Canada's Nuclear Regulator

Reporting Requirements

Reporting Requirements for Nuclear Power Plants

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Canadian Nuclear Safety Commission
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Reporting Requirements for Nuclear Power Plants
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Preface

This regulatory document is part of the CNSC's reporting requirements series of regulatory documents, which also covers reporting requirements for uranium mines and mills, non-power reactors, waste nuclear substance licensees, Class II facilities, and users of prescribed equipment, nuclear substances and radiation devices. The full list of regulatory document series is included at the end of this document and can also be found on the CNSC's website.

Regulatory document REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, consolidates and clarifies requirements found in the *Nuclear Safety and Control Act* (NSCA) and the regulations made under it. it. This document sets out additional specific reporting provisions that relate to the purposes of the NSCA and its regulations. It also provides guidance for reports and notifications that licensees must submit to the Commission.

Applicants and licensees should refer to the guidance contained in this regulatory document for additional information on requirements and for direction on how to meet them.

This document is the third version (and supersedes REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, Version 2, published in April 2016). Version 3 of this document includes the following revisions as well as other minor changes:

- clarifies certain terms and key concepts
- repackages information reported through annual and quarterly reports to create efficiencies or respond to new regulatory requirements
- includes a retraction process for conservatively reported events
- introduces requirements related to cyber security and other security reporting
- removes references to all "Other Scheduled Specific Periodic Reports"

A document that shows the changes made to REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, Version 2, is available from the CNSC upon request.

This document is focused on the reporting requirements for CANDU nuclear power plants, but high-level concepts within it may apply to other technologies. Requirements found in this regulatory document may be applied in a graded manner to all lifecycle phases for nuclear power plants. For information on the implementation of regulatory documents and on the graded approach, see REGDOC-3.5.3, *Regulatory Fundamentals*.

The words "shall" and "must" are used to express requirements to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is permissible within the limits of this regulatory document. "Can" is used to express possibility or capability.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

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Reporting Requirements: Nuclear Power Plants

1. Introduction

1.1 Purpose

This regulatory document consolidates the requirements and guidance of the Canadian Nuclear Safety Commission (CNSC) for reports and, notifications to and the filing of specific records with the CNSC by licensees of nuclear power plants (NPPs), as well as the applicable time frames for reporting.

Licensees are required to report to or notify the CNSC of situations, events, or dangerous occurrences that may require short-term action by the CNSC. They are also required to submit or file other reports, notifications or specific records, including routine scheduled reports on various topics such as certain normal business activities that are required for action by the CNSC, or that are required for longer-term compliance monitoring.

1.2 Scope

This regulatory document consolidates and clarifies requirements found in, and regulations created pursuant to, the *Nuclear Safety and Control Act* (NSCA) for reporting, including requirements on the content and timing of reports. It sets out additional specific reporting provisions that relate to the purposes of the NSCA and its regulations. In addition, this document provides guidance on the interpretation and scope of application of these requirements, in the context of NPPs.

Note: The term “reporting” is used in this regulatory document as a general term to cover any of the actions below:

- reporting or notifying of situations or events
- submitting or filing other reports or notifications
- submitting specific records, including routine scheduled reports

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee’s responsibility to identify and comply with all applicable regulations and licence conditions.

1.3 Relevant legislation

The following provisions of the *Nuclear Safety and Control Act* (NSCA) and the regulations made under it are relevant to this document:

- NSCA
  - subsection 24(5)
  - paragraph 27(b)
  - section 44
  - section 45
- *General Nuclear Safety and Control Regulations*
  - subsection 9(4)
  - section 15

- section 28
- section 29
- section 30
- section 31
- section 32

- *Class I Nuclear Facilities Regulations*
  - subparagraphs 6(k)(ii) and (iii)
- *Class II Nuclear Facilities and Prescribed Equipment Regulations*
  - subsection 17(1)
  - paragraph 19(2)(d)
- *Radiation Protection Regulations*
  - paragraph 6(2)(c)
  - paragraphs 16(a) and (e)
- *Nuclear Security Regulations*
  - subsection 7.5(4)
  - section 21
  - subsection 36(3)
  - subsection 44(2)
- *Nuclear Substances and Radiation Devices Regulations*
  - subsection 18(3)
  - subsection 30(2)
  - section 38
- *Packaging and Transport of Nuclear Substances Regulations, 2015*
  - paragraphs 32(a) and (d)
  - subsection 36(2)
  - section 37
  - section 38
  - section 40
  - section 41

2. Reporting Requirements

The following reporting requirements apply to NPPs:

1. The licensee shall manage requirements for reporting to the CNSC under this regulatory document, in conjunction with other reporting requirements specified in the NSCA, the regulations, and the licence.
2. All reports filed by the licensee according to this regulatory document shall contain the address of the sender of the report and the date of completion of the report.
3. The licensee shall mark all reports made or filed under this regulatory document with the appropriate protection and classification, and submit them in accordance with the appropriate security protocols.
4. After becoming aware of a reportable instance, the licensee shall file a report or notification according to the most restrictive requirements and time frames specified in appendix A, *Event Reporting, Notifications, and Filing of Specific Records*.
5. The licensee shall use a safety-significance classification process as documented in its management system to determine the safety significance for reports.
6. The licensee shall maintain a list of structures, systems and components (SSCs) important to safety.

7. A report or notification that must be made immediately shall be made orally to the CNSC Duty Officer.
8. Following an oral report or notification to the CNSC Duty Officer, a written report shall be submitted within 7 calendar days.
9. The licensee shall file scheduled reports with the CNSC at the following frequencies:
   a. quarterly reports are due at the end of the quarter following the reporting period
   b. annual reports are due on May 1, after the end of the calendar year, with the exception of the report on research and development, which is due on July 1, after the end of the calendar year
   c. annual compliance reports for Class II facilities and nuclear substances and radiation devices are due on March 31, after the end of the calendar year.
10. For any requests for extensions to scheduled report due dates, the licensee shall inform the CNSC prior to the due date for the scheduled report and shall provide the rationale for the delay and the new submission date.

Guidance

The NSCA and the regulations state that reports are submitted to "the Commission." In terms of submitting reports and notifications, "the Commission" is understood to be "CNSC staff." The licensee should contact their CNSC point of contact to determine details for submitting any particular report.

For item 4, a situation or event that triggers multiple reporting provisions may be amalgamated into a single event report at the discretion of the licensee. The report should indicate all reporting provisions triggered by a) the initiating situation or event; and/or b) the related consequences. The licensee should adhere to the most restrictive reporting timelines.

Throughout this document, all days are calendar days in accordance with the *Interpretation Act*.

The licensee should make all reasonable efforts to obtain and include timely and validated information when reporting to the CNSC. For event reports, in situations or events that have not attained stability and predictability, timeliness shall be prioritized over the availability of data and/or information.

The licensee may submit a request for retraction (see section 4.4) if, after further investigation, the licensee believes that a situation, event, or dangerous occurrence was not reportable, or that a specific reporting provision did not apply.

In item 2, the "sender of the report" should always be a designated representative of the licensee.

In item 4, "becoming aware" is synonymous with the date of discovery.

In item 5, for attempted or actual breaches of cyber essential assets, the licensee should also use the significance system described in CSA N290.7, *Cyber Security for Nuclear Power Plants and Small Reactor Facilities* [1], to determine the significance of the event.

In item 7, the term "immediately" means when the licensee becomes aware of the situation or event and initiates any required response actions. This term is also considered to include the next action undertaken after taking necessary actions to protect life or stabilize hazardous situations.

In item 7, the CNSC Duty Officer can be reached at 613-995-0479 or toll-free at 1-844-879-0805.

In item 9, the first quarter starts on January 1 for any given year. The reports are due as follows:

- Q1 reports due June 30
- Q2 report due September 30
- Q3 reports due December 31
- Q4 reports due March 31 of the following year

Licensees should use the situation or event reporting according to this regulatory document as an input to their public disclosure protocol as described by REGDOC-3.2.1, *Public Information and Disclosure* [2].

3. Scheduled Reporting

Licensees shall submit the following scheduled reports:

- Quarterly report on safety performance indicators
- Quarterly report on nuclear power plant pressure boundaries
- Quarterly report on nuclear power plant personnel
- Quarterly report on operational security
- Annual report on radiation protection
- Annual report on environmental protection
- Annual report on research and development
- Annual report on risk and reliability
- Annual report on fuel monitoring and inspection
- Annual compliance report for Class II nuclear facilities and nuclear substances and radiation devices

Details on each scheduled report are provided below.

3.1 Quarterly report on safety performance indicators

The safety performance indicator (SPI) reports shall be submitted on a quarterly basis. These reports shall be based on the specifications for each safety performance indicator and shall contain the information listed in the data sheet.

The SPI specifications are given in appendix B.

Guidance

If there is an apparent change in SPI results, the licensee should provide a brief explanation in the additional details section of the data sheet.

Sample data sheets are provided on the CNSC website.

3.2 Quarterly report on nuclear power plant pressure boundaries

The NPP report on pressure boundaries shall be submitted on a quarterly basis. It shall include all Class 1 to 6 pressure boundary systems in accordance with CSA N285.0, *General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3], for the purposes of reporting on pressure boundaries and pressure boundary degradations.

The report shall contain the following information:

1. a brief description of any occurrence of a pressure boundary deformation or crack, including:

- the date of discovery
- the magnitude of the deformation or crack
- the associated circumstances, causes and consequences (or potential consequences)
  - all mitigating actions

2. a brief description of any occurrence of a leak in a pressure boundary, where the leak did not exceed any relevant limit specified in a licensing document, including:

- the date of discovery
- the magnitude of the leak
- the associated circumstances, causes and consequences (or potential consequences)
  - all mitigating actions

3. a brief description of the occurrence of any degradation or fault of a pressure relief device that fails to open above the maximum set-point pressure while operating, including:

- the date of discovery of the degradation or fault
- the associated circumstances, causes and consequences (or potential consequences)
  - all mitigating actions

4. a brief description of the occurrence of any pressure relief device that fails to open above the maximum set-point pressure during testing, including:

- the date of test failure
- the associated circumstances, causes and consequences (or potential consequences)
  - all mitigating actions

5. any supporting information relevant to the descriptions in items 1, 2, 3 and 4 above.

Guidance

For consequences (or potential consequences) related to items 1 to 4, the licensee should provide details of the impact (or potential impacts) on the system, resulting from the events reported. For example, if the as-found lift pressure of a pressure relief device during testing is measured above the set pressure for the device, the licensee should describe how the system could have been impacted if the pressure device had lifted at the as-found lift pressure, instead of the correct set pressure.

If there are no consequences related to items 1 to -4, this should be indicated.

3.3 Quarterly report on nuclear power plant personnel

The report on the performance of NPP personnel shall be submitted on a quarterly basis and shall contain the following information:

1. for all persons holding a CNSC certification with accountabilities under the licence:

a. **whose employment is current:** name
b. **whose employment has ceased or has been suspended:** name and the date when employment with the licensee's organization ceased or was suspended
c. **who was a certified shift worker assigned to a temporary position in excess of 6 months:** name and the title or description of the temporary position, the start date and duration of each temporary assignment, and whether the assignment is operationally or non-operationally focused

2. for certified shift workers:

   a. the number of shifts worked in each position requiring CNSC certification
   b. the reasons for not working the minimum shifts required and a description of any corrective actions being taken
   c. the number of certified shift positions, operator trainers or examiner positions occupied by contractors
   d. a list of occurrences where the limits to hours of work or recovery periods have not been met

3. a rolling 5-year staffing plan to be provided annually, in any one of the quarterly reports, that includes the number of certified workers who are / have been:

   a. available at the beginning of the year
   b. newly certified
   c. lost to attrition and promotion
   d. assigned to shift and day support assignments
   e. available at year-end
   f. new trainees who have started the "General Training" course

4. in addition, for the final report of the calendar year, licensees shall provide:

   a. a summary of the organizational changes, reflecting the organizational structure for the calendar year being reported
   b. a complete and accurate organizational arrangement identifying the names and descriptions of each functional unit with accountability under the licence, including:
      i. staffing numbers and
      ii. staff job titles;
      iii. and if contractors are used, the reporting relationships and licence accountabilities under which contractors are managed
   c. a summary of significant simulator fidelity and system- health issues and associated corrective actions.
   d. the pass/fail rate on personnel certification examinations, including recertification examinations
   e. a description of drug and alcohol testing conducted pursuant to REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use,* (2021) [4] including:
      i. the number of tests administered
      ii. the number of refusal and subversion attempts, by type
   f. the results of alcohol and drug testing, conducted pursuant to REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use,* (2021) [4] including:
      i. summary of testing methodologies used
      ii. drugs for which testing is conducted and cut-off concentrations by specimen type (i.e., urine or oral fluid)

iii. the results of tests administered
iv. alcohol or drugs identified in verified positive tests by specimen type (i.e., breath, urine, oral fluid)

Guidance

Where "persons holding a CNSC certification" is used in the Quarterly report on nuclear power plant personnel, it applies to all persons holding a CNSC certification, including persons holding a certification to operate the NPP, authorized health physicists, and Class II radiation safety officers.

