design, process and control systems, electrical and distribution systems, and instrumentation and control systems. Any changes that impact the safety case are analyzed, documented, and included in the next revision of the Safety Report.

5.1 Deterministic Safety Analysis, Continued

The Safety Report was revised and issued to the CNSC in June 2021 and includes:

- Safety Report Part 1 – Design Description (2021 Edition)
- Safety Report Part 2 – Accident Analysis (2021 Edition) Volume 1
- Safety Report Part 2 – Accident Analysis (2021 Edition) Volume 2
- Safety Report Part 2 – Accident Analysis (2021 Edition) Volume 3
- Safety Report Part 3 – Appendices (2021 Edition) Volume 1
- Safety Report Part 3 – Appendices (2021 Edition) Volume 2.

PLNGS has performed a gap assessment of *REGDOC 2.4.1, Deterministic Safety Analysis*. An implementation plan to close gaps in a graded manner was submitted to the CNSC on July 20, 2016, and was updated to address CNSC staff comments. The current version of the implementation plan was submitted to the CNSC on December 19, 2018. PLNGS is progressing with the analysis identified in that plan.

Full implementation of *REGDOC 2.4.1, Deterministic Safety Analysis* may not be practicable or provide substantial safety benefit beyond the current safety case; and, therefore, PLNGS has established a method of evaluating the significance of gaps (applying a graded approach) against *REGDOC 2.4.1* and their importance to safety. The implementation plan identifies those corrective actions necessary to close gaps in accordance with the following.

Approach to compliance with REGDOC 2.4.1

A gap assessment was performed for PLNGS in response to CNSC generic concerns and to prepare for the eventual implementation of *REGDOC 2.4.1* into the Station operating licence. The objective of that assessment was to identify event-specific gaps in the PLNGS Safety Report content with respect to the requirements of *REGDOC 2.4.1*. Since some of the analyses were performed many years ago, and since *REGDOC 2.4.1* essentially specifies that current state-of-the-art methods are to be used, the gap assessment was aimed at identifying which analyses do not align with these modern methods and best practices.

More specifically, the gap assessment had the following objectives:

- To establish whether the list of events in the Safety Report is complete and complies with the requirements of *REGDOC 2.4.1*.
- To determine which events were classified as anticipated operational occurrences, design basis accidents and beyond design basis accidents.
- To identify analyses that do not fully comply with *REGDOC 2.4.1* requirements.
- To prioritize future efforts to bring the analyses into compliance, develop a database showing the gaps for each analyzed event.

5.1 Deterministic Safety Analysis, Continued

Each identified gap was then ranked or scored based on eight scoring items (ranking criteria) as follows:

1. Code and Station models, model simplifications
2. Generic issues
3. Initial conditions, system settings (SOE)
4. Mitigation by systems other than special safety systems
5. Documentation
6. Conservative assumptions
7. Margins to applicable derived acceptance criteria (DAC)
8. Un-analyzed plant states.

In consideration of the total aggregate gap score for each event-specific analysis and the provision of the licence condition handbook for applying a graded approach, updates to safety analysis were excluded as part of the *REGDOC 2.4.1* gap closure on the basis of the following rationale:

1. Score falls below two.
2. Score is slightly higher than two but the main driver for score is non-safety significant (e.g., documentation updates required).
3. Score is slightly higher than two but a significant margin to derived acceptance criteria exists.
4. Analysis is for non-equilibrium or unaged core and is no longer applicable to PLNGS.

Given the minimum possible aggregate score range of -5 to a maximum of +20, the selection of a threshold score value of two closer to the lower end of that range was deemed reasonable to ensure that any remaining gaps to *REGDOC 2.4.1* compliance do not significantly affect the safety case. To test its robustness, the threshold score value was varied by +/- 50% to ensure that the analysis plan would not be significantly affected. This approach ensures that resources are focused on those aspects of the safety case having the most significant impact on demonstrating safety margins while at the same time achieving compliance to *REGDOC 2.4.1* in a graded manner.

Alternative approaches or analysis methods to achieve compliance may also be proposed and applied subject to CNSC staff acceptance.

5.1 Deterministic Safety Analysis, Continued

Dose Acceptance Criteria

In the *2016 PLNGS Safety Report* (Reference 50), events are historically classified as single failures or dual failures and all are considered as design basis under the Siting Guide in AECB-1059, Reactor Licencing and Safety Requirements, Hurst and Boyd. As part of implementing *REGDOC 2.4.1*, the dose limits specified in the operating licences must be met for the existing plants. Therefore, the single/dual failure dose limits under the Siting Guide AECB-1059 are still applicable to PLNGS. As per AECB-1059, the maximum individual dose limits are 5 mSv for whole body and 30 mSv for thyroid for single failure and 250 mSv for whole body and 2500 MSv for thyroid for dual failure (See Table 2 below).

Table 2: Reference Dose Limits used for Point Lepreau Licencing

	Single Failure		Dual Failures	
	Effective	Thyroid	Effective	Thyroid
Individual (mSv)	5	30	250	2500
Population (person-Sv)	100	100	10000	10000

Following *REGDOC 2.4.1*, the dose limit of 0.5 mSv is for anticipated operational occurrences (AOO) and 20 mSv for Design Basis Accidents (DBA). No limit is applied for beyond design basis accidents BDBA in *REGDOC 2.4.1*. As a result, the dose limits of *REGDOC 2.4.1* are treated as targets in PLNGS safety analysis. A comparison between current Point Lepreau licencing requirements and *REGDOC 2.4.1* requirements is provided in Table 3 below.

Table 3: Current Point Lepreau Licencing Requirements versus *REGDOC 2.4.1* Requirements

Current Point Lepreau Licensing Requirements (Siting Guide)		Regulatory Document REGDOC-2.4.1		
Classification	Dose Limit (mSv)	Event Classification	Event Frequency (per year)	Dose Limit (mSv)
Single Failure (Frequency 10^{-1} to 10^{-2}/yr)	5	AOO	$\geq 10^{-2}$	0.5
Single Failure (Frequency 10^{-2} to 10^{-4}/yr)	5	DBA	$< 10^{-2}$ $\geq 10^{-5}$	20
Dual Failure (Frequency 10^{-4} to 10^{-5}/yr)	250			
Dual Failure (Frequency 10^{-5} to 10^{-7}/yr)	250	BDBA	$< 10^{-5}$	-

A systematic review of all events addressed in the Safety Report was performed to reassess public doses for key events to demonstrate that the application dose limits under DBA conditions are met.

5.1 Deterministic Safety Analysis, Continued

Trip Coverage

In addition to closing gaps *to REGDOC 2.4.1* compliance in a graded manner, the overall PLNGS Deterministic Safety Analysis Program also monitors key ageing related parameters that could affect shutdown system trip coverage and adjusts its analysis plans to ensure that adequate trip coverage is maintained throughout the life of the Station. All new analysis to address trip coverage issues is performed in accordance with *REGDOC 2.4.1* and the latest accepted models, correlation factors, validated computer software and derived acceptance criteria to demonstrate safety margins.

Computer Software Quality Assurance

PLNGS has integrated analytical, scientific, and design software quality assurance into the PLNGS Management System to ensure that computer programs being developed and/or used are compliant with the Canadian Standards Association (CSA) *N286.7, Quality Assurance of Analytical, Scientific and Design Computer Programs for Nuclear Power Plants*.

This process applies to analytical, scientific and design computer programs used at PLNGS, including those employed by contractors. These programs are used to perform or support:

- design and analyses of safety-related equipment, systems, structures, and components
- deterministic and probabilistic safety analyses
- reactor physics and fuel management calculations
- transfer of data between computer programs or pre- and post-processing calculations associated with the above processes.

5.2 Hazard Analysis

The hazard screening was updated in 2016 including additional analyses performed on seismic, high wind and tsunami hazards. Results of these assessments are being used in the development of the PSA version 4.0 to be completed in November 2021.

All-natural and human-induced external hazards have been screened out except for the earthquake events which have been incorporated within the PSA version finalized in 2016, following the results of the Seismic Hazard assessment.

Most internal hazards have been screened out except for the internal floods and internal fires which have been part of the PSA since its original version. In addition, the turbine missiles event is indirectly included within the Loss of Class IV internal event.

5.3 Probabilistic Safety Analysis

The original PSAs were referred to as *Safety Design Matrix Studies*. As part of the refurbishment project, these have been superseded by a Level II PSA, compliant with *REGDOC 2.4.2, Probabilistic Safety Assessment (PSA) for Nuclear Power Plants*. The results of the Level II PSA are summarized in the *2016 PLNGS Safety Report* (Reference 50), which demonstrates compliance with prescribed overall Station safety goals for the frequency of severe core damage and large radiological releases from the containment structure.

The PSA estimates the frequencies for various Station damage states and external Station release categories considering Station response following various postulated design basis initiating events. The cause and effect sequences for determining these frequencies encompass Station design, operations and maintenance practices, human reliability, and the potential for common cause failures that could reduce inherent redundancies in system design.

In the PSA, event trees were developed to identify the Station response to various initiating events. This includes success and failure of mitigating actions by Station operators or Station systems until a stable Station state is achieved; either in a Station damage state or external Station release~~,~~ or in a condition where the event is terminated prior to damage being incurred. Quantities of radionuclides released within containment were also addressed. Fault trees were prepared to determine the likelihood of mitigating system failure from various failure modes of a system. The likelihood of operator error is included in the event trees considering post-accident stresses and factors that could influence event diagnosis and task execution.

Procedures and programs are developed to ensure that changes to Station design, operation, maintenance, as well as new industry experience, are reflected in updates to the probabilistic safety assessment. Risk estimates and new risk insights are reported on a five-year basis and are included in each update of the Safety Report. The revised model is then used to assess abnormal configurations under the form of Technical Assessments and as a baseline to produce the reference and daily Risk Profile during planned outages. The latest version of the PSA model will serve as a leading role for the development of the Risk Monitor for the at-power state of the Station.

The PLNGS Probabilistic Safety Assessment Program documentation has been upgraded in order to be compliant with *REGDOC 2.4.2, Probabilistic Safety Assessment for Nuclear Power Plants.*

5.4 Criticality Safety

PLNGS maintains procedures and guidance for both in-core and ex-core criticality control of nuclear fuel. The Station uses only natural uranium and depleted uranium fuel in its operations. The low fissile content of these fuel types precludes criticality with light water as a possibility. Criticality safety concerns for spent nuclear fuel are therefore eliminated. When storing nuclear fuel, it is segregated from heavy water or heavy water systems. Limits on the quantity of fuel have been imposed for nuclear fuel temporarily stored inside containment in support of normal fuelling operations.

PLNGS maintains an Over-Poisoned Guaranteed Shutdown State (OPGSS) as part of its in-core criticality safety controls. The OPGSS is a predefined state that is established to ensure the reactor remains in a guaranteed subcritical state for the duration of some maintenance conditions and whenever the reactor is not at power under the control of the reactor regulating system (or transitioning to or from the subcritical state).

A second guaranteed shutdown state is employed to support safe and efficient Station outages. This second state is based on shutdown system and control system solid reactivity devices. This Rod-Based Guaranteed Shutdown State (RBGSS) also provides additional defense-in-depth for ensuring the reactor can be maintained in a subcritical configuration.

5.5 Severe Accident Analysis

As a result of design modifications implemented during Station refurbishment, and in response to the *CNSC Integrated Action Plan on the Lessons Learned from the Fukushima Daiichi Nuclear Accident (August 2013)*, all complementary design features to limit the risk posed by postulated, highly unlikely severe accidents have been installed at PLNGS. As per *REGDOC 2.4.1, Deterministic Safety Analysis*, the combination of severe accident analyses, supplementary assessments, complementary design features, and severe accident management guidelines demonstrate that the provisions for protection against highly unlikely severe accidents are adequate.

Severe accident analyses are undertaken at PLNGS to evaluate residual risk; support the Level II PSA (*Section 5.3*) to meet *REGDOC 2.4.2* requirements; aid in the development of severe accident management strategies (*Section 4.6*) in support of *REGDOC 2.3.2* implementation; and, provide further insights on design and procedural modifications that can help manage risk. Severe accident progression and source term evaluations are subject to significant uncertainties; therefore, these analyses do not conform to the same requirements and expectations as those defined for conducting licencing basis deterministic safety analyses in *Section 5.1*. *REGDOC 2.4.1* defines the requirements for severe accident analyses as a subset of accidents that are beyond the design basis of the Station.

5.5 Severe Accident Analysis, Continued

The severe accident analyses examine permutations of failures that may lead to a sustained loss of heat sinks to the reactor core and thus cause damage to the fuel bundles and channels so severe that channel integrity is lost. In this postulated scenario, the resulting core debris may melt and cause further damage to reactor structures including successive failures of the remaining heat sinks with significant challenges to containment integrity.

PLNGS uses the severe accident analysis code MAAP-CANDU. Its modelling provides the nature, timing, and magnitude of fission product releases from the core and challenges to the integrity of reactor structures and containment. The resulting severe accident progression and phenomena are reflected in the Probabilistic Safety Assessment (*Section 5.3*) event trees in determining what system may or may not be available to mitigate the consequences of a postulated severe accident.

Safety goals are defined in the context of PSA (*Section 5.3*). The results of the severe accident analyses serve as input to the Level II PSA, which has a safety goal for a large release frequency of 1E-05 events per year.

To select the event sequences that would undergo severe accident analyses, the-top-ranked Level I PSA accident sequences (*Section 5.3*) which represent 99% of Severe Core Damage Frequency (SCDF) were subdivided into groups of sequences based on similarities in the Station conditions that determine the further accident progression. To ensure no cliff-edge effects, the remaining Level I PSA sequences with a frequency value representing 1% of the total SCDF were reviewed to identify any sequences leading to containment impairment, which also needed to be considered in the Level II PSA (*Section 5.3*). This approach resulted in a severe accident analysis being performed for event sequences that could be grouped into six broad event categories:

- Station blackout
- Small loss of coolant accidents (LOCA)
- Shutdown cases; in-core LOCA
- Containment bypass events
- Seismic-induced LOCA.

In total, 222 severe accident cases have been analyzed. This severe accident analyses has been submitted for regulatory review and acceptance.

The severe accident analyses support understanding of severe accident phenomena, which forms part of the basis for the SAMG strategies in *Section 4.6* as required by *REGDOC 2.3.2 Severe Accident Management Programs for Nuclear Power Plants.* Reactor-specific processes and timing of key events are included in the analyses such as:

5.5 Severe Accident Analysis, Continued

- Core degradation
- In-vessel core debris retention
- Ex-vessel corium spreading and coolability
- Molten fuel coolant interaction
- Molten core concrete interaction
- All known containment challenge mechanisms.

In considering Station modifications installed during the Station refurbishment and in response to the *CNSC Fukushima Action Plan* to provide a high degree of assurance of in-vessel retention, the likelihood of ex-vessel corium relocation, core concrete interaction and any associated containment challenge mechanisms has been practically eliminated.

The predicted harsh environmental conditions due to severe accidents have also been considered in an evaluation of equipment and instrumentation survivability. The evaluation was performed to provide reasonable assurance that key equipment and instrumentation needed to support effective Station condition diagnoses and execution of SAMG strategies are available.

The aim of defence-in-depth is to mitigate the radiological consequences of the potential release of radioactive materials that may result from accident conditions. This includes an assessment of the radiological consequences to determine if improvement to emergency response provisions is required. In terms of severe accidents, the radiological consequences have been assessed in two ways:

- Dose to Station operators during prevention and mitigation of severe accidents
- Risk to the public as a result of containment failure mechanisms.

The implications of harsh environmental conditions and potential radiological dose to Operators have been considered in the context of Station habitability. During severe accident conditions, it is assumed that the Main Control Room (MCR) will not be habitable; Station control and mitigation activities will take place from the Secondary Control Area (SCA) and crews will be dispatched from that area. The assessments of habitability consider radiological and non-radiological hazards that affect the SCA and areas where operators are expected to perform severe accident mitigating actions.

The radiological hazards considered for the *representative* case were based on a severe accident and fission product source term release initiated by a Station blackout scenario. This scenario was selected as the severe accident class with the highest frequency of occurrence (e.g., the most probable event) from the Level 1 PSA (*Section 5.3*) that will require mitigating actions.

5.5 Severe Accident Analysis, Continued

The radiological hazards considered for the limiting case were based on a severe accident and fission product source term release initiated by a feeder stagnation break. Three stagnation break scenarios were analyzed, selected as the severe accident class with a low frequency yet the potential for the highest source term releases. PLNGS procured a portable filtered air supply unit that can be deployed on-demand to provide further radiological protection to operators in the SCA dealing with a postulated severe accident.

In addition to the radiological hazards, the habitability assessments evaluate the impact of non-radiological hazards (see *Section 5.2*) caused by: extreme winds or external flooding (e.g., tornadoes, hurricane, tsunami, extreme rainfall), seismic events, break of the steam and feedwater lines near the MCR, the loss of spent fuel bay heat sink, and water line break event in the SCA. Although the probability of these types of events is extremely low, PLNGS is highly robust to address all hazards.

5.6 Management of Safety Issues (Including R&D Programs)

In addition to the analyses performed in support of the inaugural operating licence, there is an on-going management of safety analysis issues at PLNGS. This assures that changes to the Station design and operation, as well as new information coming from operating experience or research and development initiatives, do not have a detrimental effect on public risk. Safety issues are tracked and managed at PLNGS through the Station's CAP.

PLNGS maintains a number of procedures and processes in support of identifying and managing safety-related issues identified through research and development, during the performance of analysis or through external operating experience. As part of the *PRR-00660-MS-3, Maintain Design and Safety Basis* (Reference 51) process, the SOE is maintained by supporting the evaluation and prioritization of issues that are identified to be outside of the current evaluated design or safety basis.

In addition, PLNGS maintains a margins management process to identify, evaluate, characterize, track, and resolve low margin issues at the Station, including operating and safety margins.

PLNGS conducts safety analysis to ensure the SOE is maintained. This ensures compensatory actions are taken, the assessed public risk is achieved within acceptable limits, regulatory limits are respected, cross-functional resolution, and the risks are balanced with the appropriate level of management oversight.

5.6 Management of Safety Issues (Including R&D Programs), Continued

As an active member of the CANDU Owner's Group (COG), PLNGS collaborates with industry partners on research and development pertinent to resolving CANDU-specific safety issues.

All safety issues identified through analysis or research findings are reported to the CNSC per *REGDOC 3.1.1, Reporting Requirements for Nuclear Power Plants.*

6.0 Physical Design

6.1 Design Governance

All design changes are prepared and executed in accordance with the PLNGS Design Configuration (DC) Process. PLNGS programs and procedures are written to ensure the Design Configuration Process complies with *CSA N286.0, Management System Requirements for Nuclear Power Plants*; *CSA N291, Requirements for safety-related structures for CANDU Nuclear Power Plants*; *CSA N290.12, Human Factors in Design* and all relevant legal and regulatory requirements. The Design Configuration Process ensures all modifications to PLNGS systems, structures and components are planned, designed, installed, and commissioned within the parameters of the SOE, design basis, and Station licencing conditions.

Over the licence period, PLNGS has continued to make improvements to the PLNGS Management System including the Design Configuration Process. Design Configuration is comprised of the following processes (References 45, 46, 44):

- *PRR-00660-MS-01, Develop Modifications (Reference 52)*
- *PRR-00660-MS-02, Implement Modifications (Reference 53)*
- *PRR-00660-MS-03, Maintain Design and Safety Basis (Reference 51)*.

6.2 Configuration Management and Change Control

Modifications

The *PRR-00660-MS-01, Develop Modifications* (Reference 52), *PRR-00660-MS-02, Implement Modifications*, (Reference 53), *PRR-00660-MS-03, Maintain Design and Safety Basis*, (Reference 51) processes are established at PLNGS to satisfy design change control requirements in accordance with the PLNGS NMM. Commissioning requirements are detailed in the *MS-02* process. These processes contain the following elements:

6.2 Configuration Management and Change Control, Continued

- Procedures for initiating, approving, and controlling design changes or modifications to systems, structures, equipment, and components.
- Review requirements to assure that any design modifications are necessary and/or improve safety, reliability, or Station efficiency.
- Assessment requirements to assure that design basis, licencing and Nuclear Safety requirements are not adversely impacted.
- Design requirements that specify that design work is done per engineering standards and codes, nuclear and regulatory standards, and operational requirements.
- Implementation and commissioning requirements that are consistent with the approved design basis, licence conditions, and design requirements.
- Maintenance of required documentation to preserve a record of the design configuration of the Station.
- Human factors requirements.
- Definition of the SOE.

Engineering roles, responsibilities, authorities and delegation, including the Design Authority, are documented in *EXP-08700-0007, Engineering Expectations* (Reference 54).

Pressure Boundary Program

The PLNGS Pressure Boundary program is comprised of many programs, processes, and procedures under the *NMM-00660, Nuclear Management Manual* (Reference 11). The details of how PLNGS complies with the requirements of *CSA N285.0, General requirements for pressure-retaining systems and components in CANDU nuclear power plants*, are described in *IR-00911-01, CSA N285.0 Pressure Boundary Program Roadmap* (Reference 112). In general, all pressure boundary activities, including repairs, replacements, and modifications, are currently controlled and executed under CSA N285.0-12 including Update 1 and 2. Based on a gap analysis completed as part of the Periodic Safety Review (PSR2), PLNGS is compliant with the latest published version of this standard, *CSA N285.0-17*.

Formal Agreement with an Authorized Inspection Agency

PLNGS continues to maintain a formal agreement with the New Brunswick Department of Justice and Public Safety (NBJPS) as our Authorized Inspection Agency (AIA) in accordance with *CSA N285.0* and its applicable referenced publications. In addition, NBJPS continues to provide design registration services for pressure boundaries as the legally entitled registrar of designs in New Brunswick. Variances or deviations from the requirements of *CSA N285.0* continue to be submitted to the AIA for evaluation, prior to submission to the CNSC for approval.

6.3 Site Characterization

PLNGS is located on the Bay of Fundy in New Brunswick Canada. The site plan, description, exclusion zone authority and control and proximity of industrial, transport and military facilities are documented in the *PLNGS Safety Report, Part 1–Design* (Reference 9). Information about local population density, climate, hydrology, geology, and seismology are also included in the Site Characterization of the Safety Report. Additional information regarding external hazard assessments within and beyond the design basis utilizing state-of-the-art methods, latest knowledge base and experience is included in Section 12 the *PLNGS Safety Report, Part II- Accident Analysis* (Reference 9).

6.4 Facility, Structures, Systems and Components Design

The physical design of PLNGS incorporates a defence-in-depth approach with multiple redundant safety systems in place to ensure the safety of workers, the public, and the environment. With respect to fuel, five layers of defence-in-depth protect the public from radioactive exposure. These are the fuel pellet, fuel sheath, heat transport system, containment system, and the 1 km site exclusion zone.

PLNGS also has four special safety systems. Two independent and diverse shutdown systems which can shut down the reactor in less than two seconds by the addition of neutron-absorbing material; an Emergency Core Cooling System, which ensures fuel cooling is maintained; and a Containment System designed to prevent the release of radioactive material to the environment.

To protect against common causes and external events, a two-group concept was applied in the design of the Station. These duplications in the design ensure essential safety functions will be performed even if an event causes damage to side spread areas of the Station.

Design Documentation

The description of the systems and equipment at PLNGS, including the design and operating conditions, are governed by:

- PLNGS Safety Report, Part 1–Design
- Design Manuals and Addenda
- Design Revision Records
- Design Guides identifying requirements and standards, which must be met in the design of various systems of a nuclear power plant.

These documents are stored as permanent records at PLNGS. The safety analysis program, which demonstrates the adequacy of the design of the Station, is identified in the Safety Report.

6.4 Facility, Structures, Systems and Components Design, Continued

Overpressure Protection Report

The *0087-01320-0001-001-OPR-A-03, Overpressure Protection Report*, (Reference 55), which documents the overpressure protection for nuclear systems at PLNGS, has been submitted to the New Brunswick Department of Public Safety and the CNSC.

7.0 Fitness for Service

7.1 Equipment Fitness for Service/Equipment Performance

PLNGS has several programs and processes in place to manage Equipment Fitness for Service and Equipment Performance of the systems, structures, and components (SSCs) credited in licencing documentation. Most of the programs have activities spanning different processes, including:

- *PRR-00660-MA-03, Perform Maintenance* (Reference 25)
- *PRR-00660-ME-02, Monitor and Manage System Health* (Reference 56)
- *PRR-00660-ME-01, Establish Maintenance Program* (Reference 57).

Equipment Reliability

Equipment Reliability encompasses two core processes at PLNGS:

- *PRR-00660-ME-01, Establish Maintenance Programs* (Reference 57)
- *PRR-00660-ME-02, Monitor and Manage System Health* (Reference 56).

These processes are governed by *REGDOC 2.6.2, Maintenance Programs for Nuclear Power Plants* and meet *CSA N286-12*.

Maintenance Programs

The *ME-01, Establish Maintenance Programs* process applies to the development of the maintenance program for all SSCs at PLNGS. The maintenance program consists of requirements, measures, policies, methods, activities, and procedures for maintaining SSCs.

7.1 Equipment Fitness for Service/Equipment Performance, Continued

This process establishes preventive and corrective maintenance activities to maintain systems, structures, and components that, if not maintained properly, could result in an unreasonable risk to:

- The health and safety of the public and Station personnel
- Reliable Station operation
- Station security
- The environment
- The design and safety basis
- Resource and cost-effectiveness.

The *ME-01, Establish Maintenance Programs* process defines a single conceptual approach to determining the need for preventive maintenance on systems, structures, and components.

The main objectives to establish maintenance programs are to:

- Establish and implement equipment monitoring programs
- Implement the continuous equipment reliability improvement process
- Control and eliminate potential component failure or consequences where failure mechanisms cannot be detected
- Establish the lifecycle management for ageing and assessment management
- Implement long-range planning.

Included under the *ME-01 process* are the program plans for generic component types (e.g., Air Operated Valves, Safety Valves, Steam Generators, Fuel channels, Cables) and program plans for the Periodic Inspection Program and In-Service Inspection Program.

System Performance Monitoring

The *ME-02, Monitor and Manage System Health* process applies to select SSCs at PLNGS, including all Systems Important to Safety. This process ensures SSCs perform within established acceptance criteria and supports the achievement of optimal service life. The main objective of the Monitor and Manage System Health process are to:

- Ensure equipment condition, health, and performance is effectively assessed and identified when maintenance is required
- Minimize equipment failures by proactively assessing and addressing equipment degradation
- Develop and control the mandatory surveillance program to proactively determine failures of safety-related systems, structures, and components.

7.1 Equipment Fitness for Service/Equipment Performance, Continued

The *ME-02, Monitor and Manage System Health* process at PLNGS ensures equipment health and reliability by providing a standard System Health Monitoring and Management method. This entails:

- Selection criteria and a list of Station systems for inclusion in the program
- A methodical approach to analyzing systems for critical equipment
- A structured approach to establishing component degradation mechanisms
- Establishing monitoring methods and activities to detect actual degradation mechanisms
- Developing comprehensive System Health Monitoring Plans for each selected system
- Routine system health reporting.

A focused effort has been made to align the core System Health Monitoring process and Equipment Reliability with industry best practices and improvement initiatives that will continue as PLNGS maintains alignment with the industry.

Reliability

REGDOC 2.6.1, Reliability Programs for Nuclear Power Plants governs the expectations of the program to ensure that Systems Important to Safety are sufficiently reliable to mitigate the likelihood of severe core damage or large early radioactive releases following a postulated initiating event.

The Reliability Program at PLNGS spans several processes, the most prominent are (References 56, 51, 24, 23):

- *PRR-00660-ME-02, Monitor and Manage System Health*
- *PRR-00660-MS-03, Maintain Design and Safety Basis*
- *PRR-00660-MA-02, Provide Planning and Scheduling Services*
- *PRR-00660-OP-01, Control and Monitor Station Equipment*.

IR-01500-12, Reliability Program (Reference 58) provides guidance on how these processes interface in support of the Reliability Program at PLNGS. It includes the overall program approach being applied, the technical elements falling within the scope of the program, guidance for those elements, and the required work activities.

7.1 Equipment Fitness for Service/Equipment Performance, Continued

Mandatory Surveillance

Systems important to safety are expected to perform to certain reliability criteria. To ensure that the systems important to safety meet these criteria, reliability analyses are produced to reflect the current design, operating, and maintenance practices. Surveillance, which is credited in these analyses, or otherwise committed for performance at regularly scheduled intervals, is termed Mandatory Surveillance. The Mandatory Surveillance Program includes activities to ensure that mandatory tests of systems important to safety are developed, scheduled, performed, reviewed, and reported.

7.2 Maintenance

PLNGS has a Maintenance Program designed to ensure Station equipment is maintained to maximize reliability and avoid adverse operational impacts resulting from equipment failure. This objective is achieved through balancing corrective maintenance requirements with proactive preventive and predictive maintenance program strategies intended to avoid failures before they occur.

The Maintenance organization consists of four departments including Production Electrical, Production Mechanical, Fix It Now (FIN) and Station Facilities. These four departments are aligned closely with Procurement Engineering, Systems and Components Engineering, Programs Engineering, Design Engineering, Work Management, Production Operations and Outage Management to support equipment fitness for service requirements.

Scheduled work consists largely of preventive maintenance (PM), such as proactive component replacements or testing of equipment. Predictive maintenance involves diagnostic testing, such as infrared thermography, vibration monitoring and analysis, and lubricating oil monitoring and analysis to identify equipment component degradation in its early stages and prior to failure. An electronic feedback process for all types of maintenance is used to apply lessons learned from experience and continuously refine and improve the maintenance program. A preventive maintenance review process has been established with a focus on optimizing the PM program for improved equipment reliability.

7.2 Maintenance, Continued

Figure 14: Maintenance Worker

Maintenance Backlog

Maintenance backlogs are tracked and trended. Work activities are categorized and prioritized based on the nature of degradation or deficiency, as well as, the importance of affected equipment to system operation. This categorization is based on the industry-standard *INPO AP-928, Online Work Management Process Description*. Industry backlog performance and current backlogs are inputs to the Station's Mission to Excellence Plans where annual maintenance backlog targets are tracked for the Station.

PLNGS has a process in place to ensure the right work gets done at the right time to lower our preventable risks to safety and generation. The online maintenance backlog includes the open work orders on critical and non-critical SSCs where the SSC cannot perform its minimum design function or is at risk of not performing its minimum design function.

The online maintenance backlog has been steadily improving over the past licencing period as a result of focused effort driven through *Equipment Excellence* in the Station's Mission to Excellence Plans (Figure 15: Overall Maintenance Backlog Reduction).

7.2 Maintenance, Continued

Maintenance Backlog, Continued

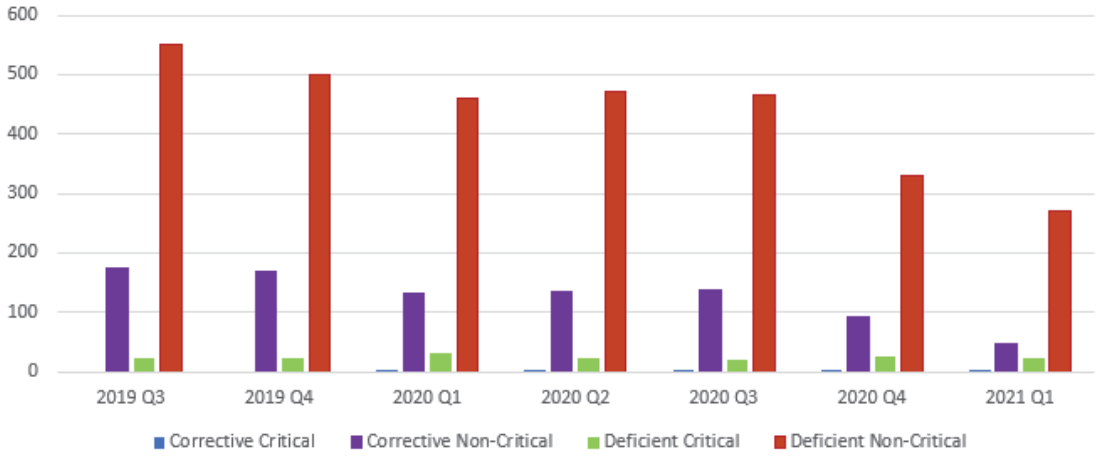

Figure 15: Overall Maintenance Backlog Reduction

PLNGS has had a focused effort to reduce our open deficient critical orders over the last licencing period as part of our overall maintenance backlog reduction (Figure 16: Deficient Critical Backlog Reduction).

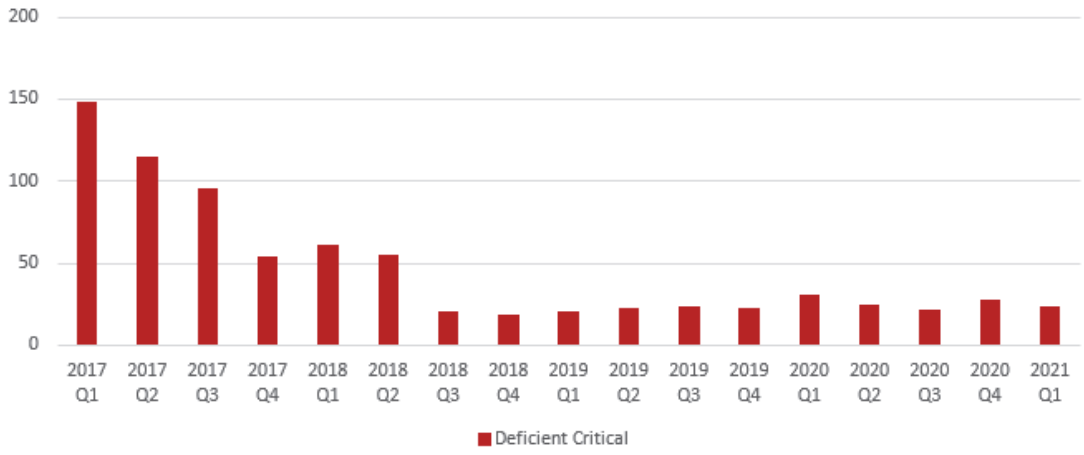

Figure 16: Deficient Critical Backlog

Strong cross-functional support and ownership of PM execution during workweeks have notably improved the completion of PM activities. Managers from involved departments act as sponsors of work management T-meetings as per industry best practice. This has contributed to significant improvement in deferrals, timely completion, and overdue PM orders.

7.2 Maintenance, Continued

Maintenance Backlog, Continued

Critical deferrals are PM tasks that have been approved to be executed past the predefined overdue date for components defined as critical through the Station's Functional Failure and Criticality Analysis process (Figure 17: Number of Deferrals of Critical Preventive Maintenance).

These are evaluated for risk in accordance with Station processes with escalating approval levels based on level of risk.

Timely completion of PMs is measured by the number of critical PMs open in the second half of grace at the end of the reporting period. Following the Station's transition to this measure in 2017, the Station has remained consistently below target indicating strong PM Program performance (Figure 18: Critical PM Orders Open Deep in Grace).

Overdue critical PM orders are PM tasks that have surpassed their predefined overdue date without a documented PM deferral. There have been no overdue critical PM orders since October of 2017.

Critical deferrals, critical PM orders open deep in grace and overdue critical PM orders have been maintained low due to a focused and ongoing effort in improving Equipment Reliability.

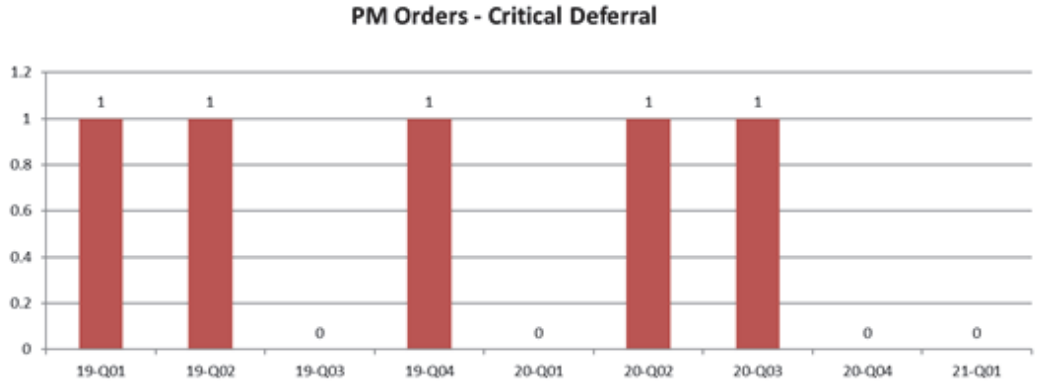

Figure 17: Number of Deferrals of Critical Preventive Maintenance

7.2 Maintenance, Continued

Maintenance Backlog, Continued

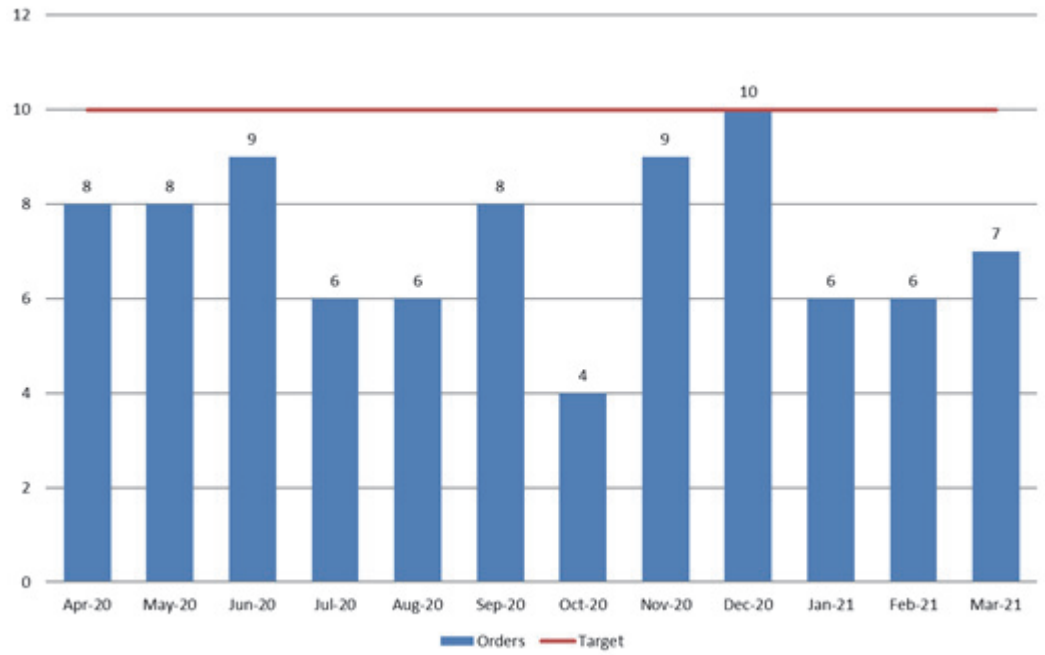

Figure 18: Critical PM Orders Open Deep in Grace

The Maintenance organization operates a days-based maintenance model with the majority of maintenance activities scheduled on day shifts. This approach is aligned with industry best practices. Advantages of this approach include the ability to optimize resources, form specialty maintenance teams, reduce fatigue resulting from a rotating shift schedule, and fewer turnovers and handoffs during a work activity reducing the potential for rework.

A Planning Superintendent oversees a separate planning department. Improvements to planning include the development of metrics for tracking the progress of orders and functional equipment grouping for improved scheduling to minimize equipment unavailability. Over the last licencing period an organizational change was made resulting in this department reporting to the Running Work Management department. This change was made to improve Maintenance focus on work execution, and to realize efficiencies in the planning and scheduling areas.

Work Week Coordinator positions and Work Package Preparer positions exist to improve efficiency for scheduling and execution of work.

PLNGS continues to utilize Dynamic Learning Activities (DLAs) as a training tool to continually improve performance within the Maintenance organization.

7.2 Maintenance, Continued

PLNGS is continuing its capital investment in the Station to improve equipment reliability through projects to replace and upgrade key equipment. The Station has completed several initiatives under the Equipment Reliability Improvement Plan (ERIP) with a focus on the industry guidance in INPO AP-913. Specific areas have included:

- Component criticality coding implementation
- Identifying and developing/implementing mitigation strategies for all Station Single Point Vulnerabilities (SPV's)
- Improvements in Equipment Failure Reviews (EFRs)
- Plant Health Committee leadership training and improvements.

This focus continues and PLNGS has maintained alignment with the industry in adopting the new Revision 4 of the COG ERI Guideline for CANDU Stations Equipment Reliability Index (COG-GL-2010-02).

The Maintenance Program is governed by *PRR-00660-MA-3, Perform Maintenance* (Reference 25). The Station currently complies with *REGDOC 2.6.2 Maintenance Programs for Nuclear Power Plants*. The following documents contain the primary safety and control area requirements for maintenance:

- *SI-01365-T089, Continuing Equipment Reliability Improvement* (Reference 59)
- *SI-01365-P025, Planning and Scheduling Preventive Maintenance* (Reference 60)
- *SI-01365-T054, System Performance Monitoring* (Reference 61)
- *SI-01365-T023, Mandatory Surveillance Program* (Reference 62)
- *SI-01365-T118, Establishing Equipment Programs* (Reference 63).

Recent and upcoming improvement initiatives include:

- Reorganizing the maintenance planning department to report up to the Running Work Management department.
- Purchased new equipment for predictive maintenance type activities including oil analysis and vibration analysis.
- Bolstered the FIN team resources to protect the schedule and increase backlog reduction capabilities.
- Implemented a new tool tracking software program that allows for better control of calibrated tools.
- Assigned a lead to develop a plan for transitioning to a Condition Based Maintenance (CBM) model. This includes:
    - Using condition data (Operational and Maintenance data) to make better maintenance decisions efficiently.
    - Researching and investigating the implementation of CBM.

7.2 Maintenance, Continued

  - Collaborating with and benchmarking industry peers and working groups such as Bruce Power, Ontario Power Generation, and EPRI.
  - Researching and evaluating exiting software at NB Power to leverage for CBM. (PI, SAP, OPENTEXT).
  - Developing an implementation strategy and process for integrating CBM into existing processes.
- Increasing maintenance workers qualifications to plan their work.
- Increasing visibility and ownership of backlogs at the maintenance crew level.
- Increasing visibility and utilization of our Tool Pouch Maintenance process to increase work execution rates.
- Increasing our use of the Lock Out Tag Out work protection process to improve through put of Fire Testing and maintenance activities.

7.3 Structural Integrity

Fitness for Service of the containment structure is established based on compliance with two CSA Standards:

- *CSA N285.5-13, Periodic Inspection of CANDU Nuclear Power Plant Containment Components (implementation plan submitted)*
- *CSA N287.7-17 In-Service examination and testing requirements for concrete containment structures for nuclear power plants*

CSA N285.5 defines requirements for the periodic inspection of containment system components, including containment pressure suppression systems in CANDU nuclear power plants. The inspection requirements specified in the standard provide assurance of the structural integrity of metallic and plastic containment system components. PLNGS implements this via *EPP-03642-PIP2, Equipment Program Plan for Periodic Inspection Program (PIP) CSA N285.5* (Reference 64).

CSA N287.7 provides the requirements for in-service examinations and positive pressure leakage-rate testing of the PLNGS concrete containment structure. PLNGS implements this through *EPP-21000-RB01, Reactor Building Management Plan* (Reference 65).

Both *CSA N285.5* and *CSA N287.7* require formal Station program documents to establish compliance. These program documents require acceptance by the CNSC.

7.4 Ageing Management

The PLNGS is focused on ensuring that structures and components that are nuclear safety-related do not degrade to a point where they are unable to meet their nuclear safety function. This is composed of understanding ageing degradation, planning for inspection and maintenance, operating the structures within their design limits, performing inspections and periodic surveillance and maintenance. The approach to ageing management at PLNGS is documented in *IR-05000-0006, Integrated Aging Management Program* (Reference 66). As described in the program documentation, ageing management is implemented through the following processes:

- *PRR-00660-ME-01, Establish Maintenance Program* (Reference 57)
- *PRR-00660-ME-02, Monitor and Manage System Health* (Reference 56)
- *PRR-00660-OP-01, Control and Monitor Station Equipment* (Reference 23)
- *PRR-00660-OP-02, Control Chemistry* (Reference 67)
- *PRR-00660-MS-03, Maintain Design and Safety Basis* (Reference 51)
- *PRR-00660-MA-02, Provide Planning and Scheduling Services* (Reference 24)
- *PRR-00660-MA-03, Perform Maintenance* (Reference 25)
- *PRR-00660-DM-02, Manage External Relationships* (Reference 47)
- *PRR-00660-DM-04, Assess and Improve Performance* (Reference 46).

In 2018, PLNGS revised *IR-05000-0006, Integrated Aging Management Program* (Reference 66) which at the time was titled Integrated Asset Management Program. This revision re-aligned the program to specifically address the requirements of *REGDOC 2.6.3, Aging Management*. With this revision, the program was re-focused to address nuclear-safety-related SSCs and was re-titled Integrated Aging Management Program. This revision was submitted to the CNSC in March 2019. The scope of the program is providing a roadmap through the PLNGS Management System to document how the requirements of *REGDOC 2.6.3, Aging Management* are met. The focus of the program is how the core processes of the PLNGS Management System are mapped onto the Plan, Do, Check and Act model.

Through these processes, PLNGS works to:

- Understand the ageing of structures and components.
  - Scoping and screening of SSCs within the scope of the aging management program including understanding structure or component degradation, conditions assessments, regulatory requirements, OPEX, etc. (*PRR-00660-ME-01, PRR-00660-ME-02*).
- Develop and optimize activities for ageing management of a structure or component (PLAN).
  - Develop ageing management plans (*PRR-00660-ME-01, PRR-00660-ME-02*).