Where "certified shift worker" is used in the Quarterly report on nuclear power plant personnel, it applies to all persons certified to operate the NPP, working in an operator position.

Item 1b applies to any situation that could potentially cause cessation of an employee certification, including:

- certified workers who are retiring
- certified workers who are moving permanently to another position within the licensee's organization
- certified workers who are ending a contract
- certified workers who are changing contracts

For item 2(d):

- information on limits to hours of work and recovery periods are found in REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue* [5]
- the licensee may submit copies of the report(s) prepared for other governing and regulatory bodies
- each description of an occurrence of non-compliance should include the date and extent of the item of non-compliance, name or unique identifier position title(s) of the worker involved, the reason for the occurrence of non-compliance and, if applicable, measures implemented to reduce fatigue or the risk of fatigue-related errors

For item 4(b):

- the organizational arrangement requested is for groups within the organization that support programs of the nuclear management system, down to the lowest organizational unit
- the organizational arrangement can be in prose or pictorial form (e.g., traditional organizational chart); it should include:
  - the roles, responsibilities and reporting relationships of each functional unit and sub-unit
  - the staffing numbers are for regular staff, and contractors – temporary workers do not need to be included

For item 4(c), simulator fidelity and system- health issues include visible errors, outstanding work orders, and corrective and preventative maintenance backlog items.

For item 4(e)(ii)., subversion attempts include, but are not limited to, adulteration or substitution.

For item 4(f)(i), the summary of testing methodologies should include any special analyses of dilute samples.

For items 4(e)(i) and 4(f)(iii), the data should be sorted by testing circumstance, for example, pre-placement, transfer, reasonable grounds, return to work and or follow-up.

3.4 Quarterly report on operational security

The operational security report shall be submitted on a quarterly basis. It shall contain the following information:

1. a description of situations or events at the NPP that had or could have had security-related implications or consequences and that were not reported under an event report
2. a detailed description of security-related drills and exercises conducted in the quarter, including scenario objectives, expected outcomes, results and lessons learned.
3. a description of revisions to security-related emergency procedures
4. where completed, the significant results of the licensee's annual review of the security-related emergency procedures for the NPP, including arrangements with the emergency response force
5. a brief description of the circumstances and causes of failures or impairment of the security structures, systems, components or devices of the NPP.
6. a description of mitigating measures that were not reported under an event report but that were taken when security structures, systems, components or devices of the NPP failed to meet their defined specifications
7. a description of any changes to the security report
8. for the NPP cyber security program, include:
    a. a summary of any audit or self-assessment, or its elements, that was conducted in the quarter
    b. a summary of cyber security program performance
    c. a summary of any cyber security posture changes identified or observed
    d. a summary of the significant results observed from cyber security– related exercises and drills that were carried out
    e. any update to the cyber security incident response process (e.g., incident response procedures)
    f. a brief description of any situations or events, taking into account system significance as described in CSA N290.7 [1] that had or could have had cyber security– related implications or consequences and that were not reported under an event report.
9. updates related to special security equipment, including the make, model and serial numbers associated with any equipment, as well as individual assignment allocation or other pertinent details, such as spares, training or repairs, of all firearms purchased under the CNSC's Public Agency Identification Number

Guidance

For item 1:

- "security-related implications or consequences" are intended to include events that are minor in nature but that could be impacted by other events to create a pattern or vulnerability; minor malfunctions or reductions in the security program that impact one or more specific area(s) would fall under this type
- the description of situations or events should include:
    - location and timing of the situation or event
    - effect or consequences on security systems

    - whether prescribed information, nuclear substances or prescribed equipment were involved
- any compensatory measures
- any involvement of external agencies
- this description should include situations or events where a threat was deemed not credible and the steps taken to deem the threat not credible

For item 2, the report should include the conclusions or outcomes of the evaluation, identified deficiencies, improvements and corrective actions, including timelines for implementation.

For item 5, this includes faults, combinations of faults, situations or events that prevented the security structures, systems, components or devices from meeting their defined specifications and that were not reported under an event report.

Item 8(b) aligns with requirements from CSA N290.7:21 [1] that are designed to confirm the continued effectiveness of the cyber security program or applicable element of the program (4.3.3, Reviewing and maintaining).

For item 8(c), "security posture" is defined in CSA N290.7:21 [1]. Clause 4.3.3.3.3 of that standard describes changes in security posture.

3.5 Annual report on radiation protection

The radiation protection report shall be submitted annually and shall include the following sections and information:

1. a summary that includes but is not limited to the following:
    a. information that could influence dose data and dose trends, such as: the number of units in operation, outage information, and scope of activities being performed
    b. initiatives and activities conducted in the last calendar year to improve the control of worker doses and radiological hazards
    c. planned initiatives and targets
    d. any significant revisions to the radiation protection governance and/or procedures
    e. trends of significant issues identified by the licensee's problem identification and resolution process
    f. major trends associated with unplanned internal exposures during the year, including information about the type of monitoring used and whether the investigations associated with exposures determined if any changes needed to be made to a worker's routine monitoring, or if changes needed to be made to the licensee's bioassay program and/or other radiological hazard control program
    g. major trends associated with contamination events through the year, separated into personal contamination events and loose contamination events

2. the results of dose monitoring for the calendar year, including:
    a. total number of persons monitored for radiation exposure
    b. number of persons who received a non-zero dose
    c. collective dose, separated into:
        - routine operations
        - major projects and outages, including forced outages

- internal dose
- external dose
- total collective effective dose (person-mSv)
- summary of year-over-year dose trends

d. effective dose
   - average and maximum doses
   - a description of the work performed by the worker that received the maximum individual whole-body dose, including their work group
   - summary of year-over-year dose trends

e. lens of the eye dose
   - average and maximum doses
   - summary of year-over-year dose trends

f. skin dose
   - average and maximum doses
   - summary of year-over-year dose trends

g. extremity dose
   - average and maximum doses
   - summary of year-over-year dose trends

h. maximum effective dose received by workers who are not nuclear energy workers (NEWs)

i. the maximum individual effective dose for the current 5-year dosimetry period

Guidance:

Worker doses are doses received in the course of the licensed activities.

The licensee should identify whether there are any outstanding dose assessments at the time the report is submitted and when and how this information will be submitted.

For item 1(f), the reporting is not limited to doses from uptakes of transuranic elements, although it does not include tritium exposures.

For item 1(f), the licensee should include all uptakes that exceeded their recording level, using what ever monitoring was used for the individual, including but not limited to, urinalysis, fecal, and personal air sampler.

For item 2, appendix D includes templates that may be used for submitting dose data as part of this report.

For items 2 (d) to (g), the average should include only the non-zero doses.

For items 2(d) and (e), the dose data should be presented by the number of workers monitored who received a dose in the following ranges:

- < 0.01 mSv
- 0.01 to 1 mSv
- 1.01 to 5 mSv
- 5.01 to 10 mSv
- 10.01 to 15 mSv

- 15.01 to 20 mSv
- 20.01 to 50 mSv
- > 50 mSv

For items 2(f) and (g), the dose data should be presented by the number of workers monitored who received a dose in the following ranges:

- > 0.01 mSv
- > 50 mSv
- > 250 mSv

3.6 Annual report on environmental protection

The environmental protection report shall be submitted annually for those facilities owned or leased by the nuclear operator, that have:

- radiological releases to the environment that contribute to the annual total effective dose to the public from the sites and

- licenced release limits (e.g., derived release limits (DRLs) and/or environmental action levels)

The report shall contain the following information:

1. a summary of the results of the environmental protection measures identified in section 4 of REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures* [6], and an analysis of the significance of the results of the environmental protection program, with respect to the health and safety of persons and the protection of the environment
2. a summary of activities conducted in the last calendar year to meet the objectives of the environmental protection measures
3. a summary of any significant updates made to the environmental protection measures, the reason for these changes, and the current timelines for the next planned periodic reviews of the environmental protection measures
4. the results of the effluent/emissions monitoring program, including the hazardous substances (i.e., activity concentrations, flow rates and loadings), in SI units; the following shall be reported:
   a. for releases to air, where applicable: tritium oxide (HTO), elemental tritium (HT), carbon-14, noble gases, radioiodine, gross alpha, and gross beta/gamma
   b. for releases to water, where applicable: tritium oxide (HTO), carbon-14, gross alpha, and gross beta/gamma
   c. hazardous substances to air and/or water as reported to other authorities having jurisdiction (AHJs)
5. a summary of other government-required monitoring and reporting associated with effluent/emissions or environmental performance as specified in the licensing basis – include a web link to the reporting or a specific means of obtaining the formal reporting
6. the results of the environmental monitoring program, including nuclear and hazardous substances, in SI units, as well as associated supportive variables required for interpreting the results as identified in the licensee's site-specific programs

7. the results and calculations of the annual radiation doses to the representative persons and/or critical group or groups, in comparison to the regulatory public dose limit. – include a description of all relevant environmental transfer models and exposure pathways associated with the operation of the NPP
8. for each parameter reported, as part of the effluent/emission monitoring and environmental monitoring program, a description of the characteristics of the monitoring results, including, but not limited to, the sample frequency, quantity, type and trend
9. a summary of reportable events and abnormal results that might require corrective action or additional monitoring and their impact on the environmental monitoring program

Guidance

The environmental monitoring program and environmental risk assessment (ERA) are strongly linked. For example, if an ERA identified areas of concern, licensees are expected to conduct confirmatory sampling, at a low frequency and/or at select locations, as part of the revision cycle of the site's ERA.

Some licensees submit annual reports to other government departments concerning their environmental protection programs, that show the results of the effluent/emission and environmental monitoring programs. These include hazardous substances. Licensees may submit a copy of such reports to the CNSC to demonstrate compliance with the CNSC's requirement for oversight of the licensee's environmental monitoring program. Some examples are:

- provincial environmental compliance approval (ECA) reports
- federal greenhouse gas (GHG) emission reports
- National Pollutant Release Inventory (NPRI) reports
- federal halocarbon release reports
- ozone depletion reports
- wastewater effluent discharge reports.

For item 3, some examples are:

- a summary of the ERA and progress on follow-up recommendations
- environmental management system
- effluent monitoring program
- environmental monitoring program
- groundwater protection program
- supplemental studies, such as sustainability, effects monitoring, species at risk and adaptive management

For item 4, the results submitted should be suitable for evaluation of compliance against environmental action levels, where applicable, and licence limits.,

For item 6, associated supportive variables are used to interpret the results of the environmental monitoring program and can include background data, environmental quality guidelines and screening levels.

For item 7, latest ERA predictions should be included, as well as any standards/guidelines, as applicable, to for all figures where monitoring data are presented.

For item 8, the characteristics of monitoring results should include, but are not limited to:

- sample frequency (e.g., daily, monthly, semi-annually),
- sample type (e.g., grab, composite, activity counts over time),
- statistical quantity reported (e.g., weekly/monthly mean, annual average, annual total), and
- spatial and temporal trend analysis (e.g., simple graphical analysis such as plotting all available sampled data – not just data for the reporting year – versus time, or averages (plus min/max) versus time,
- using statistical tools to identify trends and explain, the of cause(s) of those trends.

3.7 Annual report on research and development

The research and development (R&D) report shall be submitted annually and shall contain the following information:

1. descriptions of R&D activities to resolve safety issues, that were completed, underway or planned during the calendar year or are planned for future years
2. the nature of the safety issues to be resolved, progress made over the calendar year to resolve those issues, actual or anticipated results of R&D activities, and any unfinished R&D work (i.e., work that remained underway or planned) at the end of the calendar year
3. a description of the links between each of the R&D programs and the operational or safety issues being addressed
4. the schedule, with relevant milestones, for completing R&D activities that were not finished at the end of the calendar year

Guidance

The annual report on R&D should also include station-specific R&D activities.

3.8 Annual report on risk and reliability

The risk and reliability report shall be submitted annually and shall contain the information outlined in appendix C.

Guidance

For systems important to safety, the licensee may choose to use bounding evaluations for specific impact calculations, in which case, the cumulative effect of test deferrals must account for all test deferrals for the system over the year.

3.9 Annual report on fuel monitoring and inspection

The fuel monitoring and inspection report shall be submitted annually and shall include a description of the objectives, elements, procedures, limitations, results and conclusions of the program. for the calendar year.

The annual report on fuel monitoring and inspection shall contain the information as outlined in the “Format for the Annual Report on Fuel Monitoring and Inspection” in appendix E.

3.10 Annual compliance report for Class II nuclear facilities and nuclear substances and radiation devices

Note: This report applies only to licensees that have a Class II and/or nuclear substances and radiation devices licence that is amalgamated with their Class I nuclear power reactor operating licence (PROL).

The annual compliance report (ACR) for Class II nuclear facilities and nuclear substances and radiation devices shall contain the following information:

- information on the activities conducted during the previous year, including a summary of workload (for Class II nuclear facilities only)
- the current inventory of radiation devices, Class II prescribed equipment, sealed sources and unsealed sources
- information on any transfers or disposals

Guidance

ACR forms are available on the CNSC's Annual Compliance Reporting web page. The applicable report types are:

- Operate an Irradiator Facility
- Industrial Radiography
- Consolidated Uses of Nuclear Substances

Each annual compliance report should be a standalone document. If any information was previously provided to the CNSC (for example, in an event report or in a separate compliance report), this information does not need to be duplicated. In these cases, a reference to the previous report is adequate.

4. Event Reports and Notifications

The licensee shall submit event reports and notifications as required by their licensing basis. Appendix A summarizes the requirements from the NSCA, the regulations made under the NSCA, the licence conditions and other regulatory documents on timing and reporting of notifications, preliminary event reports, and event reports. The information to be reported for an event or notification is listed in sections 4.1,4.2 and 4.3.

Any information considered classified, protected, proprietary or personal shall be submitted with the appropriate security protection and marked with the appropriate protection and classification. For notifications to the CNSC, the licensee may choose to notify using either an electronic form or other appropriate means.

4.1 Contents of the preliminary event reports or immediate notifications

Situations may arise that require a licensee to immediately notify or report details to the CNSC. An immediate notification, or preliminary event report, shall contain the following information, as applicable:

1. date, time and circumstances of the situation or event, or of the notification
2. date and time of the onset (removal, reinstatement) and the duration of the situation or event
3. unique identification reference for the report for record- tracking purposes
4. reporting provision(s) as listed in appendix A (including reference to any specific reporting provisions) that are applicable to the situation(s) or event(s)
5. identification of the affected NPP and associated reactor units
6. identification of the affected structures, systems and components, including:
    a. the design flow diagram reference number(s)
    b. material type and code classification
    c. design and hydrostatic test pressure of the system
    d. magnitude, size or quantification of the degradation or fault (e.g., approximate size, length, depth or leak rates, deviation from set point)
7. description of the occurrence and consequences of the situation or event, including:
    a. the condition of the site where the situation or event has occurred and the operating conditions, immediately prior, during and after, of any power reactor unit involved in the situation or event
    b. the safety and control functions affected
    c. causes, method of investigations, circumstances, consequences and effects of the degradation
    d. a description of any secondary events that occurred as a result of the primary reportable event that may be of regulatory interest
    e. code, standard or methodology used to assess the significance of the degradation
    f. a summary of any impairment of a special safety system or SSCs important to safety
    g. reasons for removal of certified persons
8. identification of persons affected by the situation or event, including:
    a. any exposure of a person to radiation
    b. removal or reinstatement of a certified person from the duties of the position for which the person is certified by the CNSC
    c. revocation of authorization by the licensee
9. a description of any actions and/or remedial actions the licensee has taken or proposes to take with respect to the situation or event
10. a description of the research or analysis that led to awareness of the problem or potential problem
11. the name of the nuclear or hazardous substance released, the estimated or measured quantity of the unauthorized release, the estimated or measured rate of release, the manner of release, and the offsite monitoring results
12. the municipal, provincial or federal authorities that were notified of the situation or event
13. for event reports of a contravention of a licence, licensees are to include a description of the nature of the non--compliance with the licence condition
14. an indication of whether this type of event has occurred before

Guidance

If the licensee determined that investigation beyond the preliminary report is unlikely to yield additional relevant details or identify additional corrective actions, then a detailed report may not be necessary. In this case, the licensee may only need to submit one report; however, the preliminary report should include the information required in a detailed event report.

In item 1, "date" refers to the date on which licensee management becomes aware of the occurrence of the event (typically when a Station Condition Record/Problem Identification and Corrective Action (SCR/PICA) is entered) but before it has been processed to determine whether the event requires reporting to the CNSC. Licensees can also include the date on which licensee management initially determined that the event needed to be reported based on section 2, item 4.

In item 2, the date of onset is the date on which the event physically occurred or started to occur.

For the purposes of identifying persons in item 8, the licensee may provide the individual's full name and position title or a unique identifier, such as an employee number or dose information system number (DISN).

In item 8(a), the term "exposure" means the dose of radiation received by or committed to a person or an organ or tissue under reporting provision 20 in aappendix A.

In item 8(b), the term "removal" refers to the individual's leaving the position for any reason, including termination of the employment because of resignation or retirement under reporting provision 6 of appendix A.

In item 8(c), the term "revocation" means the cancellation or withdrawal of a security authorization under reporting provision 29 of appendix A.

4.2 Contents of the detailed event reports

Appendix A, *Event Reporting, Notifications and Filing of Specific Records,* indicates which reporting provisions require a detailed event report. A detailed event report shall contain the following information, as applicable:

1. reference to the original event report
2. updated new or additional information, on the content requirements of the preliminary event report
3. a detailed description of the occurrence or situation, including:
    a. the resulting effects on the health, safety and security of persons and on the environment
    b. any releases to the environment resulting stemming from the event
    c. the effective dose and equivalent dose received by each person involved in the event or situation, including the maximum dose received by a person from internal exposures
    d. the associated human, technical and organizational circumstances, causes and consequences, and any relevant conclusions or findings established by the investigation
    e. the exceedances to the safety and operational limits and conditions
    f. the role of contractor companies and their subcontractors
    g. the extent of condition
4. a summary of any analyses completed, including:
    a. probable cause
    b. any review of comparable situations or events
    c. any pertinent operational experience (OPEX)

   d. any analyses that are deviations from the licensee's dosimetry program or not covered by a dosimetry licence
   e. any relevant data related to the event that are needed to confirm the dose
5. the actions the licensee has taken or proposes to take, including:
   a. actions identified and taken to restore the effectiveness and of the radiation or environmental protection programs
   b. any additional measures taken to correct the situation or event and to prevent recurrences
6. the conclusions of any investigation or analysis of the situation or event, including:
   a. an evaluation of the degree of impairments of SSCs important to safety
   b. an evaluation of any resulting design, operating and/or training deficiencies
   c. a description of the human, technical and organizational factors that contributed to the event and the interactions between these factors.

Guidance

In item 2, additional information may include reporting subsequent or related reportable events linked to the original event that was the subject of the preliminary report.

For 3(c), the licensees should provide all relevant information used to calculate the committed effective dose, including:

- the time and date of the uptake,
- the time and date of any bioassay measurements and samples collected,
- the assessment scenario (inhalation, ingestion),
- the radionuclides involved,
- the assumed particle size and lung clearance type,
- the dose coefficients used and the analytical techniques used with the minimal detectable activity.

In item 3(f), the licensee should indicate the degree to which a contractor/sub-contractor was involved in the event or situation. The identity of the contractor/sub-contractor is not necessarily required.

In item 3(g), the extent of condition means the extent to which the actual condition exists and/ or impacts other units, plant processes, equipment, or human performance.

In item 4(a), the licensee should include the methods of cause analysis, such as but not limited to root cause, common cause, apparent cause, troubleshooting and event cause. The root cause analysis, if performed, should be submitted to the CNSC.

In items 5(a) and 5(b), the measures should include both preventative measures and corrective actions, as applicable.

If information is missing or unavailable at the time of submission, licensees should provide the target completion date and summarize the information that is intended to be provided to the CNSC.

4.3 Administrative report or notification

If appendix A indicates that a report or notification is administrative, then the licensee shall provide the necessary information to the CNSC in the time frame indicated in appendix A.

4.4 Request for retraction of an event report

A licensee may, for any situation or event, request a retraction for any preliminary or detailed event report it has made to, or filed with, the CNSC – pursuant to this regulatory document.

The licensee shall file the request for retraction, in writing, with the designated CNSC contact.

The request for retraction shall contain:

1. the title, the identifying number and the date of submission of the report to which the request pertains
2. the grounds for the request, including the reasons why the licensee believes that the report is not required by the licence or the regulations
3. the name and address of the sender of the request, the date of the request, and the signature of the designated representative of the licensee

Upon receipt of a request for retraction from a licensee, the CNSC will review the grounds for the request to determine whether the report is required by regulation or by the licensing basis. The CNSC will provide the results of that review to the licensee in writing. The schedule for reporting shall pause while the CNSC conducts its review. If the CNSC refuses the licensee's request for a retraction, then the licensee shall resume the schedule for reporting on the situation or event, in accordance with this regulatory document.

Guidance

When the CNSC has agreed to the request for retraction, the licensee is not required to include the event in disclosures required by REGDOC-3.2.1, *Public Information and Disclosure* [2], unless it is specifically required under the licensee's public information disclosure protocol.

If the CNSC grants the licensee's request for a retraction, then the information about the situation or event that the licensee has already submitted to the CNSC will not be treated as information required by this regulatory document, but it will remain part of the CNSC's records.

Appendix A: Event Reporting, Notifications and Filing of Specific Records

This appendix provides a list of the situations, events, dangerous occurrences and specific reporting provisions that prompt the need to submit event reports or notify the CNSC. The timing for each report or notification is included in the tables. The first priority for any reporting provision is to ensure that the reporting party has taken all reasonable measures to mitigate any potential consequences.

This appendix also sets out additional specific reporting provisions that relate to the purposes of the NSCA and the regulations made under the NSCA. These specific reporting provisions apply only when this regulatory document is included as a condition of the licence.

Licensees holding multiple classes of CNSC licence need only submit one report for the affected facility. Licensees should select the most appropriate licence and corresponding reporting requirements to fulfill the licence obligations. If the PROL and REGDOC-3.1.1 have been identified, event reports or notifications shall be filed under the reporting provisions that follow.

Information about reporting requirements and timing

Applicable section(s) of the NSCA or the regulations made under the NCSA are noted for each item.