7.4 Ageing Management, Continued

- Operate the structure or component (DO).
  - Operate the Station in accordance with approved procedures and technical specifications (*PRR-00660-OP-01, Control and Monitor Station Equipment*) (Reference 23).
  - Maintain plant chemistry in accordance with specified limits (*PRR-00660-OP-02, Control Chemistry*) (Reference 67).
- Perform inspections, monitoring and assessments of a structure or component (CHECK).
  - Perform mandatory surveillance (*SI-01365-T023*) (Reference 62). Mandatory surveillance is the surveillance and testing activities (e.g., special safety system testing) performed and reported at defined intervals mandated or claimed in relevant licences, codes and standards, safety design matrices, the Probabilistic Safety Assessment, or reliability analyses. A list of mandatory surveillance requirements is submitted in the *Annual Reliability Report*.
  - Perform system walkdown in accordance with System Performance Monitoring Plans (SPMPs) (*SI-01365-T054*) (Reference 61). Equipment and components are monitored and trended for functional readiness and degradation by system specialists through operating parameter surveillance and system walkdowns.
  - Perform inspections in accordance with equipment program plans (EPPs).
- Perform maintenance on a structure or component (ACT).
  - Plan and schedule maintenance (*PRR-00660-MA-02*) (Reference 24).
  - Perform preventive and corrective maintenance (*PRR-00660-MA-03*) (Reference 25).
  - Manage spare parts and obsolescence (*IR-00660-0003*) (Reference 68)

Ageing management at the structure and component level is implemented through Ageing Management Plans (AMPs) that are developed as part of the PLAN step shown above. AMPs within the PLNGS Management Systems are composed of system performance monitoring plans within the scope of *SI-01365-T054* (Reference 61) and equipment program plans within the scope of *SI-01365-T118* (Reference 63). In addition to these AMP, ageing management is supported by programs for environmental qualification, obsolescence management, reliability, and chemistry.

In addition, PLNGS has undertaken the initiative to develop long-term asset management. The goal of this initiative is to develop life cycle management plans for all nuclear safety and Station economic assets to ensure safe and reliable operation to the end of Station life. The life cycle management plans will address the need for future capital projects such as replacements and refurbishments, changes to preventive maintenance plans as components and structure age and planning for long-term obsolescence.

7.4 Ageing Management, Continued

Ageing management of the PLNGS fuel channels is managed by the *Fuel Channel Equipment Program Plan (EPP-31100-FC01)* (Reference 76). The program monitors ageing of the fuel channels per the requirements of *CSA N285.4* and includes:

- in-service inspections:
  - volumetric indications
  - PT/CT gap measurement
  - PT sag
  - diametrical creep and wall thinning
  - elongation
  - annulus spacer location
  - material surveillance
  - body of tube and rolled joint scrapes
  - single fuel channel replacement including annulus spacer material property testing.

PLNGS also actively supports research through the CANDU Owners Group including the joint project for fuel channel and annulus spacer life-cycle management. Disposition and fitness for service evaluations are performed to the requirements of *CSA N285.8*. The fuel channel equipment program is responsible for reactor maintenance activities such as CT/LISS gap measurements, reconfiguration of the free and fixed ends of the end-fitting. The fuel channel equipment program plan has been credited as an ageing management plan per the requirements of *REGDOC 2.6.3, Aging Management* per *IR-05000-0006, Integrated Aging Management Program* (Reference 66)

7.5 Chemistry Control

The *PRR-00660-OP-02, Chemistry Control Program* (Reference 67) is the set of chemical specifications supported by chemistry monitoring, analysis, and procedures, ensuring system chemistry is controlled within specifications to:

- optimize the performance of Station systems
- prevent degradation of system components to avoid safety issues
- reliably achieve the design service life
- limit or reduce the release of chemicals and radioactive material to the environment
- minimize the buildup of radioactive materials and activated corrosion products to reduce radiation dose to workers.

This applies to Station systems containing liquids, steam, and gases, as well as online and laboratory chemical analysis systems that support Station chemistry control as per *SI-01365-P094, Controlling Station Chemistry* (Reference 69).

7.5 Chemistry Control, Continued

The Chemistry Control program includes the following elements:

- Chemistry specifications for all major systems for normal operation, shut-down and start-up conditions are defined in operating manual *OM-78210, Plant Chemistry Control* (Reference 70)
- Chemistry parameters are monitored and controlled to ensure timely detection and correction of abnormal conditions through a combination of online monitoring and manual sampling as per the sampling frequency defined in *OM-78210, Plant Chemistry Control* (Reference 70).
- Quality assurance and quality control (QA/QC) of the chemistry control program is governed by *EXP-78200-0001, Chemistry Expectations and Requirements* (Reference 71). This document contains general expectations for chemistry personnel, sample collection, data and system condition reporting, guidelines for implementation of the chemistry laboratory QA/QC program and outlines the requirements for calibration and maintenance of chemistry laboratory and online instrumentation.
- Chemistry data associated with chemistry control in process systems data associated with the laboratory and online instrument QA/QC program is reviewed and evaluated quarterly to review chemistry control trends, performance characteristics, measurements uncertainties, analytical errors and long term trends identify chemistry control observations, performance characteristics, measurement uncertainties, analytical errors and long term trends.
- Bulk and laboratory chemicals, corrosive and cleaning agents, and other hazardous consumable products are effectively controlled. Handling, storage, labelling, and use are in accordance with Station guide *GU-08300-0004, Handling and Storing Hazardous Material* (Reference 72) and Station departmental procedure *SDP-01368-A023, Workplace Hazardous Materials Information System (WHMIS)* (Reference 73).
- Consumable materials that may subject process components and equipment to degradation are controlled in accordance with Station technical basis documentation.

7.5 Chemistry Control, Continued

Procedures, equipment, and materials used for chemical analyses, sampling, and control, are maintained to ensure the accuracy of analytical and process measurements. These are governed by *CSA N286-12*.

Requirements for chemistry sampling and analysis during abnormal conditions, including accident scenarios, are documented in *APOPs, Abnormal Plant Operating Procedures.*

Chemistry performance indicators are compiled monthly to track chemistry control compliance and instrumentation availability, domestic water quality, and human performance trends. The performance indicators include the CNSC Chemistry Index and the CNSC Chemistry Compliance Index. Noted improvements were attributable to a focus on HU tools and quality reviews of data.

7.5 Chemistry Control, Continued

For the period January 1, 2019, to December 31, 2020, the CNSC Chemistry Compliance Index average was 99.59% and the CNSC Chemistry Index average was 98.44% (Figure 19).

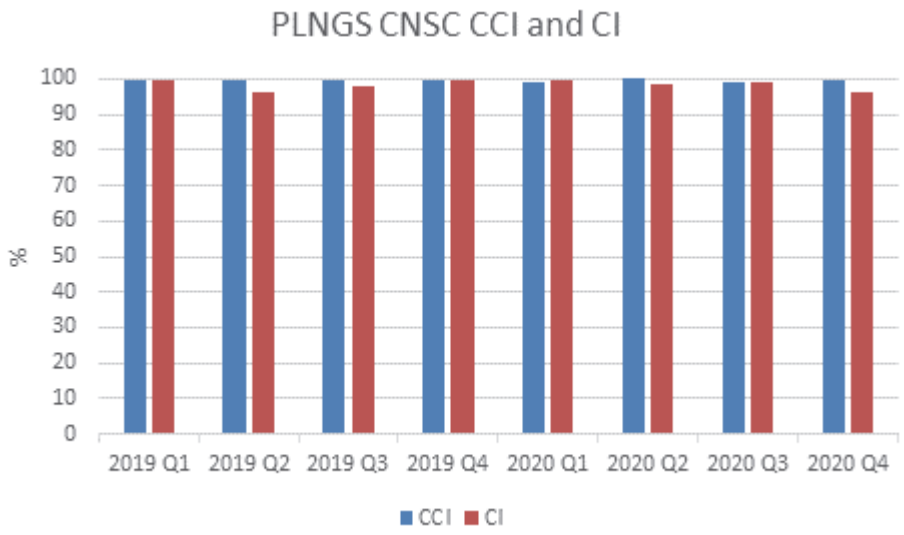

Figure 19: Chemistry Compliance Index (CII) and Chemistry Index (CI)

Planned Improvements

Over the next licencing period, driven by our excellence plan, the PLNGS Chemistry Department plans to increase bench strength for Shift workers qualification with the hiring of 1-2 individuals for placement into the Chemistry Shift qualification training pipeline. In addition, PLNGS has plans in place for the upgrading of laboratory and online instrumentation.

7.6 Periodic Inspection and Testing

Periodic Inspection as it applies to the PLNGS, is the mandatory inspection of pressure-retaining systems and components, including their supports. Periodic Inspections are carried out prior to, and at intervals following, the initial start-up of the Station. They are designed to assure that unacceptable degradation in component condition and integrity has not occurred and the likelihood of a failure that could endanger the radiological health and safety of persons has not increased significantly since the Station was put in service.

7.6 Periodic Inspection and Testing, Continued

Original equipment and components have undergone the required inaugural inspections and undergo periodic inspection by *CSA N285.4, Periodic Inspection of CANDU Nuclear Power Plant Components*, and *CSA N285.5, Periodic Inspection of CANDU Nuclear Power Plant Containment Components*.

PLNGS was shut down in March 2008 for Station Refurbishment, the scope of which included replacement of components requiring periodic inspection including Primary Heat Transport (PHT) pressure tubes and fuel channel feeder pipes. New components requiring periodic inspections are integrated into the existing Station Periodic Inspection Program including required inaugural inspections.

PLNGS submitted Periodic Inspection Program documents updated to the 2009 edition of *CSA N285.4* in July 2012 (Implementation plan submitted for 2014 update 1).

The submission excluded program documents for Supplementary Inspections as follows:

- Clause 12, Fuel Channel Pressure Tubes - Supplementary Inspection
- Clause 14, Steam Generator Tubes - Supplementary Inspection.

PLNGS submitted an implementation plan to be compliant with the 2014 edition of *CSA N285.4* to the CNSC for steam generators, periodic inspection, and fuel channel pressure tubes. With the acceptance of the following updated documents by the CNSC by July 2022, PLNGS will be fully compliant with the requirements of the 2014 Edition of *N285.4 as per*:

- *EPP-03641-PIP1, Equipment Program Plan For Periodic Inspection Program (PIP) CSA N285.4* (Reference 74)
- *EPP-33110-SG01, Steam Generator Management Plan* (Reference 75)
- *EPP-31100-FC01, Fuel Channel Management Plan* (Reference 76)

PLNGS intends to submit a revision to the periodic inspection implementation plan to be compliant with the 2019 Edition of *CSA N285.4 as per*:

- *EPP-03641-PIP1, Equipment Program Plan For Periodic Inspection Program (PIP) CSA N285.4* (Reference 74).

7.6 Periodic Inspection and Testing, Continued

PLNGS submitted an implementation plan to be compliant with the 2013 edition of CSA *N285.5* to the CNSC for Periodic Inspection of containment components. With the acceptance of the following updated document by the CNSC by July 2022, PLNGS will be fully compliant with the requirements of the 2013 Edition of *CSA N285.5:*

- *EPP-03642-PIP2, Equipment Program Plan For Periodic Inspection Program (PIP) CSA N285.5* (Reference 64)

PLNGS intends to submit a revision to the implementation plan to be compliant with the 2018 Edition of *CSA N285.5 as per*:

- *EPP-03642-PIP2, Equipment Program Plan For Periodic Inspection Program (PIP) CSA N285.5* (Reference 64)

In addition to Periodic Inspection, PLNGS carries out in-service examination and testing of the Station Reactor Building in compliance with *CSA Standard N287.7-17, In-service examination, and testing requirements for concrete containment structures for nuclear power plants*. Reactor building examination and testing are administered through the formal Station Reactor Building Management Program as defined in Equipment Program Plan, *EPP-21000-RB01, Reactor Building Management Plan* (Reference 65).

Inspection and Test Certificates

The Inspection and Test Certificates that were initially issued by the New Brunswick Department of Public Safety - Technical Inspection Services for equipment operation are stored in the PLNGS vault.

The ongoing monitoring and inspection of pressure vessels are performed according to *EPP-03644-PV01, Equipment Program Plan for Pressure Vessels* (Reference 77). This document has been formally accepted by the Authorized Inspection Agency, the New Brunswick Department of Public Safety - Technical Inspection Services. PLNGS maintains a history file for each vessel.

8.0 Radiation Protection

The radiation protection Safety and Control Area covers the implementation of a Radiation Protection Program in accordance with the *Radiation Protection Regulations*. This program ensures that the radiation doses and contamination levels are monitored and controlled and maintained as low as reasonably achievable (ALARA). The program is designed to protect workers, the public and the environment from the hazards of ionizing radiation arising from the operation and maintenance of these facilities. This section discusses the following areas:

- Application of ALARA
- Worker Dose Control
- Radiological Hazard Control
- Radiation Protection Program Performance
- Estimated Dose to the Public.

The Radiation Protection Program documentation falls under the process *PRR-00660-SU04, Provide Personnel Safety Services* (Reference 78) in the PLNGS Management System. The documentation is comprised of Radiation Protection Procedures (RPP), Station Departmental Procedures (SDP), a Guide (GU), Station Instructions (SI), Information Reports (IR) and a Standard (STD). *STD-03400-0004, Radiation Protection Directive*s (Reference 79), and its associated documentation, governs the processes used to monitor radiation doses to workers and the public, as well as the processes and methods used to control contamination. Radiation protection and ALARA requirements are also incorporated in detailed work plans, and where appropriate, in job-specific ALARA plans and radiation exposure permits (REPs). These plans are developed by work group planners/assessors and are approved by experienced radiation protection staff. In the field, the Radiation Protection group provides guidance, support, and oversight to workers to allow the work to be completed safely and in accordance with ALARA.

8.1 Application of ALARA

Individual and collective doses are being managed well below regulatory and administrative limits. While radiation work is completed all year long, it is during planned maintenance outages in which workers receive up to 80% of the total dose received annually.

Work planning is completed with specific requirements for work with radiological hazards. All doses to individuals are maintained below regulatory limits:

8.1 Application of ALARA, Continued

- Collective doses to workers are maintained as low as reasonably achievable
- The potential for the spread of contamination is well controlled
- Radiological releases to the environment are well within regulatory limits
- Conditions associated with the environmental assessment and follow-up actions are met.

ALARA planning is performed in preparation for outages based on the last available survey results for areas normally under Access Control.

8.2 Worker Dose Control

The following (Table 4) demonstrates the average and maximum effective doses to workers at PLNGS over the current licencing period:

Table 4: Average and Maximum Effective Doses to Workers

AVERAGE AND MAXIMUM EFFECTIVE DOSES TO WORKERS						
Dose Statistic	**2016**	**2017**	**2018**	**2019**	**2020**	**Regulatory Limit**
Total Persons Monitored	**2417**	**2323**	**2502**	**2383**	**2246**	
Average Effective Dose (mSv)	**1.2 mSv**	**0.8 mSv**	**1.3 mSv**	**0.8 mSv**	**1.46 mSv**	
Maximum Individual Effective Dose (mSv)	**14.0 mSv**	**11.3 mSv**	**13.3 mSv**	**10.3 mSv**	**9.6 mSv**	**50 mSv/year**

The following (Table 5) provides a summary of collective doses to workers at PLNGS through 2016 to 2020. The collective dose is the sum of all doses to all individuals at the facility, including PLNGS personnel and contractors. The total collective dose is further broken down by internal and external dose. The Station has consistently maintained worker radiation exposures below regulatory limits.

8.2 Worker Dose Control, Continued

Table 5: Collective Dose to Workers

PLNGS						
Year	Collective Dose		Collective Dose		Total Collective Effective Dose (person-mSv)	Maximum Individual Dose (mSv)
	Routine Operations (person-mSv)	Outages (including forced outages) (person-mSv)	Internal Dose (person -mSv)	External Dose (person -mSv)		
2016	*199*	*806*	*183*	*822*	*1005*	*14.0*
2017	*204*	*361*	*89*	*475*	*565*	*11.3*
2018	*217*	*963*	*156*	*1024*	*1180*	*13.3*
2019	*224*	*372*	*156*	*440*	*596*	*10.3*
2020	*211*	*1056*	*252*	*1015*	*1267*	*9.6*

The type of work included in the scope of an outage directly affects the resultant dose.

Action Levels

Action Levels are dose levels or some other parameter/limit that, if reached, may indicate a loss of control of the Radiation Protection Program.

Action Levels are identified in *STD-03400-0004, Radiation Protection Directive*s, (Reference 79). Radiation exposures are controlled utilizing of administrative dose limits, job planning through the ALARA program, instrumentation, respiratory protection, access control, and signposting. No Action Levels were met or exceeded during the licencing period.

8.3 Radiological Hazard Control

Radiation work planning serves to identify radiological hazards that may be present or created during work activities at the Station. The use of alarming monitors such as fixed Alarming Area Gamma Monitors (AAGM), fixed and portable Alarming Area Tritium Monitors (AATM), and portable Continuous Air Monitors (CAM) provide early detection of changing radiological conditions. These monitors augment radiation monitoring for workers in addition to the surveys performed as part of the work activity.

Contamination control measures are an important part of reducing the spread of contamination and controlling worker's doses. Control of contamination at the source is the goal, which minimizes the potential for uncontrolled release of contamination or radioactive materials from the site.

8.3 Radiological Hazard Control, Continued

The PROL *17.01/2022, Power Reactor Operating Licence* (Reference 4) incorporates the use of nuclear substances and radiation devices at the Station. Licence Condition 16.4 requires an annual compliance report on the activities covering the nuclear substances or prescribed equipment, to be submitted by March 31st of each year.

In order to demonstrate the integrity of sealed radiation sources, regularly scheduled leak testing is performed where required by regulations, as well as, following an incident that may have resulted in damage to a source.

The Station has designated staff that are trained and qualified in the transport packaging of radioactive material (*Section 15.0*).

8.4 Radiation Protection Program Performance

NB Power is committed to continual improvement in radiation protection programs and practices. Action Levels are identified in *STD-03400-0004, Radiation Protection Directive*s (Reference 79), which requires that the Station:

- Benchmark the Radiation Protection Program against industry best practices
- Develop strategies, processes, programs, and plans to improve Radiation Protection Program performance
- Demonstrate the achievement and effectiveness of the above through monitoring and assessment.

The effectiveness of the radiation protection program is assured through several aspects of the Station's quality assurance program, including:

- Monitoring of performance indicators for analysis and trending
- Management oversight
- Reporting of problems by all workers through the CAP system
- Self-assessments
- Internal and external audits.

PLNGS is an active participant in the development and revision of industry-wide radiation protection performance indicators that improve our ability to compare performance with our CANDU industry peers. The tracking of Station performance and improved communication with our industry peers regarding radiation protection issues and challenges has allowed us to identify areas that require increased focus as well as strengths for our Station. In addition, the Station participates in industry peer reviews and working groups to assess the content and effectiveness of the radiation protection program in comparison with those of top-performing nuclear facilities.

8.4 Radiation Protection Program Performance, Continued

Two specific areas for improvement identified through benchmarking and comparison of performance indicators with industry peers were Unplanned Personal Alarming Dosimeter (PAD) Dose and Dose Rate Alarms and Personnel Contamination Events (PCE).

Unplanned PAD Dose and Dose Rate Alarms

Station staff experienced a high number of unplanned PAD rate alarms and PAD dose alarms when Station metrics were compared with industry metrics. Actions were taken to adjust Station expectations regarding the response to these alarms to align with industry best practices. Performance has continued to improve in this area.

Alignment of Station leadership around the expectations, an increased focus on preventing PAD dose and unplanned PAD rate alarms (Figure 20) and PAD dose alarms (Figure 21), consistent follow-up on alarms, and re-enforcement of expectations in the field also contributed to the improved performance.

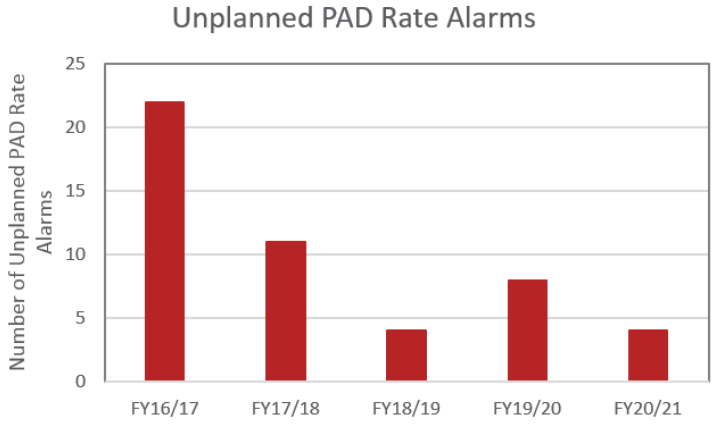

Figure 20: Unplanned PAD Rate Alarms per Fiscal Year

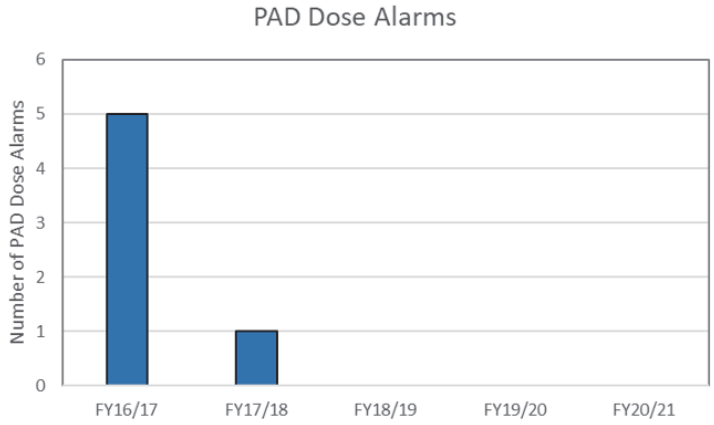

Figure 21: PAD Dose Alarms

8.4 Radiation Protection Program Performance, Continued

Personnel Contamination Events (PCE)

Improvements were made to the processes that drive the response and tracking of PCEs at the Station. A comparison of Station performance compared to industry peers identified this as an area for improvement. The Station has consistently had solid performance during planned maintenance outages, with <1 PCE/outage day but has experienced challenges with meeting the running targets for the number of PCEs per month (Figure 22).

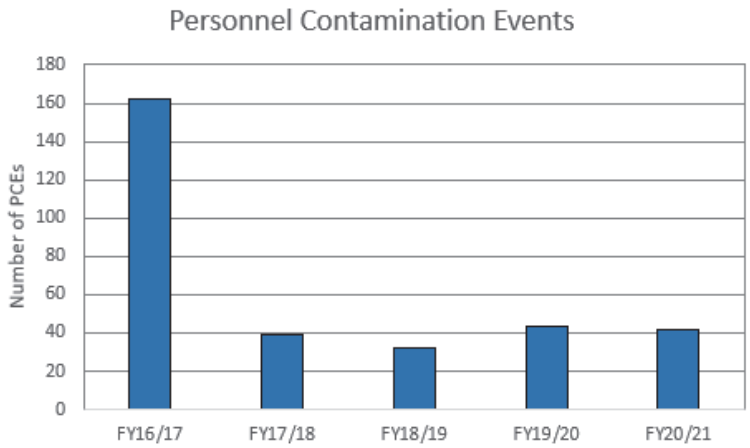

Figure 22: Personnel Contamination Events

8.5 Estimated Dose to Public

The estimated dose to the public has been maintained well below the design target for the Station and continues to be a very small percentage of the regulatory limit of 1000 µSv for members of the public. New Derived Release Limits (DRL) were calculated for Station releases as part of compliance with *CSA N288.1, Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*, which were implemented on January 1, 2019. Dose to the public remained well below regulatory limits (Figure 23).