A.1 Contravention of the NSCA in relation to an activity that is authorized

Note: See also item A.19

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
1a)	**NSCA:** **27**. Every licensee and every prescribed person shall (b) make the prescribed reports and file them in the prescribed manner, including a report on (ii) any contravention of this Act in relation to an activity that is authorized by this Act and any measure that has been taken in respect of the contravention. **Specific reporting provisions** The licensee shall report on the following situations or events: 1. a programmatic failure of a program referenced in the licence 2. any contravention of the licence **Guidance** Regulations made pursuant to the NSCA, orders of the CNSC, a designated officer or an inspector, and licence conditions have their origins from the NSCA. Therefore, it is understood that a contravention of a regulation made pursuant to the NSCA, of an order or of a licence condition is a contravention of the NSCA. Reportable situations or events include items of non-compliance identified by the licensee. Items of non-compliance with safety and control measures, which include regulatory documents and standards, are reportable only if they rise to the programmatic level. Examples of items of non-compliance that are not programmatic include:	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	• one-off occurrences of untreated wood products in the plant are not reportable as fire code violations under CSA N293-12, *Fire Protection for Nuclear Power Plants* [7]; these events will be treated as contributing to a potential programmatic non-compliance. • one-off pressure boundary inspection and test plan (ITP) execution errors, including lack of authorized inspection agency (AIA) concurrence, where there is no consequential adverse impact on operability, will not be reportable as an item of non-compliance with CSA N285.0, *General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3]; these occurrences will be treated as administrative errors contributing to potential programmatic non-compliance. Examples of items of non-compliance that are programmatic include: • an item of non-compliance with a control measure, such as a limit or requirement that would create an unreasonable risk to national security, the health and safety of persons, and the protection of the environment • failures in a program that forms one part, or all, of a program in a licence • the discovery of a degradation or vulnerability that may permit undetected drug or alcohol use by workers Note: For examples of non-compliances that are reportable and non-reportable pursuant to the requirements of the *Packaging and Transport of Nuclear Substances Regulations, 2015*, see item 32.			
1b)	***General Nuclear Safety and Control Regulations* (GNSCR):** **9.** (4) Every person who carries on an activity without a licence in accordance with subsection (1) or (2) **shall immediately notify** the Commission of that fact. **Guidance** Actions outside the licensing basis or licensed activity should be reported here.	Immediate		

A.2 Transfer or disclosure of prescribed information

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Event, notification or filing of specific records with the CNSC</th><th colspan="3">Timing</th></tr>
<tr><th>Notification or filing of specific records</th><th>Preliminary event reports</th><th>Detailed event reports</th></tr>
<tr><td colspan="5">Regulatory context
NSCA:
48. Every person commits an offence who
(b) discloses prescribed information, except pursuant to the regulations;

GNSCR:
23. (1) No person shall transfer or disclose prescribed information unless the person
(a) is legally required to do so; or
(b) transfers or discloses it to
(i) a minister, employee or other person acting on behalf or under the direction of the Government of Canada, the government of a province or any of their agencies, for the purpose of assisting themselves in exercising a power or performing a duty or function lawfully conferred or imposed on them,
(ii) an official of a foreign government or an international agency, for the purpose of meeting obligations imposed by an arrangement made between the Government of Canada and the foreign government or international agency,
(iii) a worker, for the purpose of enabling the worker to perform duties assigned by the licensee, or
(iv) a person who is legally required or legally authorized to obtain or receive the information.</td></tr>
<tr><td>2</td><td>Specific reporting provisions
The licensee shall report on:
any situations or events relating to the transfer or disclosure of prescribed information.</td><td>N/A</td><td>Immediate</td><td>60 days</td></tr>
</table>

A.3 Notification of authorized delegates and responsible persons

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
3	**GNSCR**: **15**. Every applicant for a licence and every licensee shall notify the Commission of (a) the persons who have authority to act for them in their dealings with the Commission; (b) the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and (c) any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs.	Within 15 days	N/A	N/A

A.4 Contingency plan

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
4a)	**GNSCR**: **29**. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:	N/A	Higher significance: Immediate or	Higher significance: 60 days or

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(d) a situation or event that requires the implementation of a contingency plan in accordance with the licence; **Specific reporting provisions** The licensee shall report on: i. any situation or event that requires the implementation of the nuclear emergency plan, or the use of any abnormal operating procedures or emergency operating procedures, or the mobilization of resources in response to the situation or event ii. the occurrence of any unusual external events (floods, fires, earthquakes, etc.) at or near the site that require further inspection to verify their effect on NPP structures, systems and components iii. the occurrence of any unusual external events at the site that resulted in an operating transient at the NPP **Guidance** This reporting is in response to an unexpected occurrence that creates a hazard to the safe operation of the NPP, or to the health, safety and security of persons, or to and the environment. Reportable situations include: • multiple false alarms that indicate a declining trend of an SSC important to safety's fitness for service • activation of the site nuclear emergency plan, including false alarms that activate the site nuclear emergency plan • use of abnormal or emergency operating procedures, including evacuation of an area • sounding the emergency alarm or, mobilizing the site emergency response team (ERT) or offsite emergency responders, provided that no mitigating actions were required.		Lower significance: 14 days	Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	• activation of any abnormal or operating procedure in response to a security situation or event, including the presence of on-site security responders or law enforcement entities, activation of security incident command or a heightened security posture • natural hazard events, including floods, fires, earthquakes, etc. A fire is reportable if: • application of an extinguishing agent was required • the fire causes entry into an abnormal incident manual (AIM) or the provincial nuclear emergency plan • an unexplained flame is witnessed • damage has occurred beyond the point of origin An earthquake is reportable if: • it was felt or registered at the site • it exceeded 50% of the design- basis earthquake for the NPP; to be able to calculate this, an NPP should have a working seismic monitoring system in accordance with the requirements of CSA N289.5, *Seismic Instrumentation Requirements for Nuclear Power Plants and Nuclear Facilities* [8] • any damage associated with an earthquake is identified • it has caused any disruption of life in the exclusion zone; disruption of life can be related to physical damage to housing or public infrastructure, but can also be related to traffic congestion, for example An event is not reportable if: • a minor amount of extinguishing agent was applied in error or was unnecessary			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	• smoke was coming from a slipping belt, or overheated or malfunctioning equipment • damage was very minor and limited to a single electrical component, such that no surrounding components or equipment were impacted • there was a traffic incident involving police where no arrest was made			
4b)	(g) an actual, threatened or planned work disruption by workers; **Specific reporting provisions** The licensee shall report on the following situations or events: • any actual, impending, planned or threatened work disruption, including labour actions such as a slowdown, walkout or strike, or another action such as a civil demonstration, that could affect the safety or security of operations at the facility or the capability of the licensee to maintain the staffing levels required by the licensee • situations involving the possibility of a strike are considered to be reportable when a union that operates at the facility is in a legal strike position, regardless of whether any actual strike activity has taken place	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.5 Serious illness, injury or death

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notifications	**Preliminary event report or immediate notification**	**Detailed event reports**
5	**GNSCR**:	N/A	Immediate	60 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notifications	**Preliminary event report or immediate notification**	**Detailed event reports**
	29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (h) a serious illness or injury incurred or possibly incurred as a result of the licensed activity; (i) the death of any person at a nuclear facility; **Guidance** For an illness or injury to be considered serious, there should have been lost time associated with it. The event is reportable once a lost- time incident occurs. Any death within the exclusion zone or the outer facility site boundary (whichever is larger), regardless of cause, or any death resulting from an injury or illness, regardless of time intervening between injury or illness and death, is to be reported. This applies even if the death is unrelated to the operation of the NPP.			

A.6 Notification of removal or reinstatement of certified personnel

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
6	**Specific reporting provisions** The licensee shall submit notification of the following:	21 days	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	a. removal of a certified person from the duties of the position for which the person is certified by the CNSC b. reinstatement of a certified person to the duties of the position for which the person is certified by the CNSC **Guidance** "Removal" refers to leaving the position for any reason, including termination of employment because of resignation or retirement. "Reinstatement" means a return to duties in accordance with REGDOC-2.2.3, *Personnel Certification*, *Volume III: Certification of Persons Working at Nuclear Power Plants* [9].			

A.7 Financial status

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
7	**GNSCR**: 29. (1) Every licensee who becomes aware of any of the following situations **shall immediately make a preliminary report** to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (j) the occurrence of any of the following events: (i) the making of an assignment by or in respect of the licensee under the *Bankruptcy and Insolvency Act,*	N/A	Immediate	60 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(ii) the making of a proposal by or in respect of the licensee under the *Bankruptcy and Insolvency Act*, (iii) the filing of a notice of intention by the licensee under the *Bankruptcy and Insolvency Act*, (iv) the filing of a petition for a receiving order against the licensee under the *Bankruptcy and Insolvency Act*, (v) the enforcement by a secured creditor of a security on all or substantially all of the inventory, accounts receivable or other property of the licensee that was acquired for, or used in relation to, a business carried on by the licensee, (vi) the filing in court by the licensee of an application to propose a compromise or an arrangement with its unsecured creditors or any class of them under section 4 of the *Companies' Creditors Arrangement Act*, (vii) the filing in court by the licensee of an application to propose a compromise or an arrangement with its secured creditors or any class of them under section 5 of the *Companies' Creditors Arrangement Act*, (viii) the making of an application for a winding-up order by or in respect of the licensee under the *Winding-up and Restructuring Act*, (ix) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of the licensee under provincial or foreign legislation, or (x) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of a body corporate that controls the licensee under provincial or foreign legislation.			

A.8 Inaccurate or incomplete records

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
8	**GNSCR**: **31**. (1) Every licensee who becomes aware of an inaccuracy or incompleteness in a record that the licensee is required to keep by the Act, the regulations made under the Act or the licence **shall file a report** of the inaccuracy or incompleteness with the Commission **within 21 days** after becoming aware of it, and the report shall contain the following information: (a) the details of the inaccuracy or incompleteness; and (b) any action that the licensee has taken or proposes to take with respect to the inaccuracy or incompleteness. (2) Subsection (1) does not apply to a licensee if: (a) the licence contains a term or condition that requires the licensee to report inaccuracies or incompleteness in a record to the Commission; or (b) the inaccuracy or incompleteness in the record could not reasonably be expected to lead to a situation in which the environment, the health and safety of persons or national security is adversely affected.	N/A	Within 21 days or Not required if GNSCR 31(2)(b) applies	60 days

A.9 Notification and filing of record of disposal of records

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
9	**GNSCR**: **28**. (2) No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence unless the person (a) is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and (b) has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal. (3) A person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request. **Guidance** The notification of intent to dispose of a record should include: • unique correspondence tracking identifier • planned date of disposal of the record • representative sample of the record sufficient for the CNSC to ascertain the nature of the record.	At least 90 days before the date of disposal	N/A	N/A

A.10 Failure, degradation or weakening of structures, systems and components (SSC)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event report**
10	**GNSCR**: **29**. (1) Every licensee who becomes aware of any of the following situations **shall immediately make a preliminary report** to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (f) information that reveals the incipient failure, abnormal degradation or weakening of any component or system at the site of the licensed activity, the failure of which could have a serious adverse effect on the environment or constitutes or is likely to constitute or contribute to a serious risk to the health and safety of persons or the maintenance of security; **Specific reporting provisions** For Class 1 to 6 systems in accordance with CSA N285.0, *General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3], the licensee shall report on the discovery of the following situations or events: a. ruptures b. safety-significant deformation or cracks c. degradations that have the potential to significantly impair the operating ability of the system d. degradations that cause a leak that exceeds a limit specified in the licensing basis e. changes in the size, rating or material properties of any part of a pressure boundary that was not allowed for in the design of the boundary f. local or general reductions in wall thickness beyond that allowed by the applicable pressure vessel code, standard or Act under which the Class 1 to 6 system's pressure boundary was registered (or could have been registered)		Immediate	60 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event report**
	g. degradations of overpressure protection equipment that caused or would have caused the equipment to fail to operate in accordance with the overpressure protection report or another version-controlled document or a licensee document requiring notification of change, other than a relief device that activates above its maximum set point during testing but below the hydrostatic test pressure of the associated system h. a transient load condition that exceeds a relevant design condition of a pressure boundary or that exceeds Level B service limits for a nuclear component that has been designed in accordance with Section III, Division 1, Subsection NB of the ASME Boiler & Pressure Vessel Code [10] i. an analysis related to a Class 1 to 6 pressure boundary system that concludes that an applicable limit specified in the associated design analyses, the design and inspection codes, or the design and inspection standards has been exceeded j. a safety-significant pressure boundary failure or leak in a system that: • contains radioactive or hazardous substances in high enough concentrations to pose a hazard to unprotected personnel • is of sufficient pressure or temperature to pose a hazard to unprotected personnel • results in a leak of any material that impinges upon any electrical component • results in a leak that causes damage or flooding that affects the safe operation of the plant k. a situation where the configuration of a valve or other device associated with a pressure boundary contravenes relevant requirements in the overpressure protection report or another version-controlled document or a licensee document requiring notification of change			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event report**
	Guidance Class 6 systems that satisfy the exemption criteria of Clause 5.2.4.2 of CSA N285.0, *General Rrequirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3], may be excluded. Only higher significance events are reported immediately as events. Lower significance events are reported on the quarterly report on nuclear power plant pressure boundaries (see section 3.2). Failure of the following typically do not need to be reported, unless required by another reporting provision: • vacuum relief valves, provided they are non-code valves and they do not perform or support a safety function • power- operated relief valves, provided they do not perform a safety function • pressure relief valves in systems that are not and are not required to be registered under CSA N285.0, *General Rrequirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3] In item g, event reporting is intended for the discovery of the failure or potential failure of overpressure protection equipment. If a relief device activates above its maximum set point during the testing but below the hydrostatic test pressure of the associated system, it should be reported in the quarterly report on nuclear power plant pressure boundaries (see section 3.2). If a relief device activates above the hydrostatic test pressure of the associated system, it should be reported it as an event under this reporting provision.			

A.11 Process systems

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event reports or immediate notification**	**Detailed event report**
11	**Specific reporting provisions** The licensee shall report on the following situations or events: a. a serious process failure **Guidance:** The licensee should file a report for the serious process failure once it is determined to be a serious process failure, even if the triggering event was reported under a different reporting provision. The definition of a serious process failure is a failure that leads or that could lead, in the absence of action by any special safety system, to significant fuel damage or a significant release from the NPP.	N/A	Immediate	60 days
	b. an unplanned change in reactor power or in core reactivity **Guidance:** The intent of this reporting provision is to report all unplanned shutdowns, stepbacks, setbacks and unexpected or unexplained phenomena. This reporting requirement applies to events during startup, normal operations, during shutdown / guaranteed shutdown state, and events related to radioisotope production systems. This reporting requirement applies to an unplanned change in core reactivity, such as: • a failed approach to criticality • unexpected core response • gadolinium precipitation events	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event reports or immediate notification**	**Detailed event report**
	• unexpected flux tilts greater than actionable limits in the governing operations documents • discovery of fuel burnup or cobalt-60 rod activity being significantly different than expected • an error in using or not using depleted bundles as planned • unplanned reactivity device intervention or compensation The common definition of "unplanned" is unexpected, not anticipated, not prepared for or otherwise not arranged in advance. Unexpected responses to planned power changes are reportable under this provision. However, planned changes in power related to normal operations such as testing, fuelling, reactor following (within a controlled power band), surplus baseload generation, planned outages and auto trips (during commissioning) are not reportable under this provision. Likewise, planned shutdowns associated with forced outages are not reportable.			
	c. an acute and unrecoverable loss of more than 100 kg of heavy water. **Guidance** Loss of heavy water includes losses from process failures and/or the storage of heavy water. Heavy water is considered to be a nuclear substance. Theft of a nuclear substance is covered under reporting provision 26 in appendix A.		Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.12 Safety systems

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event reports or immediate notification**	**Detailed event reports**
12	**Specific reporting provisions** The licensee shall report on situations or events that result in any of the following: a. an actuation, at any power level, of a shutdown system, except where: • the actuation occurs while the reactor unit is in a guaranteed shutdown state and there is no indication that the shutdown guarantee has failed • the actuation was deliberate, as required for testing purposes or as part of a pre-approved shutdown procedure b. an actuation of an emergency core cooling system or subsystem as a consequence of an initiating parameter going beyond a set point c. an actuation of a containment system or subsystem as a consequence of an initiating parameter going beyond a set point d. a degradation of a special safety system or standby SSC important to safety that prevents the system from performing its safety function as intended or from meeting its defined specifications found in the NPP safe operating envelope (SOE) e. a spurious operation or a spurious failure of a device at the final point of control for the purpose of separating the circuits of the heat transport system from the emergency core cooling systems **Guidance** The report should include a specific statement as to why a special safety system actuation was not a serious process failure. For item c, spurious actuation of containment by exceeding a set point from a fault or unauthentic signal should not be reported.	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event reports or immediate notification	Detailed event reports
	Example: containment system box-ups on activity where the initiating parameter was exceeded as a result of fields external to the reactor building ventilation exhaust flow (i.e., shine from moderator slurry activities in the vicinity of the box-up monitors or because of radiography in the area).			

A.13 Reactor, turbine and generator control

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event report or immediate notification	Detailed event reports
13	**Specific reporting provisions** The licensee shall report on situations or events that reduce the effectiveness of a system, outside of defined specifications, for: a. controlling reactor power b. controlling the pressure or inventory of the primary heat transport system c. protecting the turbine/generator **Guidance** For item a, only a reduction in the means of controlling reactor power is reported under this provision; an unplanned reduction in reactor power is reported under provision number 11.	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	For items a, b and c, the defined specifications may be contained in the licensee's documentation on the safe operating envelope (SOE), systems important to safety action levels, design requirements or impairment manual. Note: Reductions in redundancies or safety margins are not reportable under this clause.			

A.14 Hazards

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
14	**Specific reporting provisions** The licensee shall report on any of the following situations or events arising from operating experience, research, new or revised safety analysis, that reveals a hazard or a potential hazard to the environment, health and safety of persons and the maintenance of national security; and measures required to implement international obligations to which Canada has agreed - that may be (or is determined to be) different in nature, or greater in probability or magnitude than was previously represented to the CNSC: a. discovery of any of the following: i. any special safety system that does not meet its defined specifications ii. a reactor that is operating in a state that was not considered in the safety analysis iii. occurrence of a situation or event of a type that was not considered in the safety analysis iv. unexplained or unexpected behaviour of a reactor core	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	v. an event where 2 or more systems or components that were assumed in the safety analysis to be mutually independent are, in fact, interdependent vi. safety and control measures described in the licence application and the documents needed to support the licence application containing an error that, if accepted, relied or acted upon as being valid, could give rise to increased risks vii. new information, from an event analysis, indicating the possible release of a nuclear substance in a quantity or rate greater than predicted in the safety analysis viii. determination that actual field configuration is not consistent with assumptions made in the safety analysis ix. the discovery of any item that calls into question the critical characteristics of components and/or the defined specifications of a special safety system, an SSC important to safety or a security system x. discovery of any documentation or safety and control measures that renders inaccurate or suspect the information used to establish continued operation of a component, an SSC important to safety or a system important to safety **Guidance** Situations and events reported under this provision are typically identified as a result of operational activities such as transients, event analysis, operator routines or surveillance. It is acceptable to report lower significance events for item i above in the annual report on risk and reliability (see section 3.8).			
	b. discovery of any of the following: i. a final safety analysis report containing an assumption, input, analytical method or safety analysis result that is or may be invalid or uncertain ii. a limit defined in the licensing basis that is or may be inadequate to ensure safety			21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	iii. an analysis, from which a limit was derived, that may be invalid or uncertain such that the margin of safety may be less than predicted iv. defined specifications of a special safety system or of an SSC important to safety of an NPP are or may be invalid v. [*provision retracted as part of version 3 updates*] vi. safety and control measures in place for the purpose of protecting the environment from the operating impacts of an NPP are or may be inadequate vii. the discovery of a degradation mechanism or component condition that changes or renders inaccurate the licensing basis, continued operation of a component, SSC important to safety or system important to safety **Guidance** Situations and events reported under this provision are typically identified through activities such as research, program review or the updating of documents.			

A.15 Counterfeit, fraudulent or suspect items

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notifications**	**Detailed event reports**
15	**Specific reporting provisions** The licensee shall report situations or events that result in the discovery of counterfeit, fraudulent or suspect items during the conduct of licensed activities. **Guidance** Counterfeit and fraudulent items are reported only as such once confirmed and validated. Suspect items are reported when substandard quality or, suspicious differences in packaging, labelling, physical appearance, shipping details and so on, etc., create doubts regarding the genuineness of the item without certain proof. Suspect items do not necessarily include substandard items from a change or defect in the manufacturing process. If the item is installed in the NPP, the significance of the impact determines the timing of the preliminary report. If the item is not installed in the NPP, it is considered a lower significance event. Licensees are encouraged to report items as suspect upon discovery and not wait until confirmation as counterfeit or fraudulent. Protection of information should not inhibit reporting to the CNSC. The make/model of the item could be protected information if its release would harm the company.	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.16 Outages

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
16	**Specific reporting provisions** The licensee shall submit:			
	a. a notification of regulatory undertakings (NoRU) that identifies all regulatory undertakings to be completed during the outage. The NoRU should also identify the planned work that, in the licensee's judgement, is of regulatory interest. **Guidance** Email notification is acceptable. In this context, "regulatory undertakings" refers to outage work that is required by a code or a standard that is referenced in the power reactor operating licence (PROL) (mandatory work) or work that was committed by the licensee to the CNSC through formal correspondence (committed work), including: • periodic inspection program (PIP) inspections in the last outage of a PIP cycle • PIP work that is required to allow the extension of an existing disposition that will expire before the next planned outage Also in this context, "planned work" is major safety significant work that is scheduled in the outage, and that in the licensee's judgement is of regulatory interest, but is not mandatory or committed, including: • repair or maintenance tasks to correct known problems, (e.g., level 3 impairments) • inspection tasks (e.g., PIP inspections) that must be completed over a multi-year cycle and for which there is another planned maintenance outage before the end of the current cycle • requests from CNSC staff to do additional inspections beyond the PIP requirements	60 days prior to the outage	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	b. a notification of any changes to the regulatory undertakings and commitments stated in the notification of regulatory undertakings (NoRU)	7 days prior to the outage	N/A	N/A
	c. an outage of completion assurance statement (OCAS) confirming that all regulatory undertakings were successfully completed during the outage • the OCAS shall include any conditions that the licensee imposed upon reactor restart and/or subsequent operation to ensure the continued safe operation of the nuclear facility • the OCAS should include the status of planned work that was identified in the NoRU **Guidance** This notification should include additions to outage scope, such as component repairs or replacement. Regulatory undertakings that are not completed during the outage should be identified in the OCAS.	30 days after the outage	N/A	N/A

A.17 Missed regulatory predefines (scheduled plant activities)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
17	**Specific reporting provisions** The licensee shall report on situations or events that result in any failure to perform a test that is required by a licence condition, including any routine test of an SSC important to safety that is required by a licensing document that has not been deferred in accordance with procedures that are permitted by the licence. **Guidance** This specific reporting provision includes missed preventative maintenance calibrations for instruments identified in licensee safe operating envelope (SOE) documentation. The following failures do not need to be reported unless required by another reporting provision: • vacuum relief valves, provided they are non-code valves and they do not perform a safety function • power operated relief valves, provided they do not perform a safety function • pressure relief valves in systems that are not or would not be required to be registered under CSA N285.0, *General Rrequirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants* [3] Reports made under this provision should be consistent with the notes in safety performance indicator 17 (SPI-17), Safety System Test Performance (see appendix B). Any missed preventive maintenance (PM) on a non-SSC important to safety is not reportable.	N/A.	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.18 Other reportable situations and events

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
18	**Specific reporting provisions** The licensee shall report on all other situations or events that are not otherwise specified in this document but can be reasonably assumed to be of regulatory interest, including notifications and situations or event reports to other regulatory agencies within the scope covered by the objects of the Commission (see section 9 of the NSCA), or where CNSC requests the report. **Guidance** The licensee may submit copies of the report(s) or notification(s) prepared for other governing bodies to the CNSC as a preliminary event report. Licensees should look at all other reporting provisions before considering reporting under reporting provision 18. The term "of regulatory interest" is intended to include any situation or event that could be of concern, including but not limited to: • any matter or item of regulatory interest that the CNSC has previously or currently expressed interest in and/or concern about • matters that are likely to be of public or community concern • matters that are likely to have media attention • negative trends or non-conservative behaviours This reporting provision could include site-specific scenarios that are not covered elsewhere.	N/A.	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.19 Misuse of anything intended to protect the environment and the health and safety of persons or maintain security

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
Regulatory context **NSCA:** **48.** Every person commits an offence who (a) alters, otherwise than pursuant to the regulations or a licence, or misuses anything the purpose of which is to (i) protect the environment or the health or safety of persons from any risk associated with the development, production or use of nuclear energy or the possession or use of a nuclear substance, prescribed equipment or prescribed information, or (k) fails to comply with this Act or any regulation made pursuant to this Act. **GNSCR:** **17.** Every worker shall (b) comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment;				
19	**Specific reporting provisions** The licensee shall report on situations or events: • where an offence is committed or there is a misuse of anything intended to protect the environment or the health or safety of persons from any risk associated with authorized activities • where workers failed to comply with licensees' measures to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of nuclear and hazardous substances into the environment	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	Guidance The term “misuse” refers to intentional tampering and using something in an unsuitable or unintended way. Violations to the alcohol or drug-related fitness for duty policy, including the use, sale, distribution, possession or presence of illegal drugs, or the consumption or presence of alcohol or cannabis at a high-security site, should be reported under this reporting provision. The discovery of a degradation or vulnerability that may permit undetected drug or alcohol use or abuse by workers, such as but not limited to quality assurance or testing errors, should be reported under this reporting provision. Any intentional act that could jeopardize the integrity of alcohol and drug testing results, or that may permit undetected drug or alcohol use or abuse by workers should be reported under this reporting provision.			