The PLNGS radiological environmental monitoring program includes sampling and analysis of environmental samples for gamma emitters, tritium and carbon-14 in air, aquatic samples, soil and sediment samples, precipitation, and ground-water. Thermoluminescent Dosimeters (TLDs) are also used to measure external gamma dose rates in the environment.

8.5 Estimated Dose to Public, Continued

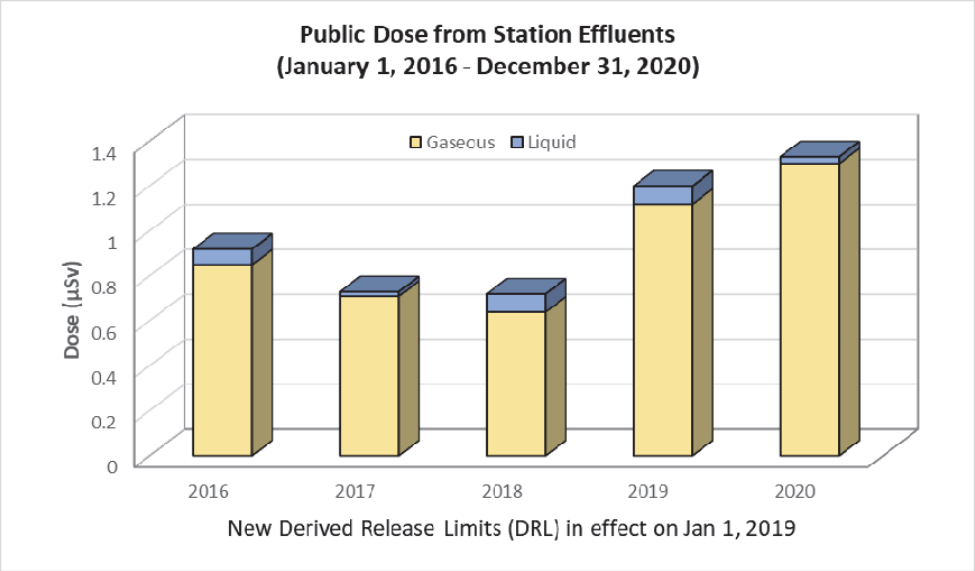

Figure 23: Estimated Public Dose from Station Effluents (January 1, 2016, to December 31, 2020)

The regulatory limit is 1000 mSv for members of the public.

9.0 Conventional Health and Safety

9.1 Performance

At NB Power and PLNGS safety is everyone's responsibility. It is fundamental to success and essential to achieving long-term business goals. Strong safety culture and a healthy workplace environment are at the heart of everything staff does. Safe work behaviour reflects a risk minimization philosophy that applies to the public, visitors, contractors, and employees. Effective hazard management systems are embedded into business planning and work activities.

PLNGS has a goal of zero industrial safety events. In striving for excellence, legal requirements are considered the minimum standard. PLNGS adopts proven and effective best-in-class practices to provide enhanced safeguards vital to achieving sustainable, top-quartile performance and in accordance with *REGDOC 2.8.1, Conventional Health and Safety.*

All employees' participation in identifying and effectively resolving safety issues is crucial to successfully uphold health and safety in the workplace. In the latest Nuclear Safety Culture survey, it showed employees had higher awareness of safety practices and believe performance has improved.

9.1 Performance, Continued

Shared Commitment

NB Power and the International Brotherhood of Electrical Workers (IBEW) are committed to upholding all safety rules and expect every employee to follow these rules thereby eliminating all potential for fatalities and serious injuries. The NB Power and IBEW shared expectations are:

- Follow The Rules
- Refuse Unsafe Work
- Report Incidents
- Lead By Example
- Have Courage.

Experience shows that when safety comes first in an organization, healthy production and profitability can naturally follow. It is in this spirit that NB Power and IBEW make this shared statement of commitment to safety – a commitment all employees are expected to live by every day, for the safety and benefit of all.

Safety Creed

No work is of such urgency or importance that it cannot be performed safely to ensure the safety of every member of the working force and the public.

Accident/Injury

PLNGS continues to encourage low-level reporting. PLNGS safety accident rate performance over the current licencing period was good overall with the latest Lost Time Accident (LTA) being an office worker's repetitive strain injury.

PLNGS recently surpassed two million hours worked without a Loss Time Accident (LTA). This accomplishment is achieved through the continuous efforts of all Station personnel to identify and correct any unsafe conditions. There is an expectation that all staff utilize Human Performance tools and to perform a *2-Minute Drill*, which has the employee identify any potential hazards before beginning work upon arrival to the field or work location. If a hazard is identified, it is eliminated, or mitigations are implemented before starting the task.

Program improvements include the overhaul of the suite of Health and Safety documents. This overhaul included the review and restructuring of 50 + documents into 24 documents ensuring a more streamlined hierarchy of the current Health & Safety process within the Management System. Over the next licencing period, plans are in place for the updating of the confined space program.

9.1 Performance, Continued

Accident/Injury, Continued

A newly developed Health and Safety Expectations and Requirements document acts as a compass directing staff to efficiently locate information related to the Health and Safety at PLNGS.

Three recent self-assessments have shown the safety program in its entirety to be continuing on the path to excellence.

A gap analysis was completed in collaboration with the Training Department on Site Orientation Training (General Employee Training (GET) Day 1, Site Access) including a review of all internal process documents and regulatory documents including the NB Occupational Health and Safety Act (OHSA), Workplace Hazardous Materials Information System (WHMIS), ISO 14001, and *CSA N293* for Fire Safety training requirements in Nuclear Facilities. All material was analyzed against the current orientation curriculum, focusing on Industrial Safety training requirements. As a result, the course learning objectives and training material have been updated. The new curriculum was delivered to all staff onboarding for Outage 2020 and continues today.

PLNGS fully complies with the NB OHSA. WorkSafe NB is the provincial authority mandated to oversee the act within the province of New Brunswick.

Figure 24: Industrial Safety

9.2 Practices and Awareness

Safety is the number one priority at PLNGS, and this theme is reflected throughout the *NMM-00660, Nuclear Management Manual* (Reference 11), which is the top-tier document governing the management of the Station. The importance of safety is reflected throughout the manual and reinforced by the principles that ensure work is performed in a safe and quality manner. The following are some excerpts from the manual.

Management Commitment

NB Power is committed to:

- Operating PLNGS in a safe, reliable, and efficient manner
- Meeting the requirements and expectations of NB Power policies related to Nuclear Safety, Conventional Safety, and the Environment
- Implementing and maintaining the PLNGS Management System
- Complying with the Nuclear Safety and Control Act and other applicable regulations
- Meeting the requirements of the Power Reactor Operating Licence and Licence Condition Handbook
- Implementing NB Power business plans
- Meeting current industry expectations
- Complying with the applicable requirements of the *ISO 14001, Environmental management systems - Specification with guidance for use* standard
- Complying with other applicable acts, regulations, licences, standards, and codes.

All staff who work for PLNGS are accountable for following the requirements of the PLNGS Management System as identified in the Nuclear Management Manual.

NB Power Mission

To be our customers' partner of choice for energy solutions.

Safety First

We are committed to Nuclear, Employee, Environmental and Radiological Safety as an overriding priority in all activities.

9.2 Practices and Awareness, Continued

Employee Responsibilities

All Station staff, have a personal responsibility to carry out duties safely and in accordance with management expectations, processes, procedures, and the training provided.

Employees are responsible for:

- Putting nuclear safety first, above all competing priorities
- Demonstrating the behaviours of a nuclear professional
- Integrating safe practices into every work activity
- Adhering to processes and procedures
- Safeguarding the public, the environment, company property, materials, and equipment
- Identifying problems and deficiencies with equipment, process, and performance
- Identifying improvement opportunities
- Demonstrating a questioning attitude and communicating concerns to management.

Management Responsibilities

Management includes the Vice President Nuclear and Chief Nuclear Officer, Site Vice President, Deputy Chief Nuclear Officer, Directors, Managers, Superintendents, and Supervisors.

Management responsibilities include:

- Providing appropriate planning and direction
- Aligning the organization to achieve safe and reliable operation
- Communicating and reinforcing expectations for high standards of performance
- Providing appropriately qualified resources including personnel, tools, and equipment
- Supporting the accomplishment of work and removing unnecessary obstacles
- Ensuring a respectful workplace.

Personnel Safety

NB Power provides a work environment in which the risk of an individual suffering injury or workplace illness is minimized. An important element in providing a safe work environment is setting the right expectations and ensuring that Station staff are working to these expectations and procedures. NB Power promotes an environment that encourages the identification and resolution of safety concerns. NB Power provides appropriate direction, training, technical support, procedures, and equipment to enable employees to work safely.

9.2 Practices and Awareness, Continued

In 2018 the Health and Safety Department engaged a training consultant to develop safety-related training specific to understanding risk, hazard identification and implementing controls to eliminate or reduce risk. Supporting SU-04 process documents include *SDP-01368-A057, Completing a Job Hazard Analysis* (Reference 80) and associated *Form PL-0741, Job Hazard Analysis* (Reference 81).

Members of the PLNGS Health and Safety Department then became qualified under the PLNGS Management System process *SU-03, Provide Training* to deliver the course curriculum. Participants included PLNGS Field Management, Supervision, and the Assessing Department staff. A high-level overview of the learning objectives includes understanding risk, understanding how to break a job down into steps, identifying the hazards associated with each step and how to use the Hierarchy of Controls to mitigate the identified hazards along with utilizing a risk matrix to show effective mitigations.

10.0 Environmental Protection

10.1 Environmental Management Systems (EMS)

Corporate Policies

The following Corporate Policies are listed as NB Power Requirements in the *PRR-00660-SU-02, Provide Environmental Services,* (Reference 82) and govern environmental policy matters at PLNGS:

- Sustainable Development l Policy (G-4)
- Reporting Environmental Spills (G-7)
- Purchasing Environmentally Safe Products (SC-11)

In addition, the following PLNGS documents contain primary references to environmental safety and control measures:

- *SI-01365-P101, Developing and Maintaining the Environmental Management System* (Reference 83)
- *RD-01364-L001, Derived Release Limits for Radionuclides in Airborne and Liquid Effluents* (Reference 84)
- *SDP-01368-P077, Control and Monitor Effluents* (Reference 85)

REGDOC 2.9.1, Environmental Protection Policies, Programs and Procedures is referenced to ensure the licensee meets expectations on an established environmental management program to ensure the protection of the environment.

10.1 Environmental Management Systems (EMS), Continued

ISO 14001

PLNGS has implemented an Environmental Management System (EMS) and has been certified as compliant with ISO 14001. PLNGS successfully re-registered in 2019 and had a successful maintenance audit in 2020.

NB Power's Sustainable Development Policy drives the elements of the EMS from the top level of the organization. The Sustainable Development Policy was signed and issued by the President and Chief Executive Officer on April 1, 2020.

The EMS considers all conventional and radiological activities, including contractor activities that may create an impact on the environment.

PLNGS has identified Significant Environmental Aspects and developed objectives and targets for continual improvement under the EMS. An Environmental Technical Specialist tracks day-to-day performance. In addition, the EMS is also reviewed periodically by senior management at the EMS Management Review meetings.

As part of maintaining its accreditation, the Station is audited annually by its ISO Registrar. The auditors randomly verify how PLNGS' Significant Environmental Aspects are being maintained. Findings of the auditors are reviewed with Station management. Major findings, if identified, must be resolved within a specific time frame, usually determined by the auditors. Every three years, the Station undergoes an ISO re-registration audit.

ISO 14001:2004 standard was revised with a new 2015 edition. PLNGS became registered to this new version of the standard in September of 2018.

Environmental Protection

The Safety, Human Resources and Environment Committee of the Board of Directors meets quarterly, and the Director of Environment and Emergency Preparedness provides regular updates on environmental accomplishments, highlights, challenges, and emerging legislation impacting NB Power's operational activities. NB Power is involved in a number of industry-wide programs and initiatives through organizations such as CANDU Owners Group, Canadian Nuclear Association, and the Canadian Electricity Association.

The PLNGS site falls within the boundaries of an established Important Bird Area (IBA NB020 Point Lepreau/Maces Bay).

10.1 Environmental Management Systems (EMS), Continued

Environmental Protection, Continued

The species likely to frequent this IBA are protected under the Migratory Birds Convention Act.

Figure 25: Point Lepreau Bird Research Observatory

The EMS includes provisions to control the release of radioactive and hazardous substances into the environment, reduce the generation of wastes and prevent adverse environmental effects. This includes:

- Emissions management
- Spills management
- Land assessment and remediation management
- Waste management
- Management of polychlorinated biphenyls (PCBs)
- Management of ozone-depleting substances
- Management of environmental impacts
- Radiological release limits and action levels
- Monitoring of radioactivity in effluents
- Management of off-site radiological environmental monitoring program
- Study of adverse effects on the fish population (e.g., fish impingement and entrainment).
- Phasing out of on-site asbestos, *SOR-2018-196 Prohibition of Asbestos and Products Containing Asbestos.*

10.2 Effluent and Emissions Control (Releases)

Spills

The New Brunswick Department of Environment issues PLNGS an *Approval to Operate*, which deals with releases to water through various effluent streams. If a non-compliance to a condition occurs, a report is required to be sent to the Department of Environment. Spills are also captured and reported. PLNGS tracks the spills that occur on the property and categorizes them into small spills (<20L), Large Spills (>20L). Spills that do not meet the criteria of reportability are captured through CAP and measured into a monthly environmental index that is included on the Station Vice President's (VP) scorecard.

Our approvals for releases to water are *I-11307, Industrial Wastewater Treatment Approval to Operate* (Reference 86) and *S-3271, Domestic Wastewater Works Approval to Operate* (Reference 87).

Liquid Waste Management

Radioactive liquid wastes from various systems are routed to storage tanks in the Service Building. The contents of the tanks are sampled and analyzed for radioactivity prior to release into the Station cooling water discharge. Provisions exist to reduce activity levels in the wastewater, if required. Discharge from the tanks is monitored and controlled to ensure that the release levels do not exceed operational targets, which are significantly below the Derived Release Limits.

Bulk waste oil (active and inactive) generated at PLNGS is disposed of through approved waste management agencies (off-site) in accordance with provincial and federal guidelines.

Gaseous Waste Management

Ventilation air from the Reactor Building and Spent Fuel Bay is filtered through high-efficiency particulate air filters and charcoal filters prior to discharge to the exhaust stack. Exhaust from other areas, which have potentially contaminated ventilation air is also routed to the stack. Ventilation from areas of the Service Building with potential particulate contamination is filtered by high-efficiency particulate air filters prior to release through the stack. Some areas of the Reactor Building use the Vapour Recovery System to reduce the tritium content in the air, which results in lower airborne tritium releases. The Containment Isolation system will prevent the release of Reactor Building air if abnormal gamma activity is detected in the airflow. Releases are monitored continuously to alert Operators to unanticipated changes. Samples from the stack monitor are analyzed in detail to verify that releases do not exceed the operational targets, which are more restrictive than regulatory limits.

10.3 Assessment and Monitoring

Provincial Licences

The following Approvals and Licences, issued by the New Brunswick Government, are in effect.

Table 6: Provincial Licences

Regulation	Approval No.	Expires
Water Quality Regulation 82-126, Clean Environment Act	Domestic Wastewater Treatment System	June 26, 2024
Water Quality Regulation 82-126, Clean Environment Act	Industrial Wastewater Treatment System	April 30, 2026
Water Quality Regulation 82-126, Clean Environment Act	Post Closure Monitoring of the Decommissioned Point Lepreau Waste Disposal Facility	Dec 20, 2021
Petroleum Product Storage and Handling Regulation 87-97, Clean Environmental Act	2984 Petroleum Storage Site Licence	Sept 30, 2021

Effluent Monitoring Program

Effluent releases from the Station have remained low throughout the licencing period. Airborne releases averaged 9.26E-2% Derived Release Limits (DRL) for the 2016-2020 calendar years. Liquid releases averaged 5.41E-3% DRL during this period. The DRL for the Station is based on the version of *CSA N288.1* that was reaffirmed in 2014. During the licencing period, new DRLs were calculated based on *CSA N288.1*. These revised DRLs were implemented in January 2019.

PLNGS became compliant with the following CSA Standards over the course of the current licencing period:

Table 7: CSA Standards

CSA Standard	Implementation Date
CSA N288.4-10, Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	Compliant
CSA N288.5-11, Effluent Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills	Compliant
CSA N288.6-12, Environmental Risk Assessments at Class 1 Nuclear Facilities and Uranium Mines and Mills	Compliant
CSA N288.7-15, Groundwater Protection Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills	Compliant
CSA N288.1-14, Guidelines for calculating DRLs for radioactive material in airborne and liquid effluents for normal opearation for nuclear facilities	Compliant

10.3 Assessment and Monitoring, Continued

The Station is compliant with the *REGDOC 2.9.1, Environmental Principles, Assessments and Protection Measures.*

Radiation Environment Monitoring Program

The Radiation Environment Monitoring Program (REMP) assesses the radiological impact of the Station and the SRWMF on the environment and the public. Monitoring results are submitted in the annual compliance report to the CNSC.

Figure 26: Radiation Environment Monitoring and Sample Collections

The estimated dose to the critical groups in the public averaged 0.92 µSv from airborne releases and 0.06 µSv from liquid releases for the 2016-2020 calendar years. These estimates are derived from the measured effluent releases in % DRL. The annual compliance report for the environmental radiation monitoring program reports airborne dose estimates.

Fisheries Act Authorization

NB Power began the process of obtaining a Fisheries Act Authorization for PLNGS. NB Power has identified a large off-setting strategy in the form of a barrier removal that would result in a significant and ongoing improvement to the marine and freshwater ecosystem in southwestern New Brunswick. The off-setting strategy has been vetted by DFO and would serve as off-setting for existing cooling water systems at multiple generating Stations, in addition to PLNGS for the lifetime of each of the four sites.

10.3 Assessment and Monitoring, Continued

Fisheries Act Authorization, Continued

The barrier removal will require an Environmental Impact Assessment (EIA) pursuant to the New Brunswick lean Environment Act. The EIA process requires NB Power, as the proponent, to consult with all First Nations in New Brunswick to satisfy the provincial process. In addition, NB Power will undertake consultation requirements under the Fisheries Act for the authorization application simultaneously.

DFO is the primary regulatory agency on all four authorizations and will continue to interface with them on this file.

A previously proposed commitment to a ghost gear retrieval program proposed for a five-year period will be maintained and commenced in the summer of 2020.

Thermal Plume

In May of 2018, a Thermal Plume Assessment was initiated in support of the Environmental Risk Assessment. The final version of the report regarding to this study was submitted to the CNSC in June of 2020.

10.4 Protection of the Public

Effluent Exceedances

Provincial licences (*Section 10.3, Provincial Licences*) dictate the requirements (e.g., criteria and timing) for reporting discharges that do not meet licence requirements.

Sewage Treatment Plant Performance

A Membrane Bioreactor filtration unit is presently being used at PLNGS. The performance is monitored by a contracted company. There have been no exceedances since the membrane bioreactor filtration unit has been in place. The data results from the sewage treatment facility are reported to the federal Effluent Regulatory Reporting Information System (ERRIS), quarterly as per our approval to operate.

PLNGS continues to uphold regulatory requirements and additional high standards for the environment. PLNGS has conducted an independent environmental risk assessment (2020) as per *CSA N288.6-12, Environmental Risk Assessment for Nuclear Power Plant,* which provides the basis for *CSA N288.4, Environmental Monitoring Program* and *CSA N288.5, Effluent Monitoring Program* and in keeping with the *REGDOC 2.9.1 Environmental Protection: Environmental Principles, Assessments and Protection Measures.*

10.5 Environmental Risk Assessment

In 2020, PLNGS conducted an update of its Environmental Risk Assessment (ERA). This study was an update of the previous ERA which was submitted to the Canadian Nuclear Safety Commission (CNSC) in December 2016. The site-wide study investigated human and non-human receptor exposure to conditions on and surrounding the site, including, air, soil, sediment, groundwater, and surface water (freshwater and seawater). The ERA study consisted of the three main components: Site Characterization, Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (EcoRA). The results of the updated ERA were determined to be consistent with that of the previous risk assessments completed for the Station. The recommendations identified within the ERA will be used to further strengthen the environmental program, with the findings to be presented and discussed in the next iteration of the ERA.

In support of the updated ERA, PLNGS conducted a Thermal Plume Assessment of the Cooling Water Discharges from the Station in 2018. The objectives of the study were to delineate the horizontal and vertical dimensions of the thermal plume, temperature changes over ambient of the thermal plume at PLNGS, and provide a list of ecological receptors (e.g., indicator species) that were use to support the EcoRA. Continuous temperature data loggers, in situ water quality profiles and geomatics and remote sensing allowed the plume to be determined and delineated for PLNGS. Consistent with previous thermal discharge assessments for the Station, the thermal plume assessment indicated that the overall thermal plume was typically less than one degree Celsius above ambient conditions, and in very infrequent instances the temperatures were above ambient by +/- 3 degrees Celsius.

PLNGS is committed to the protection of the environment and the surrounding community in which we operate. The ERA and supporting Thermal Plume Assessment further this commitment and allow us to fully understand the impacts of the Stations operation on the surrounding environment.

11.0 Emergency Management and Fire Protection

11.1 Emergency Preparedness

The Emergency Preparedness Program is governed by the *PRR-00660-SU-05, Provide Emergency Preparedness* (Reference 88) process and associated documentation. The program provides the capability to respond to radiological and conventional emergencies including severe accidents in a timely, effective, and coordinated manner through a comprehensive all-hazards approach to Emergency management. This is accomplished through focusing on the four cornerstones of emergency management: Prevention and Mitigation, Preparedness, Response and Recovery.

11.1 Emergency Preparedness, Continued

The Emergency Preparedness Program meets the requirements of *REGDOC 2.10.1, Nuclear Emergency Preparedness and Response, REGDOC 2.3.2, Accident Management (2015)* along with *CSA N1600 General Requirements for Nuclear Emergency Management Programs.*

The Emergency Preparedness Program focuses on ensuring the protection of the plant, public, personnel and environment. This is accomplished through robust emergency plans and procedures which support all-hazards, these hazards include:

- Upset alerts
- Radiation (e.g., design basis) events
- Fire events
- Medical events
- Hazmat events
- Severe accidents (e.g., beyond design basis events)
- Natural disasters (e.g., storms, floods, hurricanes, earthquakes, tsunamis)
- Pandemic events
- Security events
- Radioactive materials transport events.