A.20 Actual or potential exposure in excess of legal radiation dose limits (worker)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
20a)	**GNSCR:** **29.** (1) Every licensee who becomes aware of any of the following situations **shall immediately make a preliminary report** to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (b) the occurrence of an event that is likely to result in the exposure of persons to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations*;		Immediate	Within 21 days
20b)	***Radiation Protection Regulations*** **(RPR):** **16** When a licensee becomes aware that a dose of radiation received by or committed to a person or an organ or tissue may have exceeded an applicable dose limit prescribed by section 13 or 14, the licensee must (a) **immediately notify** the person and the Commission of the dose; (e) **within 21 days** after becoming aware that the dose limit has been exceeded, **report to the Commission** the results of the investigation or the progress that has been made in conducting it. **Guidance** Participating in the control of an emergency is understood to mean a person who is engaged in emergency response [12]. Event reports submitted under this provision contain personal information and should be reported on the Personnel Situation Report, in accordance with section 2, item 3 of this document.		Immediate	Within 21 days
20c)	**Specific reporting provisions**		Immediate	Within 21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	The licensee shall report on any situations or events that could have caused a reportable dose of radiation under the *Radiation Protection Regulations* but did not, due to fortuitous circumstances rather than to approved procedures.			
20d)	**NSCA:** **45.** Every person who, on reasonable grounds, believes that (b) an event has occurred that is likely to result in the exposure of persons or the environment to a dose of radiation in excess of the prescribed limits, **shall immediately notify** the Commission or an appropriate authority of the location and circumstances of the contamination or event.		Immediate	Within 21 days

A.21 Reaching an action level for the purposes of environmental or radiation protection

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
21	**RPR** **6.** (2) When a licensee becomes aware that an action level referred to in the licence for the purpose of this subsection has been reached, the licensee must (c) **notify** the Commission within the period specified in the licence. **Specific reporting provisions** After becoming aware of situations or events that result in an action level being reached, the licensee shall report to the CNSC the results of the investigation or on the progress that has been made in conducting the investigation.	N/A	Within the period specified in the licence	60 days

A.22 Nuclear and hazardous substance release

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event reports or immediate notification**	**Detailed event reports**
22	**GNSCR:** **29.** (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (c) a release, not authorized by the licence, of a quantity of radioactive nuclear substance into the environment; **Specific reporting provisions** The licensee shall report on the following situations or events: a. any failure to monitor, control or record the release of a nuclear substance as required by the licence b. any failure to monitor or control the release of a hazardous substance as required by any federal or provincial regulation, or by a licence, permit or certificate issued by a municipal, provincial or other federal authority c. any event that either affected the environment or that has the potential to adversely affect it **Guidance** For item b, a failure to collect an individual sample is not considered failure to monitor. For the purposes of event reporting, failure to monitor is more appropriately considered in the context of programmatic failure. An unmonitored or uncontrolled release of a nuclear or hazardous substance into the environment is reportable if the licensee cannot demonstrate that the release did not exceed regulatory limits or that the release has occurred at other than established points of release.	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event reports or immediate notification	Detailed event reports
	Reported spills do not include releases onto artificial surfaces (e.g., concrete, asphalt) that are contained and that the licensee can recover. Note: Event spill and release estimates for events not exceeding regulatory limits should be reported in the quarterly safety performance indicators, SPI-5, Environmental Releases – Radiological, and SPI-6, Spills, following the categorization indicated in those SPIs (see appendix B).			

A.23 Exposure devices and sealed source assemblies

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event report or immediate notification	Detailed event reports
23	***Nuclear Substances and Radiation Devices Regulations*** **(NSRDR):** **30.** (2) Every licensee who becomes aware of any of the following situations shall notify the Commission immediately of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) the exposure device or the sealed source assembly is lost, stolen or damaged to an extent that could impair its normal use; (b) the exposure device has a radiation dose rate of more than 2 mSv per hour on any part of its surface when the sealed source assembly is in the shielded position; (c) the sealed source assembly is separated from the exposure device when the latter is not being serviced; or		Immediate	21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(d) the sealed source assembly fails to return to the shielded position inside the exposure device. **NSRDR:** **38.** (2) Every licensee referred to in subsection (1) or subsection 30(2) who becomes aware of a situation referred to in one of those subsections shall file a full report of the situation with the Commission within 21 days after the day on which the licensee becomes aware of it or within the period specified in the licence, and the report shall contain the following information: (a) a description of the situation, the circumstances and the problem, if any, with the radiation device; (b) the probable cause of the situation; (c) the nuclear substance, and if applicable, the brand name, model number and serial number of the radiation device involved; (d) the date, time and location where the situation occurred or, if unknown, the approximate date, time and location, and the date and time of becoming aware of the situation; (e) the actions that the licensee has taken to re-establish normal operations; (f) the actions that the licensee has taken or proposes to take to prevent a recurrence of the situation; (g) if the situation involved an exposure device, the qualifications of the workers, including any trainee, who were involved; (h) the effective dose and equivalent dose – as those terms are defined in subsection 1(1) of the *Radiation Protection Regulations* – received by any person as a result of the situation; and			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(i) the effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation.			

A.24 Notification of sealed source leakage of 200 Bq or greater

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
24	**NSRDR:** **18.** (3) Where a licensee, in the course of conducting a leak test on a sealed source or on shielding, detects the leakage of 200 Bq or more of a nuclear substance, the licensee shall (d) immediately after complying with paragraphs (a) to (c), notify the Commission that the leakage has been detected.	N/A.	Immediate	N/A

A.25 Filing of a sealed source tracking report

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
25	**Specific reporting provisions** The licensee shall provide notification of any import, export, transfer or receipt of sealed sources using the CNSC database (the sealed source tracking system) that tracks the location of each significantly hazardous nuclear source (IAEA Category 1 and 2 sources and sources used for industrial radiography regardless of category) in Canada. The notification shall include: 1. on transfer or export of a sealed source(s): a. the date of transfer or export b. the export licence number (where applicable) c. the name of the recipient and licence number or the name of the importer d. the address of the recipient's or importer's authorized location e. the nuclear substance (radionuclide) f. activity (radioactivity) (Bq) per sealed source on the reference date g. the reference date h. the number of sealed source(s) i. the aggregate activity (Bq) j. the sealed source unique identifiers (if available) k. where the sealed source is incorporated into prescribed equipment: i. the name and model number of the equipment ii. the equipment serial number (if available)	At least 7 days before transfer out or export, and within 48 hours of receipt or import	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	2. on receipt or import of a sealed source(s): a. the date of receipt of a transfer or import b. the name of the shipper and licence number or the name of the exporter c. the address of the shipper's or exporter's authorized location d. the nuclear substance (radionuclide) e. activity (radioactivity) (Bq) per sealed source on the reference date f. the reference date g. the number of sealed source(s) h. the aggregate activity (Bq) i. sealed source unique identifiers (if available) j. where the sealed source is incorporated into prescribed equipment: i. the name and model number of the equipment ii. the equipment serial number (if available)			

A.26 Theft or loss of nuclear substance, prescribed equipment or prescribed information

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
26	**NSCA:**	N/A	Immediate	60 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	27. Every licensee and every prescribed person shall (b) make the prescribed reports and file them in the prescribed manner, including a report on (i) any theft or loss of a nuclear substance, prescribed equipment or prescribed information that is used in carrying on any activity that is authorized by this Act. **GNSCR:** **29.** (1) Every licensee who becomes aware of any of the following situations **shall immediately make a preliminary report** to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) a situation referred to in paragraph 27(b) of the Act [NSCA]:			

A.27 Actual or attempted breach of security or act of sabotage

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or notification**	**Detailed event reports**
27	**GNSCR:** **29.** (1) Every licensee who becomes aware of any of the following situations **shall immediately make a preliminary report** to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (e) an attempted or actual breach of security or an attempted or actual act of sabotage at the site of the licensed activity; **Specific reporting provisions**	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: 14 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or notification**	**Detailed event reports**
	The licensee shall report on: a. any attempted or actual cyber-attack that adversely impacts or potentially impacts cyber essential assets (CEAs). Cyber-attack and CEA are defined in CSA N290.7 [1]. b. any security incident in the form of: i. an actual or attempted breach of the licensee's physical protection system ii. an actual or attempted act of sabotage at the facility iii. a misuse of security-related equipment that may result in a security and/or safety vulnerability iv. the discharge of a firearm in a use-of-force application v. the application of any use of force vi. a credible threat made against the NPP **Guidance** Immediate reporting is required only where a hazard to the health, safety and security of persons, and the environment or to the security of the nuclear facility exists. The application of use of force is reportable if an officer uses force greater than physical presence or communication on the Ontario Use of Force Model (2004), the RCMP's Incident Management/Intervention Model (IMIM), or equivalent.			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or notification**	**Detailed event reports**
	Licensees should assume threats are credible until law enforcement determines otherwise. A credible threat made against the NPP can include an actual or attempted breach of the licensee's physical protection system or an actual or attempted act of sabotage at the facility.			

A.28 Filing of security record for threat and risk assessment

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
28	**Nuclear Security Regulations (NSR):** **7.5** (4) Every licensee shall provide a copy of the written [threat and risk assessment] record, together with a statement of actions taken as a result of the threat and risk assessment, to the Commission within 60 days after completion of the assessment. **Guidance** The following are the 10 key principles that should be covered in the licensee's threat and risk assessment (TRA) methodology: 1. summary of management processes and procedures for conducting a TRA (site specific) 2. data collection to be included in the submission (interviews, intelligence, local law enforcement, site staff interviews, news outlets, environmental data, etc.) 3. documented analysis of facility policies and procedures taken into consideration (security or other)	Within 60 days	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	4. summary of how asset identification was completed, and rationale on where the "asset identification line" is located 5. asset identification (all systems related to nuclear material and substances, security systems associated with protection of those assets, all vital areas, employees, security staff, material and substances, etc.) 6. threat analysis to identified assets 7. vulnerability assessment 8. countermeasures and effectiveness 9. correlation and assessment of risk acceptability clearly defined 10. recommendations on residual risk and risk acceptance			

A.29 Notification of revocation of authorization

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
29	**NSR:** **21.** (2) Subject to subsection (3), a licensee **shall immediately notify** the Commission in writing **of any revocation** made under subsection (1) and the reasons for it.	Immediate	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(3) If a revocation is in respect of an authorization under section 17, a licensee need not inform the Commission of the revocation and the reasons for it unless the revocation was made because there were reasonable grounds to believe that the person to whom the authorization was issued posed or could have posed a risk to the security of the facility.			

A.30 Notification of intent to conduct security exercise

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
30	**NSR:** **36.** (3) Every licensee **shall notify** the Commission in writing of its intention to conduct a security exercise **at least 60 days before the exercise date**. **Guidance** Security exercises include cyber security exercises.	At least 60 days before the exercise date	N/A	N/A

A.31 Safeguards

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
31	**GNSCR:** **30.** (1) Every licensee who becomes aware of any of the following situations **shall immediately** make a preliminary report to the Commission of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) interference with or an interruption in the operation of safeguards equipment or the alteration, defacement or breakage of a safeguards seal, other than in accordance with the safeguards agreement, the Act, the regulations made under the Act or the licence; and (b) the theft, loss or sabotage of safeguards equipment or samples collected for the purpose of a safeguards inspection, damage to such equipment or samples, or the illegal use, possession, operation or removal of such equipment or samples. (2) Every licensee who becomes aware of a situation referred to in subsection (1) **shall file a full report** of the situation with the Commission within 21 days after becoming aware of it, **unless some other period is specified in the licence**, and the report shall contain the following information: (a) the date, time and location of becoming aware of the situation; (b) a description of the situation and the circumstances; (c) the probable cause of the situation; (d) the adverse effects on the environment, the health and safety of persons and the maintenance of national and international security that have resulted or may result from the situation;	N/A	Immediate	21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(e) the effective dose and equivalent dose of radiation received by any person as a result of the situation; and (f) the actions that the licensee has taken or proposes to take with respect to the situation.			

A.32 Dangerous occurrences

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
32	**Regulatory context** **Packaging and Transport of Nuclear Substances Regulations, 2015 (PTNSR, 2015):** **35.** For the purposes of sections 36 to 38, a dangerous occurrence is any of the following situations: (a) a conveyance carrying radioactive material is involved in an accident; (b) a package shows evidence of damage, tampering or leakage of its contents, or its integrity is degraded in a manner that may reasonably be expected to impair its ability to comply with these Regulations or its certificate; (c) radioactive material is lost, stolen or no longer in the control of a person who is required to have control of it under the Act; (d) radioactive material has escaped from a containment system, a package or a conveyance during transport; (e) fissile material is outside the confinement system during transport; (f) the level of non-fixed contamination, as defined in the IAEA Regulations, during transport exceeds the following limits as applicable when averaged over any area of 300 cm^2 of any part of the surface of the package or the conveyance: (i) 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or (ii) 0.4 Bq/cm^2 for all other alpha emitters; (g) there is a failure to comply with the provisions of the Act, the provisions of these Regulations or any licence or certificate that is applicable to a package that may reasonably be expected to lead to a situation in which the environment, the health and safety of persons or national security is adversely affected. **37.** (2) No preliminary report is required for the dangerous occurrence referred to in paragraph 35(f) in respect of the internal surfaces of a tank or intermediate bulk container, as those terms are defined in the IAEA Regulations – or of a freight container or conveyance – that is dedicated to the transport of unpackaged radioactive material under exclusive use for as long as it remains under that specific exclusive use. **Guidance**			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	Relating to paragraph 35(a) of the PTNSR, 2015, regardless of the severity of the accident, the reporting requirements remain unchanged. All accidents involving a conveyance carrying radioactive material must be reported. Relating to paragraph 35(b) of the PTNSR, 2015, all damage sustained by a package during the loading or unloading process or during the course of transportation, regardless of the severity, must be reported. However, normal wear and tear sustained by a package is not reportable. Examples of normal wear and tear include, but are not limited to, a cringed corner on a fiberboard box, paint scratches, minor dents and surface rust. As per paragraph 35(g) of the PTNSR, 2015, not all non-compliances are considered a dangerous occurrence, and therefore reportable. Only those non-compliances that can adversely affect the environment, the health and safety of persons or national security are reportable. Examples of non-compliances relating to the transport documents that do not require reporting include: • typographical errors such as incorrect spelling of shipping names • activity not accurately matching what was in transport or what was stated on transport labels • incomplete or incorrect declaration Note that if no transport document is present during transport, this would be reportable. Examples of non-compliances relating to the labelling or marking of packages that do not require reporting include: • activity not accurately matching what was in transport or what is stated on the transport document • incorrect transport index noted on label • typographical errors such as incorrect spelling of shipping names • missing mark, as long as it does not adversely affect the environment, the health and safety of persons or national security, such as the international vehicle registration code (VRI code) Any non-compliance with section 26 of the PTNSR, 2015, must be reported.			
32a)	**PTNSR, 2015:**	As soon as feasible after a dangerous occurrence	N/A	N/A

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	36. (2) As soon as feasible after a dangerous occurrence has occurred the consignor, carrier or consignee of the package or radioactive material involved in the occurrence must have an expert in radiation protection assess the situation. The expert must report the results of the assessment to the Commission as soon as feasible. **Guidance** The expert in radiation protection may be an employee of the consignor, carrier or consignee, or may be an independent consultant retained for the purpose of assessing the situation and reporting to the Commission.			
32b)	**PTNSR, 2015:** **37.** (1) Immediately after becoming aware of a failure to comply with the requirements of section 26 or after the obligations set out in subsection 36(1) have been discharged, every consignor, carrier, consignee and holder of a licence to transport a package while in transit must make a preliminary report of the situation to the Commission. **38.** Within 21 days after the failure to comply with the requirements of section 26 or after the dangerous occurrence, the consignor, carrier and consignee and any holder of a licence to transport a package while in transit must file a full report with the Commission that includes the following information: (a) the date, time and location of the failure to comply or of the dangerous occurrence; (b) the names of the persons involved; (c) the details of the packaging and packages; (d) the probable cause; (e) the effects on the environment, the health and safety of persons, and national or international security that have resulted or may result; (f) the doses of radiation that any person has received or is likely to have received; and	N/A	Immediate	Within 21 days after a dangerous occurrence or a failure to comply with the requirements

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(g) the actions taken to remedy the failure to comply or the dangerous occurrence and to prevent its recurrence. **Guidance** Subsection 37 (1) and section 38 refer to section 26, which sets out the requirements for presenting a package containing radioactive material or a nuclear substance for transport. Subsection 37(1) refers to subsection 36(1), which sets out the [non-reporting] obligations of the consignor, carrier or consignee in the event of a dangerous occurrence. For any non-compliances with section 26 of the PTNSR, 2015, reports are required. Examples of non-compliances associated with section 26 include, but are not limited to, the use of improper package type, preparing a package for transport in a manner that was not in accordance with its manufacturing standard, loading a package with radioactive material that exceeds the capacity of the package. As stated in subsection 37(2), no preliminary report is required for the dangerous occurrence referred to in paragraph 35(f) in respect of the internal surfaces of a tank or intermediate bulk container, as those terms are defined in the IAEA Regulations, or of a freight container or conveyance – that is dedicated to the transport of unpackaged radioactive material under exclusive use for as long as it remains under that specific exclusive use.			

A.33 Package is damaged, tampered with, or contents are outside the containment system

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
33	**PTNSR, 2015:** **40.** (3) Every person who receives a package or who opens a package must, at that time, determine if any of the following conditions exist: (a) the package is damaged; (b) the package has been tampered with; (c) if the package contains fissile material, whether any portion of the fissile material is outside the confinement system; and (d) any portion of the contents of the package is outside the containment system. (4) If any of the conditions exist, the person must immediately make a preliminary report to the Commission and to the consignor. (5) The preliminary report must include information on how and where the condition was discovered and on any action that the person has taken or proposes to take with respect to it. (6) Within 21 days after the condition has been discovered the consignor and the person who made the preliminary report must file a full report with the Commission that includes the following information: (a) the date, time and location of the discovery of the condition; (b) the names of the persons involved; (c) the details of the packaging and packages; (d) the probable cause; (e) the effects on the environment, the health and safety of persons, and national or international security that have resulted or may result;	N/A	Immediate	Within 21 days after the discovery

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
	(f) the doses of radiation that any person has received or is likely to have received; and (g) the actions taken to remedy the condition and to prevent its recurrence. **Guidance** The 21-day detailed event report only has to include what happened as per the PTNSR, 2015.			

A.34 Notification of undeliverable consignments

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
34	**PTNSR, 2015:** **41.** If a consignment cannot be delivered to the consignee, the carrier must (a) notify the consignor, the consignee and the Commission;	As soon as feasible	N/A	N/A

A.35 Hours of work exceedances

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
35	**Specific reporting provisions** The licensee shall report on any situations or events involving hours of work exceedances for safety-sensitive positions for the following limits: a) 16 hours of work in a 24-hour period; and b) minimum recovery period of 8 consecutive hours free from work between shifts.	N/A.	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

A.36 Firearms or special security equipment

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
36	**Specific reporting provisions** The licensee shall report on all situations or events involving firearms or special security equipment, including: a) the negligent, accidental or unintentional discharge of a firearm or special security equipment	N/A	Immediate	60 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event report or immediate notification	Detailed event reports
	b) the removal of a firearm from the facility without prior CNSC authorization c) the theft or loss of a firearm or special security equipment d) any other reporting conditions outlined in the public agent authorization **Guidance** The discharge of a firearm or special security equipment is considered a higher significance event. The police agency of jurisdiction needs to be made immediately aware of any stolen or missing firearms. These reporting provisions apply if a firearm is negligently, accidentally or unintentionally discharged for any reason. These reporting provisions apply regardless of whether the firearm discharge occurred on site or off site.			

A.37 Exposure to chemical or biological agents

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	Preliminary event report or immediate notification	Detailed event reports
Regulatory context **GNSCR:** **12** (1) Every licensee shall **(c)** take all reasonable precautions to protect the environment and the health and safety of persons and to the maintain the security of nuclear facilities and of nuclear substances;				

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Administrative report or notification	**Preliminary event report or immediate notification**	**Detailed event reports**
(f) take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of licensed activity and into the environment as a result of the licensed activity;				
37	**Specific reporting provisions** The licensee shall report on the following situations or events that have or could have led to worker exposures: c) aAny regulatory exceedance of hazardous chemicals or biological agents d) tThe discovery of previously unreported worker exposures to hazards known to cause acute or chronic negative health effects from short- or long-term exposure **Guidance** Refer to the *Canada Occupational Health and Safety Regulations* as well as any relevant provincial regulations for information on hazardous substances, including any regulatory limits associated with specified biological or chemical agents. Licensees should report any incident following a chemical or biological agent exposure that resulted in a worker receiving a provincial workplace safety board Worker Exposure Incident Form. e) Any worker exposure related to a serious illness or injury incurred or possibly incurred as a result of the licensed activity should be reported under A.5.	N/A	Higher significance: Immediate or Lower significance: 14 days	Higher significance: 60 days or Lower significance: N/A

Appendix B: Safety Performance Indicators

This appendix provides the specifications for each safety performance indicator (SPI). The safety performance indicator reports shall be based on these specifications.

Sample data sheets are available on the CNSC's website.

B.1 Collective Radiation Exposure

Purpose:

To indicate the total dose of ionizing radiation received by all individuals working at the nuclear power plant (NPP) and its related facilities.

To monitor the performance in keeping NPP effective dose as low as reasonably achievable.

Definitions:

Total dose is the sum of all effective doses (received and committed) assigned to all individuals, including contract staff and visitors, exposed to ionizing radiation at operating stations and associated sites.

Calculations:

Online (in operation) effective dose = collective external radiation exposure (mSv) + collective internal radiation exposure (mSv)

Outage effective dose = collective external radiation exposure (mSv) + collective internal radiation exposure (mSv)

Notes:

Collective dose is the total dose for all activities captured under the licence. The licensees are to provide a brief summary of the activities that contributed to the collective dose.

B.2 Personnel Contamination Events

Purpose:

To indicate the total personnel contamination events (PCEs) that occurred at the NPP and its related facilities.