Continuing for excellence in conventional and radiological response is maintained through a robust drill and exercise program and is supported by qualified and competent emergency response organization staff. This is further augmented through coordination and collaboration with our emergency response partners through established Mutual Aid Agreements.

Emergency facilities and equipment on-site and off-site are kept in a constant state of readiness and include robust and redundant communications equipment. These facilities and equipment are tested and integrated with our emergency response partners to ensure effective incident management.

Strong communications with our local and First Nations communities along with all local and provincial response agencies ensure~~s~~ the continued success of our emergency plans and procedures. This further supports the safe reliable operation of the Station and protection of the plant, public, personnel and environment.

The following documents are the applicable PLNGS documents that support the licencing basis and are to be listed in the Licence Conditions Handbook:

- *SI-01365-EP02, Emergency Response Plan* (Reference 31)
- *SI-01365-EP01, Preparing and Maintaining the Emergency Response Plan* (Reference 89)

11.1 Emergency Preparedness, Continued

- *SDP-01368-EP02, Preparing and Implementing Emergency Procedures, Drills, and Exercises* (Reference 90)
- *SDP-01368-EP03, Maintaining, Testing and Expectations the Contingency Roster Personnel* (Reference 91)
- *SDP-78660-0001, Pandemic Response Plan* (Reference 32)
- *IR-78600-02, Technical Planning Basis – Radiation Emergency* (Reference 93)

PLNGS maintains a fire protection program compliant to *CSA N293-12, Fire Protection for Nuclear Power Plants* as per *SI-01365-A236, Providing Fire Protection* (Reference 92). As part of this program, Fire Protection assessments are maintained through the Fire Hazard Assessment, Fire Safe Shutdown Analysis and the Code Compliance Review. Maintaining field implementation of the program is controlled through various Station processes covering Space Allocation for Transient Materials (SATM), control of hot work activities, managing of fire protection impairments and integrated risk management. Also included in the scope of the program is maintenance for the fire protection system. This is managed through an equipment program plan. Fire brigade requirements of the program are covered in *Section 11.2, Conventional and Fire Emergency Preparedness and Response*.

The following documents are the applicable PLNGS documents that support the licencing basis and are to be listed in the Licence Conditions Handbook:

- *SI-01365-A236, Providing Fire Protection* (Reference 92)
- *71400-3000-001-FHA, Fire Hazard Assessment for Point Lepreau Generating Station* (Reference 113)
- *71400-3000-001-FSSA, Fire Safe Shutdown Analysis for the Point Lepreau Nuclear Generating Station* (Reference 114)
- *71400-9012-001-CDCR, Code Compliance Review Point Lepreau Generating Station* (Reference 115)

11.2 Conventional and Fire Emergency Preparedness and Response

PLNGS continues to make improvements in the Fire Protection Program with investments in fire protection and life safety systems as well as a robust ERT maintenance training program. As part of the licencing period prior to 2017, the fire protection SSC was largely replaced and upgraded throughout the Station. Work has continued with fire system upgrades in the last licencing period. These include new system jockey pumps and are currently underway with the installation of new diesel-driven fire pumps to ensure fire water supply reliability and capacity.

11.2 Conventional and Fire Emergency Preparedness and Response, Continued

The PLNGS ERT transitioned from a five-crew to a six-crew shift schedule in February 2021 as part of the implementation of *REGDOC 2.2.4*, *Fitness for Duty – Managing Worker Fatigue.* The new six-crew schedule will provide the ERT teams with an additional 72 hours of training per year and will provide more availability of members to cover duty shifts and ensure members are fit for duty.

Figure 27: Emergency Response Team

The ERT department assumed a lead role during the initial stages of the 2020 COVID-19 pandemic response by implementing COVID-19 screening for Station Staff and visitors. The ERT also assumed this role during the most recent planned maintenance outage. In late August, a COVID-19 Response Team (CRT) was established to provide additional support for screening and to respond to any potential COVID-19 matters at the Station. PLNGS implemented a defence in-depth approach that has been recognized by our provincial public health to have the Gold Standard in COVID-19 prevention. The CRT is being led by the ERT Fire Chief and supported by the Health Unit, Safety Department, Corporate Office, members of the ERT and other support staff from the Station.

In 2019, the PLNGS ERT and Security's Nuclear Response Team (NRT) introduced a joint ERT/NRT cross-training day. This was an opportunity for each department (within the Emergency Service Division) to network and gain further understanding of the respective teams' responsibilities during an emergency response situation and how best to support in an integrated response. This has been viewed as a success by both departments. Also, in 2019 the ERT played an active role in the biannual Security exercise allowing the NRT to demonstrate a complete response to a security event. ERT assisted in the development and incorporation of the ERT allowing the drill to include a hand-off to medical first responders making it more realistic than ever.

11.2 Conventional and Fire Emergency Preparedness and Response, Continued

In August of 2019, nine representatives from PLNGS Emergency Response Organization participated in a two-day Incident Command System Canada I-200 training and certification, supplemented with a one-day Fire Service Command Staff Leadership Workshop facilitated by Emergency Solutions International Inc.

In 2019, PLNGS ERT co-hosted a Fire Workshop on-site and had 146 firefighters from 26 different Fire Departments attend from around the Province. The workshop included pump operations, boat rescue, low angle rescue, live-fire response, Rapid Intervention Team (RIT) and basic auto extrication. Building relationships and training with our local volunteer Fire Departments is an important part of working with the local community.

Figure 28: 2019 PLNGS Fire Fighter Workshop

In 2019, PLNGS ERT purchased new auto extrication equipment and lifting bags and began training to align with industry peers and continue to expand our response capabilities.

11.2 Conventional and Fire Emergency Preparedness and Response, Continued

PLNGS continues to maintain up to-date Code Compliance Review (CCR), Fire Hazard Assessment (FHA), Fire Safe Shutdown Analysis (FSSA), and routinely performs fire program audits, multiple drill evaluations of our ERT and ERT program audits. Additional improvements are driven through the use of self-assessments.

PLNGS ERT participates in Haz-Mat, Medical, Fire, and Design Basis drills. A Systematic Approach to Training is used for rescue, incident command, firefighting, medical response and hazardous material response. Training provided at PLNGS for emergency response is in accordance with the *SU-03, Provide Training* process and complies with *CSA N293-12*.

Figure 29: PLNGS Mutual Aid

PLNGS has a mutual aid agreement with the local Musquash Volunteer Fire Department as well as a renewed agreement with the Saint John Fire Department valid through to 2030. These mutual aid agreements are exercised annually and PLNGS has a well-established relationship with both departments.

Local volunteer firefighters train at the site weekly and have developed a solid understanding of the Station layout, Station fire hazards and firefighting equipment locations, increasing their value and capability as emergency responders. Station personnel facilitate this by working closely with the local fire department, building relationships by supporting many of the volunteers in becoming nuclear energy workers, and as a result be able to act as fire drill evaluators, and participate in fire drills on a monthly, quarterly and annual basis.

11.2 Conventional and Fire Emergency Preparedness and Response, Continued

Musquash Fire Department members are trained to the orange badge level in radiation protection.

Through continuous improvement, the Station further enhances programs through the use of operating experience, best practices, and drill/exercise evaluations. PLNGS continues its participation on the technical committee for *CSA N393-13, Fire Protection for Facilities that Process, Handle, or Store Nuclear Substances*. As PLNGS maintains an all-hazards approach to Emergency Preparedness; training along with drills and exercises are regularly conducted with the Station's emergency response organization to ensure it is prepared to protect the plant, public and personnel during any event.

11.3 Nuclear Emergency Preparedness and Response

Nuclear Emergency Preparedness and Response is covered under the all-hazards emergency management program for PLNGS. The on-site emergency response plans directly support the Point Lepreau Nuclear Off-site Emergency Response Plan, which is managed by the New Brunswick Emergency Measures Organization (NBEMO) in coordination with PLNGS.

PLNGS maintains strong interfaces with off-site organizations and agencies through robust plans, procedures, and protocols. Which ensure that the Station, province of New Brunswick, and all supporting agencies provincially and federally can respond to and manage any event which could occur. This also includes the Warden service under the direction of NBEMO and is unique to New Brunswick. The Warden service supports both preparedness and response to a Nuclear Emergency at PLNGS.

1.3 Nuclear Emergency Preparedness and Response, Continued

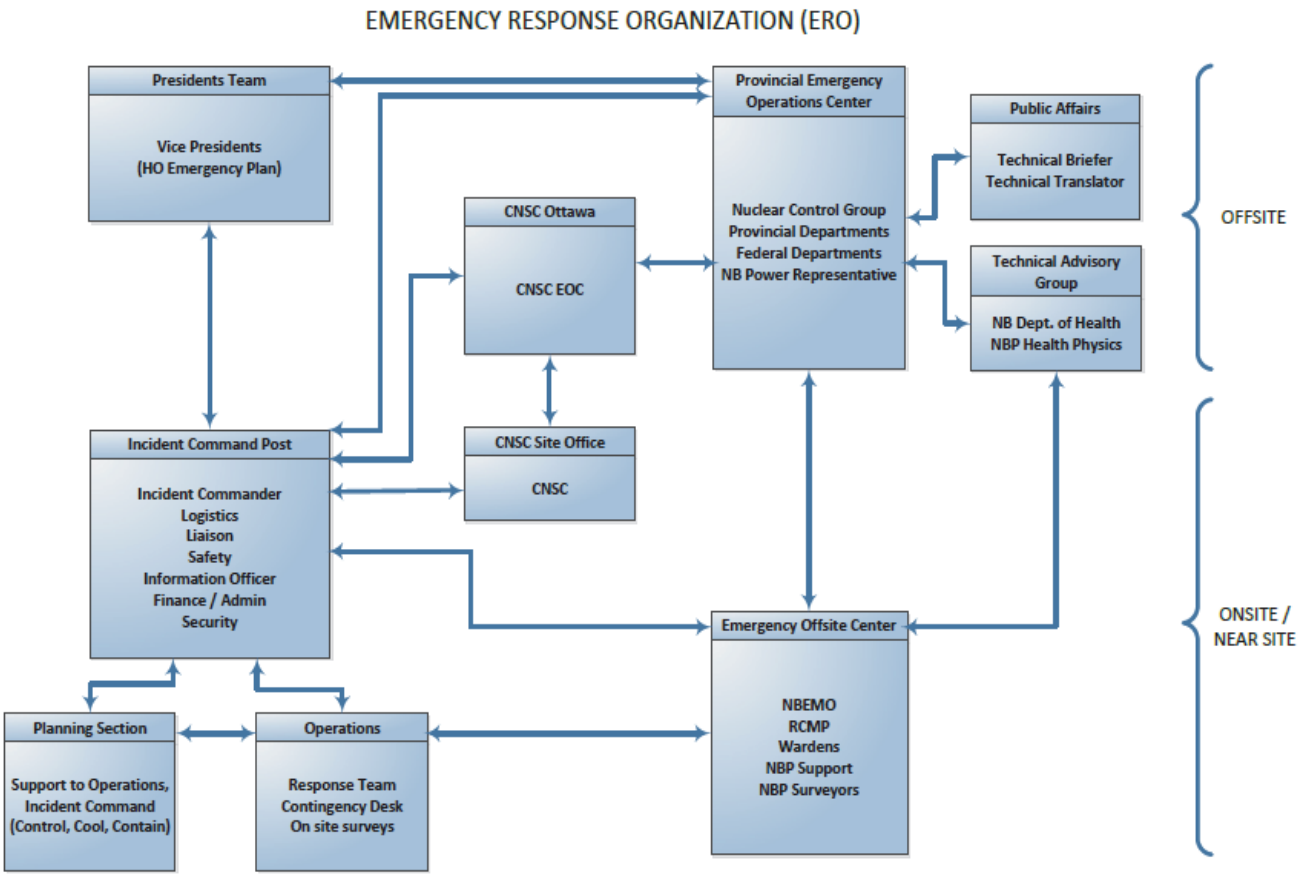

Figure 30: Emergency Response Organization Diagram

Evacuation Time Estimate Study

An Evacuation Time Estimate (ETE) study was completed for PLNGS in 2017. The study was based on current census data along with NBEMO demographic survey information and used an Industry-accepted methodology. The study provided NB Power and NBEMO with the estimated times to evacuate the protective action zones around PLNGS, to a radius of approx. 30km from the Station.

The study concluded that the evacuation emergency planning zones including schools and transit-dependent residents could be completed within four hours. The estimate provides NBEMO with projections on how long it may take to evacuate if required. Variables such as time of day, day of week, road restrictions, special event assemblies and weather were assessed as to how those factors may impact the evacuation duration.

11.3 Nuclear Emergency Preparedness and Response, Continued

Incident Command System

PLNGS utilizes the Incident Command System (ICS) for all event responses. The Incident Command structure consists of the Incident Command Section, Planning Section, Operations Section and Contingency Support Personnel. Incident Command initially resides with the Shift Supervisors and is transitioned to the Incident Command Section once activated. This system is also the structure used by NBEMO along with the other emergency response agencies which support the Station during emergency response.

During any nuclear emergency the full ICS is activated along with notifications and activation of off-site response agencies under the direction of NBEMO, as well as the CNSC. During the progression of any event, conditions are continuously assessed with classifications and protective action recommendations being made to the province under the direction of NBEMO. This also transitions into termination of a nuclear event is done in coordination between PLNGS and NBEMO and is based on having a recovery plan established which allows the transition to recovery.

Emergency Facilities

In 2018, PLNGS transitioned into its new Off-site Emergency Operations Center (OEOC) located outside of the 20km Emergency Planning Zone. This new off-site emergency operation center houses all off-site response agencies required to support the response to a radiological emergency at the Station. In addition, the facility provides a full back-up to the on-site Incident Command and Planning Sections if on-site facilities become inhabitable. This facility also houses the Monitoring and Decontamination Center Equipment maintained by NBEMO and is used as a training facility for response agencies.

The Station’s on-site Incident Command and Planning sections have seen significant facility upgrades with the introduction of a more user-friendly layout and additional IT infrastructure. These enhancements allow the sections to better manage events by having more prominent displays of event and Station information.

11.3 Nuclear Emergency Preparedness and Response, Continued

Emergency Facilities, Continued

Figure 31: Off-site Emergency Operations Center

Staffing, Training and Resources

PLNGS maintains fully trained and competent staff within the Incident Command Section, Planning Section, Operations Section, Contingency Support Personnel, and resources to support the OEOC. The resources for these positions are comprised of staff across the organization and are staffed with resources that support long-term extended response events.

Qualifications for these positions include initial and continuing training programs, with drills and exercises being used to validate the performance and effectiveness of training. Qualifications are managed between the line organization and the Emergency PreparednessDepartment.

Drills and Exercises

PLNGS maintains an extensive drill and exercise program. This program validates emergency plans and procedures and provides the emergency response organization with the opportunity to improve and sustain its response capability. The lessons learned from these exercises ensure the continuous improvement of the program.

11.3 Nuclear Emergency Preparedness and Response, Continued

Drills and Exercises, Continued

Exercise Synergy Challenge 2018 was a two-day, full-scale emergency exercise conducted in October 2018 by New Brunswick Emergency Measures Organization and New Brunswick Power along with all local, municipal, provincial, and federal response partners. The exercise was successfully completed and marked the first time that recovery from a radiological event had been exercised to this scale in New Brunswick and Canada. Synergy Challenge 2018 allowed all response agencies to respond to a simulated radiological emergency at the PLNGS on day 1 of the exercise with a transition to recovery for all agencies progressing on day 2. The lessons learned from the execution of the exercise will further enhance the Station's and province's ability to respond to and recover from a nuclear emergency.

The PLNGS in coordination with the province of New Brunswick will be conducting Synergy Challenge 2021 in the fall of 2021.

Figure 32: Synergy Challenge

12.0 Waste Management

The objective of the PLNGS Waste Management Program is to provide for the safe and reliable processing of active and inactive waste. Station Instruction *SI-01365-P102, Controlling Waste* (Reference 94) contains the primary references concerning waste management safety and control measures.

12.1 Waste Characterization

At PLNGS, solid and liquid waste is characterized as either radioactive waste or inactive waste. Radioactive waste is, in turn, classified as either low-level waste (LLW) (e.g., Type 1, < 2 mSv/h), intermediate-level waste (ILW) (e.g., Type II, 2-125 mSv/h), or high-level waste (HLW) (e.g., Type III, > 125 mSv/h).

12.2 Waste Minimization

During training and pre-job briefs, a focus is placed on waste minimization practices, particularly segregation at source.

To this end, the Station continues a Likely Clean Program as a radioactive waste reduction strategy. Waste generated in Zone 3 areas that are believed to be uncontaminated is placed in Likely Clean receptacles. This waste is then screened to determine the appropriate disposal location. Based on the results of that screening, radioactive waste is packaged for interim storage in Phase I of the SRWMF, while non-radioactive waste is sent to a provincially licenced regional sanitary landfill or an appropriately licensed external agency for disposal. PLNGS had historically considered all waste generated in Zone 3 to be radioactive.

Additionally, in support of PLNGS' strategy for the long-term management of LLW/ILW, legacy LLW/ILW is sent to an appropriately licensed external agency for processing via incineration, metal melt, or compaction. PLNGS commenced this practice in 2011, which has led to a significant reduction of the volume of such waste in Phase I of the SRWMF. When considering the volume of incinerable waste and the associated return ash, for example, this practice represents a volume reduction of approximately 80%.

12.3 Waste Management Practices

Waste Management Program

PLNGS meets all the requirements of *CSA N292.0-14, General Principles for the Management of Radioactive Waste and Irradiated Fuel*; *CSA N292.1-16, Wet Storage of Irradiated Fuel and Other Radioactive Materials*; *CSA N292.2-13 (Update 1), Interim Dry Storage of Irradiated Fuel*; and *CSA N292.3-14, Management of Low- and Intermediate-Level Radioactive Waste.* PLNGS is conducting a gap analysis for future implementation of the newly issued *REGDOC 2.11.1, Waste Management Volume 1: Management of Radioactive Waste*.

Solid Radioactive Waste Management

The SRWMF is located within the Station exclusion boundary. The design provides a simple, safe, and reliable means of managing solid radioactive waste, a by-product of the nuclear reaction process, such that the public, processing personnel, and the environment are adequately protected from radioactive hazards. To accomplish this, waste is stored in above-ground, reinforced concrete structures. The structures are designed to provide interim storage of Station waste (including waste generated from retubing operations) for at least 50 years, as per Safety Report *0087-79100-3010-001-SR, Solid Radioactive Waste Management Facility Safety Report* (Reference 10). Operational waste is stored in Phase I of the facility, while waste from retubing and other operations completed during the Refurbishment Outage is stored in Phase III of the facility.

An inventory of radioactive waste stored at the SRWMF is submitted quarterly to the CNSC via the *Solid Radioactive Waste Management Facility Quarterly Reports*. As of March 31, 2021, a total of 858.13 m^3 of waste was in storage in Phase I of the facility and a total of 1011.22 m^3 of waste was in storage in Phase III of the facility.

Table 8 below displays the volume of low-level and intermediate-level radioactive waste generated in the Station since October 01, 2016. These volumes are presented to the CNSC every quarter via Safety Performance Indicator *SPI 25, Low- and Intermediate-Level Radioactive Solid Waste Generated*.

12.3 Waste Management Practices, Continued

Solid Radioactive Waste Management, Continued

Table 8: Low/Intermediate Level Radioactive Solid Waste Generated

	Low (m^3)	Intermediate (m^3)
2016 Q4	13.93	0.29
2017 Q1	19.21	0.21
2017 Q2	32.92	0.84
2017 Q3	15.42	0.53
2017 Q4	24.51	0.52
2018 Q1	14.85	0.004
2018 Q2	50.43	1.04
2018 Q3	13.76	0.28
2018 Q4	13.86	0.53
2019 Q1	11.47	0.26
2019 Q2	33.90	0.26
2019 Q3	12.09	0.29
2019 Q4	9.92	0.21
2020 Q1	10.25	0.50
2020 Q2	11.12	0.17
2020 Q3	32.63	0.48
2020 Q4[1]	109.31	0.28
2021 Q1	18.06	0.00

[1]PLNGS experienced a shortage of packaging used to compact low-level radioactive waste. This occurred in parallel with a planned maintenance outage where an increase in waste was expected to occur. As a result, approval was obtained for the transfer and processing of the uncompacted low-level waste in an effort to ensure that a backlog of low-level waste did not occur. This resulted in the apparent higher than usual volume for this quarter.

Spent Fuel Management

Spent fuel bundles, another by-product of the nuclear reaction process, are removed from the reactor and placed into the Spent Fuel Bay for the purposes of cooling and shielding. Following a minimum residency of seven years in the Spent Fuel Bay, the fuel is transferred to the Dry Storage Facility (e.g., Phase II of the SRWMF). At this facility, the spent fuel bundles are stored in above-ground cylindrical, reinforced concrete structures designed to provide maintenance-free storage for an interim period of at least 50 years.

As of March 31, 2021, two hundred and twenty-five canisters had been filled and sealed in Phase II of the facility.

12.3 Waste Management Practices, Continued

Spent Fuel Management, Continued

Requirements pertaining to the transfer of spent fuel between the Spent Fuel Bay and the SRWMF are incorporated into the PLNGS Power Reactor Operating Licence, namely via Safety Report *0087-79100-3010-001-SR, Solid Radioactive Waste Management Facility Safety Report* (Reference 10). Further to this, transfers are aligned with the Integrated Safeguards Procedure for Canada.

Preliminary engineering currently underway in terms of the Phase II Extension, which will provide sufficient storage capacity for spent fuel until the end-of-life of the Station.

Mixed Waste Management

Mixed waste (e.g., having both radioactive and hazardous properties) is disposed of via an appropriately licensed external agency.

Hazardous Waste Management

Hazardous waste is disposed of via an appropriately licensed external agency.

Inactive Waste Management

Inactive solid wastes are recycled, where possible, or disposed of off-site at a provincially licensed regional sanitary landfill.

12.4 Decommissioning Plans

PLNGS meets all requirements regarding the decommissioning of the Station in accordance with *CSA N294-09 Update 1, Decommissioning of Facilities Containing Nuclear Substances* and *G-219 Decommissioning Planning for Licenced Activities*. PLNGS is conducting a gap analysis for future implementation of the newly issued *REGDOC 2.11.2, Decommissioning*. By meeting the above, PLNGS ensures that the selected decommissioning strategy is a technically feasible approach that protects health, safety, security, and the environment.

Effective July 29, 2003, NB Power provided the CNSC with a Decommissioning Financial Guarantee for PLNGS. The PLNGS Preliminary Decommissioning Plan (PDP) and Decommissioning Cost Estimate form the basis for the Decommissioning Financial Guarantee, while financial guarantee requirements associated with used fuel management are calculated based upon the updated Adaptive Phased Management cost estimates completed by the Nuclear Waste Management Organization (NWMO). The PLNGS PDP and Decommissioning Cost Estimate were last updated in June 2020. PLNGS is conducting a gap analysis for future implementation of the newly issued *REGDOC 3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licence Activities*.

13.0 Security

PLNGS has established a comprehensive nuclear security program that uses the security-in-depth model. The Nuclear Security Program supports PLNGS' fundamental nuclear safety objective to protect the public, site personnel, and the environment from harm by establishing and maintaining effective security defences against theft, sabotage, or other malicious acts in accordance with the Design Basis Threat.

The objective of PLNGS's Security Program is to ensure safe and secure operation of the Station by maintaining protection through the use of equipment, well-trained personnel and procedures. A wide range of state-of-the-art security equipment is deployed around and throughout the site.

PLNGS works closely with our industry peers, provincial and federal emergency services and participates in an Inter-Utility Security Working Group, which includes all power reactor Operators in Canada. This group is part of the overall program to ensure nuclear security programs in Canada continue to evolve to meet future requirements. PLNGS continues to use external benchmarking, consultative services, and shared operating experience to ensure that the security program meets or exceeds industry standards.

Figure 33: PLNGS Nuclear Response Team

PLNGS Security also participates in the World Institute of Nuclear Security program and has several officers certified as Certified Nuclear Security Professionals. PLNGS maintains its program by being compliant with a number of regulatory documents pertaining to security.

13.0 Security, Continued

PLNGS has a security program in accordance with CNSC regulatory documents and regulations.

The following table is a list of security regulatory documents for PLNGS:

Table 9: Security Related Regulations

Source	Document Title	Document #
CNSC	Nuclear Security Regulations	SOR/2000-209
CNSC	General Nuclear Safety and Control Regulations	SOR/2000-202
CNSC	High Security Facilities, Volume 1: Nuclear Response Force	REGDOC-2.12.1
CNSC	Site Access Security Clearance	REGDOC-2.12.2
CNSC	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2	REGDOC-2.12.3
CNSC	Fitness for Duty, Volume III: Nuclear Security Officer Medical, Physical and Psychological Fitness	REGDOC- 2.2.4
CNSC	High-Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices	REGDOC 2.12.1

PLNGS uses the following guidance documents as a general framework for security program procedures:

- *IAEA Nuclear Security Series No. 4 Technical Guidance "Engineering Safety Aspects of the Protection of Nuclear Power Plants Against Sabotage"*
- *IAEA Series No. 13 Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*
- *IAEA Nuclear Security Series No. 17 Technical Guidance "Computer Security at Nuclear Facilities"*
- *IAEA Nuclear Security Series No. 8 Implementing Guide "Preventative and Protective Measures against Insider Threats*
- *Government of Canada - Standard on Security Screening.*

The following PLNGS documents contain references to security safety and control measures:

- *RD-01364-L025, Station Security Report* (Reference 95)
- *SDP-14000-SE02, Transporting Nuclear Material On-Site* (Reference 96)
- *SI-01365-A094, Complying with Security Requirements* (Reference 97)

13.0 Security, Continued

- Tactical Deployment Plan (Classified) (Reference 98)
- *SDP-14000-SE019, Controlling and Maintaining Firearms, Ammunition and Less Lethal Weapons* (Reference 99)
- *SDP-14000-SE025, Organizing and Maintaining the Nuclear Response Team* (Reference 100)
- *SI-01365-A116, Security Expectations* (Reference 101)
- *SDP-14000-SE026 Maintaining and Modifying Nuclear Security Officer Status* (Reference 102)
- *SI-01365-A115 Establishing and Maintaining the Security Program* (Reference 103)
- *SI-01365-A096 Responding to an Abnormal Situation* (Reference 104).

13.1 Facilities and Equipment

Security systems are installed, operated, tested, and maintained in accordance with manufactures' specifications and meet the *Nuclear Security Regulations* and *REGDOC 2.12.1 Volume II: High-Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices.* PLNGS has a dedicated team that monitors and repairs the systems when required with support from the System Health Specialist.

PLNGS has an ongoing requirement, by the CNSC, to continue to monitor the threat situation at the SRWMF to ensure the required measures are in place to address any credible threats. PLNGS is required to report on this matter through the annual Security Threat and Risk Assessment submission to the CNSC as required by the *Nuclear Security Regulations.*

With all requirements in place, the PLNGS Security Department provides the means to detect, deter, and respond to unauthorized entry to, and unauthorized activity within the Protected Areas. Security measures exist in all protected areas where fissile material is stored or used. This provides protection related to Nuclear Safety, personnel safety, and supports Canada's obligation to the non-proliferation treaty.

PLNGS has upgraded many Security systems and response equipment over the last licence period, which not only meet**s** but, in some cases, exceed**s** the requirements set out under our regulatory guidance.

13.2 Security Practices and Response Arrangements

Security processes are in place to prevent the loss or illegal use, possession or removal of the nuclear substance, prescribed equipment, or prescribed information. All PLNGS personnel and others who require unescorted site access and/or IT network access are subjected to a personal screening process. This process is based on guiding principles of confidentiality, respect for human rights, timeliness, efficiency, and compliance of *REGDOC 2.12.2 Site Access Security Clearance* and *Government of Canada Standard on Security Screening.*

The PLNGS Security Program ensures that both the Station and staff are aware of and protected against Design Basis Threats and any other credible threat identified in the annual Threat and Risk Assessment (TRA).

The Security Program has implemented measures to prevent, deter, detect, and address unauthorized entry of weapons, explosives, personnel, theft and malevolent acts by both external threats and insider threats to the Protected Areas. PLNGS Security deployment strategies, to meet the Design Basis Threats (DBT), have been approved by the CNSC and tested through the CNSC Performance Testing Program.

PLNGS has an established agreement with the Royal Canadian Mounted Police (RCMP) as the off-site response for PLNGS in accordance with *Nuclear Security Regulations* and requirements set out in *REGDOC 2.12.1, High-Security Facilities, Volume I: Nuclear Response Force, Version 2.*

The *RD-01364-L025, Station Security Report,* (Reference 95) also outlines the robustness studies and program details that are in place at the Station. Submissions and required updates will be implemented as per the *Nuclear Security Regulations.*

Cyber Security

In accordance with *CSA N290.7-14, Cyber security for nuclear power plants and small reactor facilities*, the PLNGS has a cyber security program that protects Cyber Essential Assets that perform or impact:

- functions important to nuclear safety
- nuclear security functions
- emergency preparedness and response functions.

Security Program Improvements

PLNGS has made changes to their screening process with the implementation of a new screening lobby for personnel and visitors entering the Main Site Protected Area. An officer is now dedicated to the access control systems for monitoring of personnel, radiological source security and back security clearances for the site.

13.2 Security Practices and Response Arrangements, Continued

Security Program Improvements, Continued

A new Memorandum of Understanding (MOU) and Service Level Agreement (SLA) has been updated and go beyond the regulatory requirements laid out in the *Nuclear Security Regulations and REGDOC 2.12.1, High-Security Facilities, Volume I: Nuclear Response Force, Version 2*. This agreement will improve the already great relationship with the RCMP.

PLNGS has several trained and qualified Security Tactical Command NRT that completed the course in conjunction with the RCMP, which provide the skills and knowledge required to lead the front line NRT during a security event. PLNGS plans to create and develop a Tactical Team Lead course that will further develop the front-line officers to lead on the ground during an event.

PLNGS continues to adapt and improve the Security Department by updating a number of procedures and currently developing others to improve the program. The Security Training documents have been updated and now have a dedicated resource that ensures they remain compliant with regulatory requirements and align with the *SU-06 Provide Security Services* process.

PLNGS Security added a sixth team to be in compliance with *REGDOC 2.2.4, Fitness for Duty: Managing Worker Fatigue* which will create more training hours for the NRT to develop and improve on their skills for protecting the facility against acts of sabotage and/or theft of nuclear material. This new schedule also allows more time off for officers to rest and hopefully extend the longevity of the NRT career.

Finally, PLNGS has worked hard to recruit many officers to comply with the facility requirements for security and has put a large focus on hiring more female officers for diversity within the group. This recruiting effort has been successful and PLNGS will continue to focus on hiring skilled, qualified NRT that represent our communities.

13.3 Drills and Exercises

Training is conducted to sustain and enhance performance in the Security Department. Specialized training is provided to the NRT following *REGDOC 2.12.1, High-Security Facilities, Volume I: Nuclear Response Force, Version 2,* to ensure regulatory qualifications are achieved and maintained to ensure security proficiencies. The Security drill and exercise program validates PLNGS' security measures, ensures regulatory compliance, and identifies areas for improvement.

PLNGS has conducted several successful Security exercises testing both the on-site and off-site response capabilities with our off-site partner, the RCMP. These exercises have been held since 2012 with the most recent in 2019.

PLNGS completes a drill for their NRT monthly and participates in exercises at both Protected Areas onsite. All training and drills are captured in a robust program that monitors and tracks the progression of the drills, creates lessons learned and actions so leadership and training can follow up on any areas for improvement. Security Training reports directly to the Security Department and this is viewed as a success due to the complexity of the training and knowledge required to ensure compliance with all regulatory requirements including *REGDOC 2.2.2, Personnel Training*, which provides guidance for a training program that meets the systematic approach to training.

PLNGS continues to work closely with industry peers, off-site response and other outside agencies to improve our training program and develop the NRT.

Figure 34: NRF Training Exercise

14.0 Safeguards and Non-Proliferation

14.1 Nuclear Material Accountancy and Control

Safeguards

PLNGS implements the IAEA Safeguards in accordance with Canadian obligations to the IAEA, under the International Treaty on Non-Proliferation of Nuclear Weapons and associated Agreements made by Canada under the Treaty (e.g., *IAEA INFCIRC/164, Agreement between Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons; IAEA INFCIRC/164/Add.1, Protocol additional to INFCIRC/164 and Integrated Safeguards Procedure for CANDU Stations and Associated Used Fuel Storage Facilities in Canada*).

To ensure the Safeguards Program enables Canada to meet its international safeguards obligations, PLNGS adheres to the CNSC regulatory document *REGDOC 2.13.1, Safeguards and Nuclear Material Accountancy*. The primary PLNGS documentation defining the requirements of *REGDOC 2.13.1* is *RD-01364-L007, Physical Accounting of Fuel* (Reference 105) and *SI-01365-P095, Maintaining IAEA Safeguards* (Reference 48).

The Safeguards Program outlines the IAEA safeguard controls used at PLNGS to:

- Provide support and information to the IAEA
- Prevent the theft or diversion of nuclear fuel
- Ensure the timely detection and reporting of any such theft or diversion
- Interface with IAEA personnel
- Monitor and control the transfer of nuclear fuel to and from, and within the Station, including transport to the Dry Fuel Storage Facility
- Establish and maintain a system of accounting for nuclear fuel
- Generate reports required under agreements signed by Canada
- Establish and maintain IAEA safeguard controls
- Ensure access requirements are met for activities relating to inspections.

The Safeguards Program ensures that information is gathered, and the required reports are prepared and submitted per the current Licence Conditions.

14.1 Nuclear Material Accountancy and Control, Continued

The Reports include but are not limited to:

- Annual Operational Programme
- Quarterly Operational Programme Reports
- List of Inventory Items Exemption Report
- Request for Exemption
- Advance Information
- Fissionable Substance (General Ledger) Report
- Monthly Declarations
- Summary of Inventory Changes
- Inventory Change Document
- List of Inventory Items
- Physical-Key Measurement Point (P-KMP) Inventory Summary
- Obligated Material Inventory Summary
- Reconciliation Statement
- Re-Classifying Nuclear Material
- Design Information Questionnaire
- Additional Protocol – Annual Report

Safeguards facilitate various inspections and surveillances in conjunction with the IAEA and CNSC. These inspections and surveillances include:

- Physical Inventory Verification
- Design Information Verification
- Short Notice Random Inspection
- Inventory Change Verification
- Remote Monitoring
- Dry Storage Canister Surveillance
- Unannounced Inspections
- Physical Inventory Taking
- Physical Inventory Taking Evaluation
- Physical Inventory Verification
- Complimentary Access
- Canister Verification Activities

14.1 Nuclear Material Accountancy and Control, Continued

PLNGS has consistently demonstrated its obligations through the successful conclusion of these inspections over the years, in addition to its routine submissions of required reports to both the IAEA and CNSC. The CNSC has assessed the area of safeguards and non-proliferation as satisfactory. Additionally, the IAEA over the previous licencing period concluded that its verification activities were successful and that the Station has met all of its obligations.

A Fuel Accounting System (e.g., Sibyl Bundle Tracker – SBT) has been implemented to document the movement of fuel to and from the Station; and on-site between the new fuel storage room, the reactor, the irradiated fuel bays, and the dry fuel storage canisters; and to allow for the tracking of specific fuel bundles as well as the containers they are in. In addition, the Fuel Management Program assures that accurate records are maintained. The IAEA periodically audits these records as part of their Safeguards Program.

14.2 Access and Assistance to the IAEA

Regular visits by IAEA inspectors occur on-site to review the status of our records, monitoring equipment, procedures, and worker practices to ensure that all fuel is safeguarded and accounted for.

PLNGS will grant prompt access at all times to all locations at the Station to an IAEA inspector, or to a person acting on behalf of the IAEA, where such access is required to carry on an activity pursuant to a safeguards agreement. In granting access, PLNGS will provide health and safety services, escorts and any technical or equipment assistance as required. Initial access to areas for inspection will be attained within two hours of the IAEA arriving on site.

14.3 Operational and Design Information

The Design Information Questionnaire (DIQ) provides the IAEA/CNSC with information pertaining to PLNGS's design to ensure safeguards responsibilities are met as per Facility Attachment No. 25. The DIQ is to be provided upon request from the IAEA/CNSC. The DIQ ensures that general information describing the PLNGS facility, design and operation, nuclear material descriptions, processing and flow of nuclear materials, safeguard measures, and accounting and reporting of nuclear materials are accurate and available to support a Design Information Verification (DIV) inspection.

14.4 Safeguards Equipment, Containment and Surveillance

Safeguards equipment and information are marked as such and secured to prevent interference or tampering. The IAEA conducts an annual inspection to ensure the functionality and no tampering of remote monitoring equipment have occurred at PLNGS. The inspector may replace seals. Surveillance systems (e.g., Digital Multi-Camera Surveillance Systems, Integrated Fuel Monitor, Silo Entry Gamma Monitor and X-Cams) exist at PLNGS to permit the IAEA continuous detailed data of safeguards related functions; specifically, the core discharge monitors and bundle counters. The information is compared against PLNGS's monthly declarations.

Dry Storage Canisters (DSC) that are being actively used remain under continuous IAEA surveillance. The IAEA may conduct any of the following on the DSCs: radiation-profiling, attach seals, Silo Entry Gamma Monitoring and X-Cam data review.

14.5 Import and Export

The scope of the Non-Proliferation Program at PLNGS is limited to the tracking and reporting of foreign obligations and origins of nuclear material. Import and export of controlled nuclear substances, equipment, and information as identified in the *Nuclear Non-proliferation Import and Export Control Regulations,* is not currently permitted under the PLNGS site licence and any application is made in accordance with applicable regulations.

15.0 Packaging and Transport

NB Power has procedures for handling, packaging, and shipment of Hazardous Waste and Dangerous Goods. PLNGS regularly contracts the transportation and disposal of waste out to qualified vendors who are licensed, trained, and experienced in conducting these activities.

The shipment of Dangerous and Hazardous materials from the Station is performed in accordance with the Station processes: *PRR-00660-SU-12, Provide Materials and Services,* (Reference 26) and *SI-01365-A078, Performing Outgoing Shipments* (Reference 106) and *SDP-01368-A048, Preparing, Shipping and Receiving Radioactive Material* (if applicable) (Reference 107). These documents comply with *SOR/2015-145, Packaging and Transport of Nuclear Substances Regulations, 2015.*

Documentation for shipments is prepared or reviewed by workers following procedures that contain safety and control measures for the Transport Canada regulation *Transportation of Dangerous Goods Regulations*. All shipments of radioactive waste require the approval of the Senior Health Physicist. NB Power has designated staff who are trained and qualified in the transport packaging of dangerous goods and hazardous materials.

NB Power has procedures for handling, packaging, shipping, and receiving radioactive material. An emergency response plan has been registered and approved by Transport Canada. Radioactive material packages are required by regulations to meet specific criteria. NB Power procures certified packaging for radioactive shipments, where required and does not maintain certification for specific packaging types or apply for certification of packaging. NB Power may, at times, apply to the CNSC to become a registered user of specific packaging (e.g., Type B packaging for transporting spent fuel that is owned by another utility) if this type of packaging is required to be used, but does not own this type of packaging for radioactive material. NB Power routinely contracts the transportation of radioactive material out to qualified transporters who are trained and experienced in conducting these activities.

16.0 Other Matters of Regulatory Interest

16.1 Nuclear Substance Control Program

Table 10: Nuclear Substances

Item	Nuclear Substance	Unsealed Source Maximum Quantity	Sealed Source Maximum Quantity	Equipment Make and Model	Certification Number
1	Activation Products	1 GBq	N/A	N/A	N/A
2	Fission Products	1 GBq	N/A	N/A	N/A
3	Depleted Uranium	6000 grams	N/A	N/A	N/A
4	Am-241	1 MBq	N/A	N/A	N/A
5	Am-241 / Be	N/A	50 GBq	N/A	N/A
6	Activation Products	N/A	5 GBq	N/A	N/A
7	Fission Products	N/A	5 GBq	N/A	N/A
8	Depleted Uranium	N/A	6000 grams	N/A	N/A
9	U-235	N/A	100 kBq	N/A	N/A
10	Cesium 137	N/A	370 MBq	BOT Engineering TR-1A Universal Gamma Checker	R-414-0011-1-2031
11	Cesium 137	N/A	5.5 TBq	J.L. Shepherd 89 calibrator	R-179-0210-2-2033
12	Strontium 90/ Yttritium 90	N/A	1480 MBq	R-Metrics Beta Meter Checker	R-276-0001-1-2032
13	Enriched Uranium 235	N/A	370 kBq	BOT Engineering Model RM- VIFM CDM	414-0012
14	Cesium 137	N/A	1.1 MBq	Eberline Model CSM-1 for GEM	N/A
15	Cesium 137	N/A	366 kBq	Amersham-Buchler Nds for LEPM	N/A
16	Cesium 137	N/A	4.44 MBq	MGPI Model 124086 for GEM	R-069-0002-0-2023
17	Cesium 137	N/A	4.44 MBq	MGPI Model 124087 for GEM	R-069-0002-0-2023

AAGM = Alarming Area Gamma Monitor
GEM - Gaseous Effluent Monitor
LEPM = Liquid Effluent Pipe Monitor

The Consolidated Nuclear Substance and Radiation Device Licence, held by NB Power, is incorporated into the Power Reactor Operating Licence. *Section 16.4* of the *LCH-PLNGS-R001, Licence Conditions Handbook* associated to *PROL 17.01/2022* (Reference 4) and requires that an annual compliance report be submitted.

16.1 Nuclear Substance Control Program, Continued

Table 11: Other Nuclear Substances

Nuclear Substance	Form	Location	Maximum Quantity
Natural Uranium	Solid Bundles	New Fuel Inventory	5741 Bundles
Depleted Uranium	Solid Bundles	New Fuel Inventory	203 Bundles
	Spent Solid Bundles	Cannister + Storage Bays	160 190 Bundles[1]
Irradiated Uranium	Solid Bundles	Core	4560 Bundles
Heavy Water	Liquid D2O	Various	558 056 kg[2]

[1] 38 692 spent depleted bundles in the storage bay. 121 498 spent depleted bundles at the SRWMF.
[2] A Heavy Water Accounting Program for PLNGS has been established. The purpose of this program is to provide a means of maintaining correct records of the heavy water inventory and ensuring that heavy water with different isotopic and tritium concentrations is kept segregated. It supports PLNGS to limit releases to the environment and personnel exposures.

NOTE

See *Section 1.2* for reference to CNSC licences that control nuclear substances.

16.2 Hazardous Substances

In accordance with the *Class I Nuclear Facilities Regulations, Section 1, hazardous substance is* "a substance or waste, other than a nuclear substance, that is used or produced in the course of carrying on a licensed activity and that may pose a risk to the environment or the health and safety of persons."

NB Power's inventory of hazardous substances at PLNGS is maintained in NB Power's WHMIS Browser. There are currently approximately 2758 products approved for use and catalogued in our inventory. The quantity of these substances stored or in use will be based on work execution, demand, and production.

In lieu of an inventory that would be immediately out-of-date, a listing of the substances evaluated annually against reporting thresholds for reporting to the National Pollutant Release Inventory (NPRI) has been provided (Table 12). All other substances reportable through the NPRI have been determined, (through a self-assessment completed in 2020), to be well below any reporting thresholds for materials manufactured, produced, or otherwise used (MPO).

Table 12: Hazardous Substances

Evaluated Substance	Amount Assessed as MPO 2020 (kg)	Threshold for Reporting (kg)	Form
Sulphuric Acid	27400	10000	Liquid
Ethylene Glycol	3373.48	10000	Liquid
Hydrazine	1076	1000	Liquid
Cobalt	0.408	50	Solid (welding rods)
Lead	2.1	50	Solid (ammunition)

16.2 Hazardous Substances, Continued

NOTE

All hazardous substances are subject to a rigorous approval process prior to purchase and use, in accordance with *SI-01365-T092, Performing Procurement Engineering Evaluations (Reference 108)* and *SDP-01368-A023, Workplace Hazardous Materials Information System (WHMIS)* (Reference 73).

16.3 Environmental Assessment

The overall PLNGS site has been the subject of a series of environmental evaluations and assessments:

- A full federal and provincial environmental assessment for Point Lepreau 1 (1977)
- A full federal and provincial environmental assessment for a proposed Point Lepreau 2 (1985)
- An assessment to allow the storage of Dry Spent Fuel Storage in above-ground canisters at the SRWMF (1990)
- A screening-level assessment of modifications at the SRWMF to manage refurbishment related wastes, including the:
  - specific refurbishment activities that would generate waste requiring management in the SRWMF
  - handling and transport of those wastes
  - incremental environmental effects of continued operation of the PLNGS following completion of the refurbishment activities
- An independent environmental risk assessment as per *CSA N288.6-12, Environmental Risk Assessment at Class 1 Nuclear Facilities and Uranium Mines and Mills* and to provide the basis for *CSA N288.4-10, Environmental Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills* and *CSA N288.5-11, Effluent Monitoring Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills*.

Collectively, these assessments and related approvals projected the construction, operation, and maintenance of generation and related facilities at this site for an additional 25-30 years post refurbishment operation, followed by decommissioning activities.

CNSC staff has determined that these assessments are sufficient to cover the continued operation of PLNGS.

16.4 Indigenous Consultation

The Point Lepreau site lies adjacent to the Bay of Fundy, which straddles the ancestral territories of the Mi'gmaq/Mi'kmaq Nation (including the Mi'gmaq communities in New Brunswick represented by Mi'gmawe'l Tplu'taqnn (MTI) and the Mi'kmaq communities in Nova Scotia including Sipekne'katik First Nation), six Maliseet communities of New Brunswick represented by the Wolastogey Nation of New Brunswick (WNNB) and the Peskotomuhkati Nation.

16.4 Indigenous Consultation, Continued

NB Power recognizes the importance of communicating and engaging with the First Nations Communities in New Brunswick. Through mediums such as information sessions, educational forums and regularly occurring monthly meetings, representatives of NB Power are continuing to engage First Nations in meaningful conversations about NB Power business, Station operations and major projects. NB Power has negotiated formalized capacity funding agreements with both the Wolastoqey Nation in New Brunswick (WNNB) and Mi'gmawe'l Tplu'taqnn Incorporated (MTI): the consultative body representing eight of the nine Mi'gmaq/Mi'kmaq communities. Open dialogue is maintained with the local Peskotomuhkati Band regarding PLNGS operational activities given the proximity of their traditional territory to the Station boundaries. NB Power keeps Sipekne'katik informed of activities of interest.

NB Power regularly participates in meetings of the Union of New Brunswick Indians and provides updates on NB Power activities. The Mi'gmaq/Mi'kmaq consultative body representing Elsipogtog First Nation; Kopit Lodge also has regular engagement and is kept apprised of activities conducted at the Station.

NB Power's Strategic Approach to First Nations Affairs enhances and complements corporate policies and guides NB Power in its relationships with First Nations. The NB Power Strategic Approach is built upon three interdependent elements: engagement, education, and employment. PLNGS is committed to ensuring a welcoming and supportive environment of respect, recognition and inclusion that embraces and values diversity.

Engagement

NB Power recognizes the importance of building and maintaining positive relationships with the First Nations of New Brunswick. In addition to regular engagement with community members, organizations and government agencies, NB Power and representatives of the First Nations Communities meet monthly to discuss projects, operations, and First Nations interests. The meetings are held in person as often as possible and occur in both NB Power and First Nations facilities. Capacity funding agreements with both WNNB and MTI were uniquely tailored to suit each organization's needs. The agreements provide funding to support/create positions within the First Nations organizations, fund capacity to host and attend engagement meetings and provided opportunities to host community information sessions. These initiatives have also been extended to engaging with consultative bodies, tribal councils, and indigenous leadership regarding Station specific areas of interest and Small Modular Reactors (SMR).

NB Power is working closely with the First Nations Power Authority to organize and sponsor Forums for Indigenous Communities. NB Power is also working with MAWIW Tribal Council in supporting community events and youth initiatives.

Education

NB Power appreciates the deep history of the First Nations Peoples of New Brunswick and acknowledges the wisdom of the values that have been passed down through the generations. As such, NB Power strives to increase the awareness of First Nations culture within the organization.

16.4 Indigenous Consultation, Continued

Education, Continued

NB Power's First Nations Affairs Department has been delivering Cultural Awareness Orientation sessions to its employees and contractors for some time. The presentations were developed by First Nations employees within NB Power and had been reviewed by elders of the Wolastoqey Nation, as well as the respective consultative bodies of both the Wolastoqey and Mi'gmaq/Mi'kmaq Nations.

NB Power has created a First Nations Cultural Awareness Orientation computer-based training (CBT) module. The training has been formalized in both official languages. NB Power has also partnered with the Government of New Brunswick and the University of New Brunswick to develop a comprehensive First Nations Cultural Awareness CBT module. NB Power also creates opportunities for its employees to participate in various cultural activities including attending Pow-Wow gatherings and blanket exercises. NB Power has also implemented a number of activities supporting Indigenous traditional knowledge, establishing more awareness and sensitivity among its workers. Members of New Brunswick Indigenous communities are leading medicine walks, participating in regular activities at the site including collaborative environmental and safety monitoring and delivering presentations to leadership. NB Power staff learned from the Indigenous involvement and integrated some of those lessons into its approach in Station management, particularly with environmental management. As well, NB Power worked with Indigenous groups to build capacity within their communities to better understand and self-direct learning on nuclear technology and its use in New Brunswick, waste management and new opportunities in nuclear development and its role in a clean electricity mix. It also attended several Open Houses in Mi'gmaq/Mi'kmaq communities.

NB Power continues to support a variety of First Nations initiatives including, educational programs with opportunities for job exposure with the St. Mary's First Nation, placements on the Energy Fundamentals Program held jointly by the Atlantica Centre for Energy and the University of New Brunswick Saint John Campus, Energy Advisor training and placements on the Indigenous Clean Energy Program. NB Power also facilitated procurement information sessions for the Mi'gmaq/Mi'kmaq Nation, where economic development officers from communities, Service New Brunswick and Opportunities New Brunswick met to learn how to become involved in tendering opportunities.

Through on-going engagement, the desire for independent First Nations field monitoring was expressed by both Mi'gmaq/Mi'kmaq and Wolastoqey Nations and these positions have been created. Peskotomuhkati First Nations independent field monitor will also start participating this summer (2021).

The field monitors work alongside NB Power employees and contractors and share their knowledge and perspectives, leading to well-rounded field reporting which is shared openly with the First Nations Communities.

16.4 Indigenous Consultation, Continued

Education, Continued

NB Power is compliant with *REGDOC 3.2.2, Aboriginal Engagement.* Presently, PLNGS does not have any major projects scheduled that impact its duty to consult.

16.5 Cost Recovery

NB Power pays CNSC's fees every quarter. NB Power is in good standing for payments.

16.6 Financial Guarantees

NB Power liability related to the Financial Guarantee Program is confirmed to be acceptable by the CNSC. NB Power funding for decommissioning and the long-term storage of radioactive waste is in a positive state and will continuously monitor investments for the required funding. PLNGS has and will continue to submit financial guarantees as required by the PROL and the CNSC Financial Security and Access Agreement. The plans, cost estimates, and fund performance are periodically updated and reviewed to ensure NB Power has the necessary financial guarantees for these two obligations.

The source for the basis of the PLNGS decommissioning financial guarantee is contained within two bodies of information:

- A site-specific Decommissioning Cost Estimate and associated Preliminary Decommissioning Plan (PDP) undertaken by a US-based decommissioning consultant, TLG Services, Inc.

- An Adaptive Phased Management Cost Estimate was developed and maintained by the Nuclear Waste Management Organization (NWMO).

PLNGS is conducting a gap analysis for the newly issued *REGDOC 3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licence Activities*.

16.7 Improvement Plans and Significant Future Activities

Achieving excellence in Safety, Leadership, Operations, Process, and Equipment is sustained as part of our *DM-01, Direct and Manage the Business* and *DM-04, Assess and Improve Performance* processes in the PLNGS Management System. Regular performance monitoring occurs in many ways; however, a summary of performance is reviewed monthly and quarterly at the senior management and executive levels. In addition to this, independent reviews of performance are completed regularly by industry peers, WANO, the CNSC and other regulatory bodies. As a result, targets and plans are updated continually to drive improved performance. NB Power continues to strive for industry excellence in all areas of our business to ensure safe operation, continued protection of the public and environment, to meet NB Power's long-term energy supply and to continue to provide clean energy to our customers. As such, over this next licencing period, PLNGS's significant future activities and improvement efforts include:

Significant Future Potential Upgrades Being Evaluated:

Heat Transport Pump Motor Replacement

HP Turbine Rotor Replacement

Unit Transformer Replacement

Moderator D_2O Replacement is progressing to replace the current higher curie D_2O with lower curie D_2O from an external vendor. The water that is removed will be stored in a purpose-built safe storage building to be located in the vicinity of the SRWMF. The higher curie water will be drummed and transported to this facility. The building will be designed and constructed to store these drums of D_2O.

Switch Gear Upgrade/ MCC Replacement

Zone 3 Storage Improvements

Improvement Efforts

Excellence Plans continue to be revised on an annual basis. These are fundamental operational plans for achieving both compliance and world-class performance within a specified process area. These plans include the various elements included within this section of improvements and future significant activities as well as others such as CSA/REGDOC implementation; Action Items and a broad range of undertakings to lead PLNGS to world-class performance. The Excellence Plans provide personnel with a common picture of excellence, vision, and direction, including a multi-year path to excellence. Leaders use the plans to improve alignment around a common purpose, vision, and goal to improve Station performance. The plans have a communication strategy that includes an employee handbook, which contains key behaviours leaders regularly reference to coach personnel. Senior leaders work with employees to develop these behaviours. This continues to contribute to increased employee engagement, accountability, and plan ownership.

16.7 Improvement Plans and Significant Future Activities, Continued

Some of the potential upcoming improvement efforts include:

- System Health Monitoring and Equipment Reliability initiatives. Such as:
    - Investigating the implementation of a Condition Based Maintenance (CBM) model.
    - Increasing maintenance workers qualifications to plan their work.
    - Increasing visibility and utilization of our Tool Pouch Maintenance process expanding work execution rates.
    - Increasing our use of the Lock Out Tag Out work protection process to improve through put of fire testing and maintenance activities.
- Continue to invest in capital projects to replace and upgrade key equipment.
- Long term asset management initiatives to develop life cycle management plans for all nuclear safety and Station economic assets.
- Implementation of an outage cycle of 24-month frequency beginning 2022 to optimize overall outage duration.
- Initiatives to improve outage scheduling and preparation.
- Continue with public and community outreach initiatives.
- Increase HU training and dynamic learning activities for Station staff. Including Leadership training activities focusing on reinforcement of what good looks like and observation in the field activities.
- Development and Implementation of additional Computer Based Training courses. Also improving the utilization of online learning initiatives to ensure training remotely.
- Improved efficiency in exam preparation and grading by using a multiple-choice question test format for the Science Fundamental Certification exam and the establishment of an internship program for certification training.
- Implementation of a new document management system with the use of OpenText Content Server.

16.7 Improvement Plans and Significant Future Activities, Continued

- Complete installation of new diesel-driven fire pumps.
- Management of succession planning, leadership development and effectiveness initiatives.
- Implementation of a new employee onboarding website.
- Implementation of an Alcohol and Drug Policy.
- Continue through working committees to review for new or newly revised documents and provide input into the development of various standards and aid in their eventual integration at the Station. This will ensure the enhancement of strategies, processes, programs, and plans to improve overall performance.
- Digitalize paper-based routines and processes. Invest in Condition Based Monitoring hardware and software.
- Continue to perform Periodic Safety Reviews at a frequency to support the safe operation of the Station.
- Engage with CNSC on revisions to the Licence Conditions Handbook on a continuous frequency over the requested licence term.

The following (Table 13) outlines those standards with which PLNGS has achieved compliance as part of our licencing basis and those the Station is working towards gap analyses and action plans for implementation. The progression to the compliance with the documents listed below will assist PLNGS in achieving continuous improvement.

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CNSC (AECB) 1059	Reactor Licensing and Safety Requirements	1972	✓		CVC
CNSC EG1	Requirements and Guidelines for Written and Oral Certification Examinations for Shift Personnel at NPPs	2005	✓		CVC
CNSC EG2	Requirements and Guidelines for Simulator-based Certification Examinations for Shift Personnel at NPPs	2004	✓		CVC
CNSC N/A	Requirements for the Requalification Testing of Certified Shift Personnel at NPPs	2009 (R2)	✓		CVC
CNSC RD 321	Criteria for Physical Protection Systems and Devices at High-Security Sites	2010	✓		CVC
CNSC RD 360	Life extension of NPPs	2008	✓		CVC
CNSC RD 361	Criteria for Explosive Substance Detection, X-Ray Imaging and Metal Detection at High-Security Sites.	2010	✓		CVC
CNSC RD 363	Nuclear Security Officer Medical, Physical and Psychological Fitness	2008	✓		CVC
CNSC REGDOC-2.1.1	Management System	2019			CVC
CNSC REGDOC-2.1.2	Safety Culture	2018		✓	Guide
CNSC REGDOC-2.2.1	Human Factors	2019		✓	Guide
CNSC REGDOC-2.2.2	Personal Training	2014	✓		CVC
CNSC REGDOC-2.2.3	Personnel certification, Volume III Certification of Persons Working at Nuclear Power Plants	2019	✓		CVC
CNSC REGDOC-2.2.4	Fitness for Duty: Managing Worker Fatigue	2017	2022/06/30	✓	Guide(I)
CNSC REGDOC-2.2.4	Fitness for Duty, Volume II: Managing Alcohol and Drug Use, Version 3	2021			CVC(I)
CNSC REGDOC-2.2.4	Fitness for Duty, Volume III: Nuclear Security Officer Medical, Physical, and Psychological Fitness	2018			CVC
CNSC REGDOC-2.2.5	Minimum Staff Complement	2019		✓	Guide
CNSC REGDOC-2.3.2	Accident Management, Version 2	2015		✓	Guide
CNSC REGDOC-2.3.3	Periodic Safety Reviews	2015	✓		CVC
CNSC REGDOC-2.4.1	Deterministic Safety Analysis	2014	2024/04/29		CVC(I)
CNSC REGDOC-2.4.2	Probabilistic Safety Assessment (PSA for NPPs)	2014	✓		CVC
CNSC REGDOC-2.4.3	Nuclear Criticality Safety, Version 1.1	2020	2022/07/31		Guide(I)
CNSC REGDOC-2.5.1	REGDOC-2.5.1, General Design Considerations: Human Factors	2019		✓	Guide
CNSC REGDOC-2.5.2	Design of Reactor Facilities: Nuclear Power Plants	2014		✓	Guide
CNSC REGDOC-2.6.1	Reliability Programs for NPPs	2017	✓		CVC
CNSC REGDOC-2.6.2	Maintenance Programs for NPPs	2017	✓		CVC
CNSC REGDOC-2.6.3	Fitness for Service: Aging management	2014	✓		CVC

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022, Continued

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CNSC REGDOC-2.7.2	Dosimetry, Volume II: Technical and Quality Assurance Requirements for Dosimetry Services	2020	2022/01/01		CVC(I)
CNSC REGDOC-2.8.1	Conventional Health and Safety	2019			Guide
CNSC REGDOC-2.9.1	Environmental Protection: Policies, Programs and Procedures	2017	2021/05/31		CVC(I)
CNSC REGDOC-2.9.1	Environmental Protection: Policies, Programs and Procedures	2020			CVC(I)
CNSC REGDOC-2.10.1	Nuclear Emergency Preparedness and Response	2014	✓		CVC
CNSC REGDOC-2.10.1	Nuclear Emergency Preparedness and Response	2016			CVC(I)
CNSC REGDOC 2.11.1	Waste Management, Volume I: Management of Radioactive Waste	2021			Guide(I)
CNSC REGDOC 2.11.2	Decommissioning	2021			Guide(I)
CNSC REGDOC-2.12.1	High-Security Facilities, Volume I: Nuclear Response Force, Version 2 (2018)	2018	✓		CVC
CNSC REGDOC-2.12.1	High-Security Facilities, Volume II: Criteria for Nuclear Security Systems and Devices	2018			CVC
CNSC REGDOC-2.12.2	Site Access Security Clearance	2013	✓		CVC
CNSC REGDOC-2.12.3	Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1	2020	✓		CVC
CNSC REGDOC-2.13.1	Safeguards and Nuclear Material Accountancy	2018	✓		CVC
CNSC REGDOC-2.13.2	Import and Export, Version 2	2018		✓	Guide
CNSC REGDOC-3.1.1	Reporting Requirements: NPPs	2016 (V2)	✓		CVC
CNSC REGDOC-3.2.1	Public Information and Disclosure	2018			CVC
CNSC REGDOC-3.2.2	Indigenous Engagement, Version 1.1	2019		✓	Guide
CNSC REGDOC 3.3.1	Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities	2021			Guide(I)
CNSC REGDOC 3.5.1	Regulatory Fundamentals			✓	Guide
COG 07-4089	Fitness-for-Service Guidelines for Steam Generator and Preheater Tubes	2007	✓		CVC

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022, Continued

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CSA N285.0 / .6	General requirements for pressure retaining systems and components / Material Standards for reactor components for CANDU NPPs	2012 (U2)	✓		CVC
CSA N285.0 / .6	General requirements for pressure retaining systems and components / Material Standards for reactor components for CANDU NPPs	2017			CVC
CSA N285.4	Periodic Inspection of CANDU NPP Components	2011 (U2)	✓		N/A
CSA N285.4	Periodic Inspection of CANDU NPP Components	2014			N/A
CSA N285.4	Periodic Inspection of CANDU NPP Components	2019	2022/06/30		CVC(I)
CSA N285.5	Periodic inspection of CANDU nuclear power plant containment components	2010 (U1)			N/A
CSA N285.5	Periodic inspection of CANDU nuclear power plant containment components	2013	2022/06/30		CVC(I)
CSA N285.5	Periodic inspection of CANDU nuclear power plant containment components	2018			CVC(I)
CSA N285.7	Periodic inspection of CANDU NPP balance of plant systems and components	2015		✓	Guide
CSA N285.7	Periodic inspection of CANDU NPP balance of plant systems and components	2021		2024/06/30	Guide(I)
CSA N285.8	Technical requirements for in-service evaluation of Zr alloy pressure tubes in CANDU reactors	2010 (U2)	✓		N/A
CSA N285.8	Technical requirements for in-service evaluation of Zr alloy pressure tubes in CANDU reactors	2015	2022/06/01		CVC(I)
CSA N286-12	Management system requirements for nuclear facilities	2012 (R2017)	✓		CVC
CSA N286.7	Quality assurance of analytical, scientific, and design computer programs	1999	✓		CVC
CSA N286.7	Quality assurance of analytical, scientific, and design computer programs	2016			CVC(I)
CSA N286.10	Configuration management for high energy reactor facilities	2016		✓	Guide
CSA N287.1	General requirements for concrete containment structures for nuclear power plans	2014		✓	Guide
CSA N287.2	Material requirements for concrete containment structures for CANDU nuclear power plants	2008		✓	Guide
CSA N287.2	Material requirements for concrete containment structures for CANDU nuclear power plants	2017			Guide(I)
CSA N287.3	Design requirements for concrete containment structures for nuclear power plants	2014		✓	Guide
CSA N287.4	Construction, fabrication, and installation requirements for concrete containment structures for CANDU nuclear power plants	2009		✓	Guide

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022, Continued

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CSA N287.5	Examination and testing requirements for concrete containment structures for nuclear power plants	2011		✓	Guide
CSA N287.6	Pre-operational proof and leakage rate testing requirements for concrete containment structure for nuclear power plants	2011		✓	Guide
CSA N287.7	In-service examination and testing requirements for concrete containment structures for CANDU NPPs	2010 (U1)			N/A
CSA N287.7	In-service examination and testing requirements for concrete containment structures for CANDU NPPs	2017			CVC(I)
CSA N287.8	Aging management for concrete containment structures for nuclear power plants	2015		✓	Guide
CSA N288.1	Guidelines for calculating DRLs for radioactive material in airborne and liquid effluents for normal operation for nuclear facilities	2014	✓		CVC
CSA N288.4	Environmental monitoring programs at Class 1 nuclear facilities	2010	✓		CVC
CSA N288.4	Environmental monitoring programs at Class 1 nuclear facilities	2019			CVC(I)
CSA N288.5	Effluent monitoring programs at Class 1 nuclear facilities	2011	✓		CVC
CSA N288.6	Environmental risk assessments at Class I nuclear facilities and uranium mines and mills	2012		✓	CVC
CSA N288.7	Groundwater protection programs at Class 1 nuclear facilities	2015		✓	Guide
CSA N288.8	Establishing and implementing action levels for releases to the environment from nuclear facilities	2017		✓	Guide
CSA N291	Requirements for safety-related structures for NPPs	2008 (U2)	✓		N/A
CSA N291	Requirements for safety-related structures for NPPs	2015			Guide(I)
CSA N292.0	General principles for the management of radioactive waste and irradiated fuel	2014	✓		CVC
CSA N292.0	General principles for the management of radioactive waste and irradiated fuel	2019			CVC(I)
CSA N292.1	Wet storage of irradiated fuel and other radioactive materials	2016		✓	Guide
CSA N292.2	Interim dry storage of irradiated fuel	2007	✓		N/A
CSA N292.2	Interim dry storage of irradiated fuel	2013(R2018)		✓	Guide
CSA N292.3	Management of low and intermediate level radioactive waste	2014	✓		CVC
CSA N292.5	Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances	2011		✓	N/A
CSA N292.5	Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances	2017(U1)			Guide(I)

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022, Continued

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CSA N293-12	Fire protection for NPPs	2012	✓		CVC
CSA N294	Decommissioning of facilities containing nuclear substances	2009 (U1)	✓		CVC
CSA N294	Decommissioning of facilities containing nuclear substances	2019			CVC(I)
CSA-NRC IRC-10NBC	National Building Code of Canada	2010	✓		CVC
CSA-NRC IRC-10NFC	National Fire Code of Canada	2010	✓		CVC
CSA N290.0	General Requirements for Safety Systems of NPP	2017	2022/03/31	✓	Guide(I)
CSA N290.1	Requirements for the shutdown systems of nuclear power plants - in guidance of LCH	2013		✓	Guide
CSA N290.2	Requirements for emergency core cooling systems of nuclear power plants	2011		✓	N/A
CSA N290.2	Requirements for emergency core cooling systems of nuclear power plants	2017	2022/03/31		Guide(I)
CSA N290.3	Requirements for the containment system of nuclear power plants	2016		✓	Guide
CSA N290.4	Requirements for reactor control systems of nuclear power plants	2011		✓	Guide
CSA N290.4	Requirements for reactor control systems of nuclear power plants	2019			Guide(I)
CSA N290.5	Requirements for electrical power and instrument air systems of CANDU nuclear power plants	2006		✓	N/A
CSA N290.5	Requirements for electrical power and instrument air systems of CANDU nuclear power plants	2016			Guide(I)
CSA N290.6	Requirements for monitoring and display of nuclear power plant safety functions in the event of an accident	2009		✓	N/A
CSA N290.6	Requirements for monitoring and display of nuclear power plant safety functions in the event of an accident	2016			Guide(I)
CSA N290.7	Cyber security for NPPs and small reactor facilities	2014	✓		CVC
CSA N290.11	Requirements for reactor heat removal capability during outage of NPPs	2013	✓		CVC
CSA N290.12	Human Factors in design for NPPs	2014	✓		CVC
CSA N290.13	Environmental qualification of equipment for CANDU NPPs	2005 (U1)	✓		CVC
CSA N290.13	Environmental qualification of equipment for CANDU NPPs	2018			CVC(I)
CSA N290.14	Qualification of digital hardware and software for use in instrumentation and control applications for nuclear power plants	2015	2022/04/30	✓	Guide(I)
CSA N290.15	Requirements for the safe operating envelope for NPPs	2010	✓		N/A
CSA N290.15	Requirements for the safe operating envelope for NPPs	2019			CVC(I)
CSA N290.16	Requirements for beyond design basis accidents	2016		✓	Guide
CSA N393	Fire Protection for facilities that process, handle or store nuclear substances	2013	2022/03/31		Guide(I)

16.7 Improvement Plans and Significant Future Activities, Continued

Table 13: REGDOC and CSA Standards – Proposed for PROL 2022, Continued

Code	Title	Year	Current LCH CVC	Current LCH Guide	CVC vs. Guidance
PLNGS Licence Condition Handbook: Compliance Verification Criteria LCH-PR-17.00/2022-R001					
CSA N289.1	General requirements for seismic design and qualification of CANDU nuclear power plants	2008 (U1)		✓	Guide
CSA N289.1	General requirements for seismic design and qualification of CANDU nuclear power plants	2018			Guide(I)
CSA N289.2	Ground motion determination for seismic qualification of nuclear power plants	2010		✓	Guide
CSA N289.2	Ground motion determination for seismic qualification of nuclear power plants	2021			Guide(I)
CSA N289.3	Design procedures for seismic qualification of nuclear power plants	2010		✓	Guide
CSA N289.3	Design procedures for seismic qualification of nuclear power plants	2020			Guide(I)
CSA N289.4	Testing procedures for seismic qualification of nuclear power plant structures, systems, and components	2012		✓	Guide
CSA N289.5	Seismic instrumentation requirements for nuclear power plants and nuclear facilities	2012 (R2017)		✓	Guide
N1600	General requirements for nuclear emergency management programs	2014		✓	N/A
N1600	General requirements for nuclear emergency management programs	2016			Guide(I)

16.8 Licensee Public Information Program

Public Communication

The public and community information programs are managed by the Manager - Community Affairs and Nuclear Regulatory Protocol and delivered collaboratively by the Manager working with the Marketing and Communications Division.

The Public Information Program allows the PLNGS to nurture and maintain relationships with individuals and groups who have an interest in the operation of the PLNGS. The program ensures that timely and accurate information is delivered to address key issues and concerns in a systematic and traceable way. PLNGS complies with the requirements of *REGDOC 3.2.1, Public Information and Disclosure*.

A variety of public and stakeholder consultations and communication activities are undertaken aimed at increasing public and stakeholder understanding in support of PLNGS activities.

Figure 35: Community Engagement

16.8 Licensee Public Information Program, Continued

Target Audience

The target audience of groups and individuals who have the greatest interest and concern regarding PLNGS include, but are not limited to:

- Employees
- Host community members including the PLNGS Community Relations Liaison Committee
- Surrounding Region Communities
- Provincial General Public
- Federal General Public
- First Nations (e.g., Provincial and National)
- Local/Municipal Governments
- Key Community, Government and Regulatory Stakeholders
- Media
- Union/District Labour Councils
- Regular Commentators and Lobby Groups
- Local Schools, Colleges, Universities
- Individuals and Groups with a heightened interest in the Station initiatives and operation

Figure 36: STEM EXPO

16.8 Licensee Public Information Program, Continued

Target Audience, Continued

Audience understanding is fostered using principles of accurate, authentic communication and accountable, transparent relationship management. Polling and research play a role to confirm assumptions and focus communication program course corrections as needed.

NB Power as a Crown Corporation is accountable to provide documentation and periodic briefings to various segments of the provincial government on Station operations and important projects and initiatives. These include, but are not limited to, the following:

- Business plans
- Environmental reports
- Outage briefings
- Project updates
- Station updates
- Face to face updates in regularly scheduled, publicly held committee meetings related to Station operation
- Update to local municipal councils
- Presentations
- Website
- Social media
- Conventional/digital mail

Public Opinion

Various briefings and public information sessions are held as part of the information program. A record of the number of attendees and comments received from the participants are documented.

An information line toll-free telephone line that connects to a messaging mailbox in the event the call is not answered directly has been set up to ensure that all inquiries are captured. All calls are returned in a timely fashion.

16.8 Licensee Public Information Program, Continued

Media Opinion

The Marketing and Communications Division manages and coordinates access to local and provincial media on issues relating to Station operations. This includes scheduling designated NB Power Corporate or Nuclear officials for interviews. Media monitoring is also conducted.

The Manager, Community Affairs and Nuclear Regulatory Protocol plays a role in media monitoring as media items are passed along from the Corporate group. The Manager is consulted before releases are made to the media and ensures that these are provided to the CNSC prior to release.

Public Information

NB Power appreciates the importance of communicating with the public. The following are the main initiatives and tools used to communicate with the public:

- Public information meetings to keep the general public apprised of Station operations and details of maintenance activities.
- Key stakeholder meetings are held throughout the province.
- PLNGS has an active Community Relations Liaison Committee, which has been in place for many years. The committee is a formal mechanism that interacts with, and receives information and public concerns from, community members relating to the operation of the Station.
- Media days are held at the Station. Journalists from all mediums are given a briefing and tour of the Station when possible. Media interviews are conducted on a regular basis.

The Station also provides access to certain areas on-site to individual or groups with special interests when possible, including:

- First Nations
- Saint John Naturalists Group
- UNB Biology and Environment Department
- Local School Groups
- Local Fishing Community
- Local Fire Departments
- Local, Provincial and Federal Government Agencies
- Local, Provincial, Federal and Global Industry Peers

16.8 Licensee Public Information Program, Continued

Public Information, Continued

Figure 37: Station Visit

Special visits and workshops are also conducted at PLNGS. Presentations are provided on various subjects including Station operation, environmental impact, safety, and careers. Some of these groups include:

- Public Schools
- Emergency Responders
- Association of Professional Engineers and Geoscientists of New Brunswick
- Various departments of New Brunswick Community Colleges and Universities
- Municipal and Provincial Emergency Measure Organization
- Federal and Provincial Government Organizations

NB Power staff also provides regular updates and participates in various community activities and events, including:

- First Nations open house, information sessions and cultural activities
- Earth Day celebration
- Environment awareness day
- Fundraising activities to support local community activities and programs
- Business and economic development
- National marigold planting
- Fishers meet and greet
- Health and sciences

16.8 Licensee Public Information Program, Continued

Program Evaluation

PLNGS has consistently evaluated the success of the public information program through the use of quantitative research. The overall results of the most recent survey indicate that the public still feels informed and those who live close by have a general understanding of Station operations.

In addition, individual evaluation methods for each target audience are used to ensure respective objectives are met with each group. Such evaluation methods include, but are not limited to, the following:

- Email designed specifically for employee feedback and questions,
- Surveys to target audiences
- Feedback forms to customers via bills/website.

Internal Communication

Communicating with employees is an important aspect of the information program at the PLNGS. As the primary advocates for the Station, information sharing and receiving is two-way directional. The primary tools used to communicate with employees include, but are not limited to, the following:

- **Face to Face** – supervisory groups, individual workgroup meetings, one-on-one interaction etc.

- **Videos-** produced to capture the overall progress of work or a significant message from NB Power executive or the PLNGS Station Director.

- **Daily 15 Briefing Sheet –** a daily publication is intended to provide workgroups 15 minutes to get together and discuss any successes, challenges, operational focus, and Station status.

- **SSB/Alignment Meeting –** designed to align the organization on operational activities.

- **Visual Management System -**The Visual Management System is placed throughout the Station and comprised of a suite of signage/posters. It also includes TV-screen monitors located in the staff work area for a frequent form of secondary communications.

- **All Hands Meetings -**All Hands meetings involve bringing all employees and supplemental workers together to receive information from the Site Vice President, Station Director, and other leaders.

16.8 Licensee Public Information Program, Continued

Internal Communication, Continued

- **Station-wide Memos -**Station-wide memos are sent via email from the Communications Team.

- **Station Handbook -** The Handbook is the primary engagement vehicle for all employees and supplemental staff. It serves as a guide for the Navigating for Excellence plan. All workers carry the Handbook which contains the fundamental behaviours that drive excellence.

- **Leaders' Forums -**Leaders' Forums are held bi-weekly or as required to bring the Leadership Team together to share information about key issues that may impact them and their teams.

- **Station Director Update -**The Station Director Update is used to inform staff about key activities and expectations for behaviours at PLNGS.

- **Station-wide Stand-Downs -** These communication sessions are called when a high-risk situation (e.g., a near-miss situation, a time-lost accident, or a dangerous trend in behaviours) indicates that employee attention needs to be drawn to it. The Leadership Team will stop work, either for specific work groups or all staff; gather for a face-to-face discussion; and trigger dialogue to help focus staff attention on the ways to avoid the issue/hazard.

- **Outage Manager Update -** The Outage Manager Update provides staff with information about outage planning, preparedness, and execution.

- **Insight -** Insight is a section on the Communications SharePoint page that contains backgrounders, overviews, Q&As, etc., to provide staff with supplemental information to help them understand specific initiatives or activities.

Reports

NB Power produces and publishes an Annual Report and Quarterly reports for employees and the people of New Brunswick with a focus on the environmental, social, and economic performance over the past year. The Report is a snapshot of the innovation and forward-thinking that drives today's NB Power.

16.9 Nuclear Liability Insurance

Nuclear Liability Insurance, as required under the Nuclear Liability Act, came into effect at PLNGS on the date of commencement of fuel loading, March 26, 1982. Insurance requirements are maintained on an annual basis. The policy is underwritten by the Nuclear Insurance Association of Canada (NIAC).

16.10 Periodic Safety Review

NB Power has conducted a Periodic Safety Review (PSR) in accordance with *REGDOC 2.3.3*, *Periodic Safety Reviews*. The purpose of the PSR (*IR-03612-04, Periodic Safety Review PSR2 Basis Document*) (Reference 109) is to evaluate our Station for modern codes, standards and to identify any factors that would limit safe, long-term operation. The results of fifteen safety factors as defined for the PSR process have been reviewed and summarized in Safety Factor Reports and cover all aspects important to the continued safe operation of the Station. Strengths and gaps identified from these safety factor reviews were assessed in the Global Assessment Report (GAR), *IR-03612-22, PSR2 Global Assessment Report* (Reference 110). The objective of the GAR is to provide an overall rating of the safety of the Station. It contains the overall conclusions, corrective actions, and safety improvements to be considered. The resulting output is documented in an Integrated Implementation Plan (IIP), *IR-03612-0023, Periodic Safety Review 2 (PRSR2) Intregrated Implementation Plan* (Reference 111). The IIP is a consolidated list of safety improvements, including safety significance, priority, and target implementation dates. All findings were consolidated and graded for inclusion within the IIP. No Safety concerns requiring immediate actions were identified. However, this IIP will enhance the current safety of our Station. The proposed improvements have been submitted to the CNSC for acceptance and are intended to form part of the licencing basis.

We propose the following be added for inclusion in the Licence Conditions Handbook to support the requested licence term. “The licensee shall conduct a PSR to confirm that the facility remains consistent with a set of modern codes and standards intended to demonstrate that the safety basis remains valid. The PSR shall be conducted in accordance with *REGDOC 2.3.3*, *Periodic Safety Reviews* every ten years.”

16.10 Periodic Safety Review, Continued

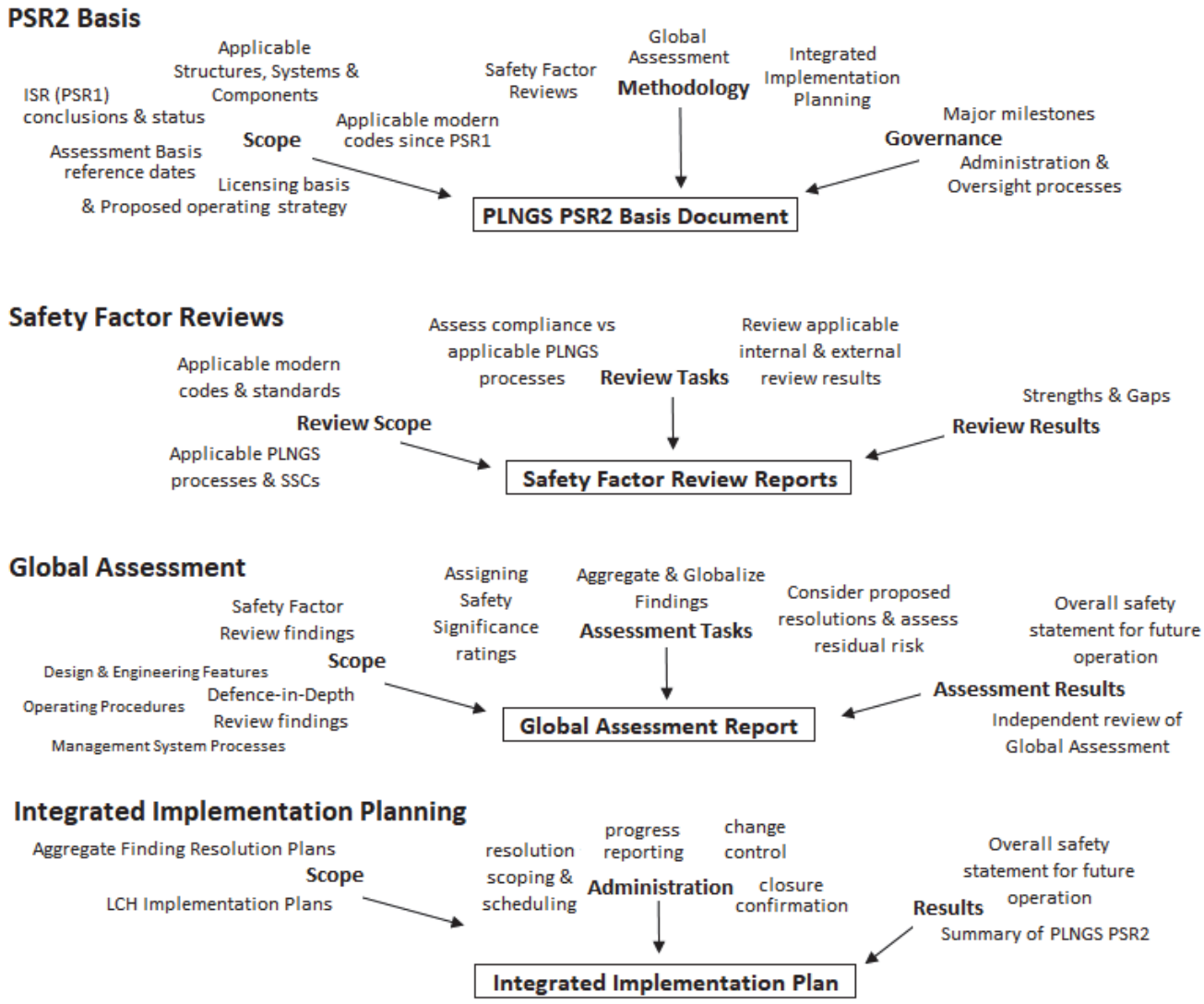

Figure 38: PSR Overview

16.11 Small Modular Reactors

NB Power continues to explore the potential of two Small Modular Reactors (SMR) technologies for possible demonstration at the Point Lepreau site. It is still relatively early in the development phase and no decision has been made to proceed at this time. NB Power has been discussing this potential with various First Nations groups, the local community as well as the general public at large to both raise awareness and to receive feedback. Any future developments will require a separate operating licence granted by the Commission.

17.0 References

1. Point Lepreau Generating Station Site Plan Drawing No., 0086-10200-3001-001-SP-E, Rev. 7, July 3, 2019.
2. Point Lepreau Generating Station Site Plan Drawing No., 0086-10200-3001-002-SP-E, Rev. 5, July 3, 2019.
3. Point Lepreau Generating Station Site Plan Drawing No., 0086-10200-3001-003-SP-E, Rev. 0, July 3, 2019.
4. PROL 17.01/2022, Point Lepreau Nuclear Generating Station Power Reactor Operating Licence.
5. Drawing No. 0087-10200-3002-01-GA-E, Site and Improvements Site Layout Site General Location, Rev. 12.
6. Drawing No. 0087-79100-2001-001-GA-D, Operational Flowsheet Solid Radioactive Waste Management Facility Phase One, Rev. 12.
7. Drawing No. 0087-79100-2001-002-GA-E, Operational Flowsheet Solid Radioactive Waste Management Facility Dry Fuel Storage, Rev. 15.
8. Drawing No. 0087-79100-2001-003-GA-D, Solid Radioactive Waste Management Facility Phase III, Rev. 0.
9. Point Lepreau Nuclear Generating Station 2021 Safety Report, Part I, II and III, Rev. 0 (Prescribed).
10. *0087-79100-3010-001-SR, Solid Radioactive Waste Management Facility Safety Report*, Rev. 1 (Prescribed).
11. *NMM-00660, Nuclear Management Manual*, Rev. 17.
12. *PRR-00660-DM-05, Manage Processes*, Rev. 10.
13. *PRR-00660-SU-09, Provide Documents and Records*, Rev. 11.
14. *PRR-00660-SU-01, Provide Human Resources*, Rev. 3.
15. *SI-01365-A062, Self Assessments and Benchmarking*, Rev. 21.
16. *SI-01365-A088, Performing Internal Independent Nuclear Oversight*, Rev. 21.
17. *SI-01365-A234, Providing Nuclear Safety Oversight*, Rev. 6.
18. *SI-01365-A063, Implementing the Corrective Action Process*, Rev. 34.
19. *SI-01365-T032, Using Operating Experience*, Rev. 14.
20. *PRR-00660-DM-01, Direct and Manage the Business*, Rev. 8.
21. *SI-01365-A076, Managing Change*, Rev. 6.
22. *SDP-01368-A044, Conducting Nuclear Safety Culture Assessment and Nuclear Safety Culture Monitoring Panel*, Rev. 7.
23. *PRR-00660-OP-01, Control and Monitor Station Equipment*, Rev. 7.
24. *PRR-00660-MA-02, Provide Planning and Scheduling Services*, Rev. 7.
25. *PRR-00660-MA-03, Perform Maintenance*, Rev. 17.
26. *PRR-00660-SU-12, Provide Materials and Services*, Rev. 11.

17.0 References, Continued

27. *SDP-01368-PD09, Providing Oversight of Supplemental Personnel*, Rev. 15.
28. *SI-01365-A085, Assessing and Monitoring Supplier Performance*, Rev 21.
29. *PRR-00660-DM-03, Manage Independent Nuclear Oversight*, Rev. 3.
30. *SI-01365-A131, Human Performance Process*, Rev 2.
31. *SI-01365-EP02, Emergency Response Plan*, Rev. 3.
32. *SDP-78660-0001, Pandemic Response Plan*, Rev. 0.
33. *SDP-01368-P036, Meeting Operations Staffing Requirements*, Rev. 25.
34. *SDP-01368-CA04, Screening a PICA*, Rev. 39.
35. *PRR-00660-SU-03, Provide Training*, Rev. 14.
36. *SI-01365-TR25, Systematic Approach to Training*, Rev. 3.
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38. *TPD-97177-01, Shift Supervisor Incremental Training Program Description*, Rev. 5.
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18.0 Acronyms

AAGM - Alarming Area Gamma Monitors
AATM - Alarming Area Tritium Monitors
ACR - Annual Compliance Report
AIA – Authorized Inspection Agency
ALARA - As Low As Reasonably Achievable
AMP - Ageing Management Plans
AOOM - Advanced Operations Overview for Managers
CAM - Continuous Air Monitors
CAP - Corrective Action Program
CBM - Condition Based Maintenance
CBOP - Continuous Behaviour Observation Program
CBT – Computer-Based Training
CCR - Code Compliance Review
CEO - Chief Executive Officer
CMD - Commission Member Document
CNO - Chief Nuclear Officer
CNOT - Corporate Nuclear Oversight Team
CNSC - Canadian Nuclear Safety Commission
COG - CANDU Owner's Group
CRC - Curriculum Review Committees
CRT – COVID-19 Response Team
CSA - Canadian Standards Association
CVC - Compliance Verification Criteria
DAC - Derived Acceptance Criteria
DBA - Design Basis Accident
DBT - Design Basis Threats
DC - Design Configuration
DCARB - Department Collective Action Review Board
DEFCR - Department Event Free Clock Reset
DIQ - Design Information Questionnaire
DIV - Design Information Verification
DLA - Dynamic Learning Activities
DRL - Derived Release Limit
DSC - Dry Storage Canisters
ECC - Emergency Core Cooling
EcoRA - Ecological Risk Assessment
EFAP - Employee and Family Asssitance Program
EFR - Equipment Failure Reviews
EIA - Environmental Impact Assessment
EME - Emergency Mitigating Equipment
EMS - Environmental Management Systems
ERA - Environmental Risk Assessment
ERIP - Equipment Reliability Improvement Plan

18.0 Acronyms, Continued

ERRIS - Effluent Regulatory Reporting Information System
ERT - Emergency Response Team
ETE - Evacuation Time Estimate
FHA - Fire Hazard Assessment
FIN - Fix It Now
FSSA - Fire Safe Shutdown Analysis
GAR - Global Assessment Report
GET - General Employee Training
HHRA - Human Health Risk Assessment
IAEA - International Atomic Energy Agency
IBA - Important Bird Area
IBEW - International Brotherhood of Electrical Workers
ICS - Incident Command System
IIP - Integrated Implementation Plan
INPO - Institute of Nuclear Power Operators
ISO - International Organization for Standardization
IT - Information Technology
LOCA - Loss of Coolant Accident
LMS - Learning Management System
LTA - Lost Time Accident
MCR - Main Control Room
MDP - Management Development Program
MOU - Memorandum of Understanding
MRM - Management Review Board
NBEMO - New Brunswick Emergency Measures Organization
NBJPS - New Brunswick Department of Justice and Public Safety
NIAC - Nuclear Insurance Association of Canada
NIEP - Nuclear Industry Evaluation Program
NOS - Nuclear Oversight
NRT - Nuclear Response Team
NSCA - Nuclear Safety Control Act
NSRB - Nuclear Safety Review Board
NWMO - Nuclear Waste Management Organization
OE - Operating Experience
OEOC - Off-site Emergency Operations Centre
OHSA - Occupational Health and Safety Act
OPGSS - Over-Poisoned Guaranteed Shutdown State
OP&P - Operating Policies and Principles
PAD - Personal Alarming Dosimeter
PCE - Personnel Contamination Event
PDP - Preliminary Decommissioning Plan
PHT - Primary Heat Transport
PID - Property Identification

18.0 Acronyms, Continued

PIE - Postulated Initiating Events
PLNGS - Point Lepreau Nuclear Generating Station
PM - Preventive Maintenance
PROL - Power Reactor Operating Licence
PSA - Probabilistic Safety Assessment
PSR - Periodic Safety Review
RBGSS - Rod Based Guaranteed Shutdown State
RCMP - Royal Canadian Mounted Police
REMP - Radiation Environment Monitoring Program
REP - Radiation Exposure Permit
RFS - Readiness for Service
RIT - Rapid Intervention Team
RP - Radiation Protection
SA - Satisfactorily Acceptable
SAT - Systematic Approach to Training
SAMG - Severe Accident Management Guidelines
SATM - Space Allocation for Transient Material
SBT - Sibyl Bundle Tracker
SCA - Safety and Control Area
SCDF - Severe Core Damage Frequency
SEFCR - Site Event Free Clock Resets
SLA - Service Level Agreement
SMR - Small Modular Reactor
SOE - Safe Operating Envelope
SPMP - System Performance Monitoring Plans
SPV - Single Point Vulnerabilities
SSB - Station Shift Brief
SSC - Systems, Structures and Component
STC - Senior Training Council
STEM EXPO - Science, Technology, Engineering and Math Exhibition
SRWMF - Solid Radioactive Waste Management Facility
TLD - Thermoluminescent Dosimeters
TRA - Threat and Risk Assessment
TRG - Training Review Group
WANO - World Association of Nuclear Operators
WELL - What Excellence Looks Like
WHMIS - Workplace Hazardous Materials Information System