Definitions:

Tier 1 PCE: > 50,000 cpm on skin, clothing, modesty garments

Tier 2 PCE: > 5,000 cpm on skin, clothing, modesty garments

Tier 3 PCE: ≥ 100 cpm on skin, clothing, modesty garments (not radiation personal protective equipment (RPPE))

Calculations:

Data only.

Notes:

As the licensee's available data permits, it is acceptable to submit the number of PCEs at the entire NPP as stated in the purpose above or the number of PCEs at NPP units, as shown in the data sheet e-form.

Licensees are to provide the skin dose received from a skin contamination greater than the minimum recordable dose.

Licensees are to provide a tracking number, brief description and corrective actions (as applicable) for each Tier 1 and Tier 2 PCE.

B.3 Unplanned Dose / Unplanned Exposure

Purpose:

To indicate the estimated unplanned external whole-body exposure and unplanned internal exposure received by an individual at the NPP and its related facilities.

Definitions:

Unplanned external whole-body exposure:

- Tier 1 unplanned dose/exposure: ≥ 2 mSv (200 mrem) above plan
- Tier 2 unplanned dose/exposure: ≥ 1 mSv (100 mrem) above plan
- Tier 3 unplanned dose/exposure: ≥ 0.1 mSv (10 mrem) above plan

Unplanned internal tritium exposure:

- Tier 1 unplanned dose/exposure: ≥ 2 mSv (200 mrem) above plan
- Tier 2 unplanned dose/exposure: ≥ 1 mSv (100 mrem) above plan
- Tier 3 unplanned dose/exposure: ≥ 0.3 mSv (30 mrem) above plan

Unplanned internal exposure (other than tritium):

- ≥ the licensee's recording level

Calculations:

Data only.

Notes:

The term "unplanned" refers to a radiation dose that exceeds the estimated planned dose to an individual for the radiological work to be performed.

Licensees are to provide a tracking number, brief description and corrective actions (as applicable) for each Tier 1 and Tier 2 unplanned dose/exposure.

For any unplanned internal exposure other than tritium, the licensees are to provide a brief description of the unplanned dose/exposure, including the radionuclides of concern, such as radioiodine, C-14, MFAP or TRU, the dose received from the exposure and any other relevant details.

B.4 Loose and/or Fixed Contamination Events

Purpose:

To indicate loose and/or fixed contamination that occurred at the NPP and its related facilities. Excluded from this are PCEs, which are covered under SPI 2 (see section B.2).

Definition:

Tier 1: Loose and/or fixed contamination ≥ 37 kBq/m2 in zone 1 or public domain

Tier 2: Loose and/or fixed contamination in unzoned area, zone 1 or public domain, or widespread loose in zone 2

Tier 3: Widespread loose contamination in zone 3 or isolated loose in zone 2

Calculations:

Data only.

Notes:

The term “widespread” uses the following definition: contamination is found in multiple locations traceable to a common source.

The term “isolated” is intended to mean a specific area with defined borders such as an object or small surface.

Licensees are to provide a tracking number, brief description and corrective actions (as applicable) for each Tier 1 and Tier 2 loose and/or fixed contamination.

B.5 Environmental Releases – Radiological

Purpose:

To indicate the airborne carbon-14 releases, airborne tritium releases and waterborne tritium releases at the NPP and its related facilities.

Definitions:

Airborne tritium release is the weekly tritium air emissions released to the environment via monitored pathways from each station.

Airborne noble gas release is the weekly noble gas air emissions released to the environment via monitored pathways from each station.

Airborne iodine-131 release is the weekly iodine-131 air emissions released to the environment via monitored pathways from each station.

Airborne radioactive particulate release is the weekly radioactive particulate air emissions released to the environment via monitored pathways from each station.

Airborne carbon-14 release is the weekly carbon-14 air emissions released to the environment via monitored pathways from each station.

Waterborne tritium release is the monthly tritium liquid effluent released to the environment via monitored pathways from each station.

Waterborne gross beta/gamma release is the monthly beta/gamma liquid effluent released to the environment via monitored pathways from each station.

Waterborne carbon-14 release is the monthly carbon-14 liquid effluent released to the environment via monitored pathways from each station.

Calculations:

Data only.

Notes:

In addition to the SPI form, licensees shall also submit their effluent data in a machine -readable format as part of their quarterly SPI reports.

“Airborne” and “waterborne” releases are radiological releases from the NPP.

“Related facilities” are those facilities that have radiological releases to the environment that contribute to the annual total effective dose to the public from the site and have licensed release limits (e.g., derived release limits (DRLs)) and/or environmental action levels.

Releases, other than airborne and waterborne releases from those facilities owned or leased by the nuclear operator that have licensed release limits and/or environmental action levels established in the NPP licence, are not included in this SPI.

B.6 Spills

Purpose:

To indicate the total Category A, B and C spills that occurred at the NPP and its related facilities.

Definitions:

A Category A/1 spill causes or may cause one or more of the following adverse effects:

- widespread injury or damage to plant or animal life
- harm or material discomfort to any person
- adverse effect on the health of any person
- impairment of the safety of any person

A Category B/2 spill causes or may cause one or more of the following adverse effects:

- localized injury or damage to any animal life
- widespread or long-term interference with the normal conduct of business
- widespread or long-term loss of enjoyment of the normal use of property
- widespread damage to property other than plant or animal life
- damage to property, other than plant or animal life, such that the property cannot be restored, within a reasonable time, to the condition that existed immediately before the discharge occurred

A Category C/3 spill requires reporting to the Ministry of the Environment but is not classified as either a very serious (Category A/1) or serious (Category B/2) spill:

- little to no potential for environmental impact

Calculations:

Data only.

Notes:

In this context, “widespread” uses the following definitions: contamination is found in multiple locations traceable to a common source.

The term “localized” is intended to mean a specific area with defined borders such as an object or small surface.

The term “loss of enjoyment” is intended to mean a change in the normal usage of the property.

B.7 Mispositioning Index

Purpose:

The mispositioning index value (MIV) is an aggregate index based on the number of mispositioning events and consequential or non-consequential mispositionings.

Definitions:

NC = non-consequential mispositioning = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that results in:

- no fluid / energy movement
- fluid / energy movement that has no operational consequence
- no challenge to personnel safety
- no introduction of energy into a work protection (WP) boundary

C = consequential mispositioning = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that:

- resulted in fluid or energy movement (or lack of) that has operational consequences
- affected equipment operation (including poised systems)
- introduced energy into a WP boundary
- challenged personnel safety
- caused unplanned radiation exposure

E = Mispositioning event = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that:

- caused a transient or would have prevented operation when called to in response to a transient
- caused a safety system actuation or would have prevented a poised or standby system from operating when called
- resulted in an unmonitored release or significant spill/contamination
- resulted in personal injury
- caused damage to SSCs important to safety or process system(s)

Index performance is averaged over a 3-month rolling period. Data is collected on a monthly basis.

Calculations:

MIV = 100 - (E*10) - (C*5) - (NC*1)

Notes:

Performance flag: high is better

Unit of measure: percentage (3-month rolling average)

Include additional details for consequential events.

The term “mispositioning” means that something was found in a different state than expected or that a normal change in state had an unexpected result.

The licensee’s event identifier and the date for category E and C events can be listed in the Additional Details text box.

B.8 Number of Unplanned Transients

Purpose:

To indicate the number of reactor power transients due to equipment failures or operator errors while the reactor is not in a guaranteed shutdown state (GSS).

Definition:

The unplanned transients are the situations or events that result in a change of reactor operating states due to:

1. unplanned reactor setbacks and stepbacks, both automatic and manual, that occur while the reactor is not in a guaranteed shutdown state. These reactor setbacks and stepbacks are events resulting from internal plant equipment failure, spurious signal, human error or an external event.

b. unplanned reactor trips, both automatic and manual, that occur while the reactor is not in a guaranteed shutdown state. These reactor trips are events resulting from internal plant equipment failure, spurious signal, human error, or an external event.

Calculations:

Total number of unplanned transients in a quarter for a unit.

Total number of hours during which the reactor is either being placed in GSS or is in GSS.

Notes:

The manual reactor trips, setbacks or stepbacks that are required by planned (as opposed to forced) outage maintenance or routine testing are not to be included. Include additional details for setbacks and trips.

If a situation or event results in a combination of a reactor setback, stepback and/or trip in sequence, then the total number of transients will be counted as one.

If a situation or event results in a reactor trip on both shutdown systems, the number of reactor trips shall only be counted as one.

After a reset of reactor setback, stepback and/or trip by operator and the reactor power is allowed to increase, if another transient occurs because the causes of the initial transient were not corrected, then the subsequent reactor setback, stepback and/or trip shall be included in the calculation of the number of unplanned transients.

Data inputs for this SPI are related to SPI 13, Total Reactor Trips.

B.9 Reactivity Management Index

Purpose:

The reactivity management index is based on the severity of reactivity management events.

Definition:

RMEC = reactivity management event category

RMEC1= significant reactivity management event:

An unplanned or uncontrolled change in reactivity that leads to a significant impact, including operation outside safe operating limits (e.g., as a result of a change in reactor configuration, status or poison concentration, operating policies and principles (OP&P) limits for reactor power exceeded).

RMEC2= reactivity management event:

An unplanned or uncontrolled change in reactivity that leads to an impact, including operation outside administrative (procedural) limits (e.g., as a result of a change in reactor configuration, status or poison concentration).

RMEC3= near-miss reactivity management event:

Failure of a barrier, process or procedure for which there was minor or no direct impact on reactivity; however, under different circumstances, the failure could have led to a category 1 or 2 event (e.g., loss of redundancy on a reactivity management- related system).

RMEC types:

- Type A: power and reactivity device control
- Type B: fuelling/fuel
- Type C: guaranteed shutdown state/criticality control
- Type D: safe operating envelope

Notes:

The basis for the RMEC types is COG GL 2007-01, *Screening and Trending of Reactivity Management Events (CANDU Plants)*.

Event summary:

- include summaries of the RMEC events
  - the summaries shall include a report number, RMEC category, RMEC type, unit, event title and date of occurrence –
  - e.g., X-2013-123456, RMEC2, Type A, Unit 1, Reactor stepback on approach to criticality, dd/mm/yyyy
- For RMEC1 and RMEC2 events, provide additional details to describe the circumstances of the event.

B.10 Unit Capability Factor

Purpose:

To monitor progress in attaining high unit and industry energy production reliability. This indicator reflects effectiveness of plant programs and practices in maximizing available electrical generation and provides an overall indication of how well plants are operated and maintained.

Definition:

Unit capability factor is defined as the ratio of the available energy generation over a given time period to the reference energy generation over the same time period, expressed as a percentage.

Calculations:

The unit capability factor is determined for each period as shown below:

$$UCF = \frac{(REG - PEL - UEL)}{(REG)} \; x \; 100$$

where:

UCF = unit capability factor

REG = reference energy generation for the period

PEL = total planned energy losses for the period

UEL = total unplanned energy losses for the period

Notes:

SPIs 10, 11 and 12 are reported on the same data sheet.

B.11 Unplanned Capability Loss Factor

Purpose:

To monitor industry progress in minimizing outage time and power reductions that result from unplanned equipment failures or other conditions. This indicator reflects the effectiveness of plant programs and practices in maintaining systems available for safe electrical generation.

Definition:

Unplanned capability loss factor is defined as the ratio of the unplanned energy losses during a given period of time, to the reference energy generation, expressed as a percentage.

Unplanned energy loss is energy that was not produced during the period because of unplanned shutdowns, outage extensions, or unplanned load reductions as a result of causes under plant management control. Causes of energy losses are considered to be unplanned if they are not scheduled at least 4 weeks in advance. Causes considered to be under plant management control are further defined in the clarifying notes.

Reference energy generation (REG) is the energy that could be produced if the unit were operated continuously at full power under reference ambient conditions throughout the period. Reference ambient conditions are environmental conditions representative of the annual mean (or typical) ambient conditions for the unit.

Calculations:

Reference energy generation (REG) = Unit capacity x referenced period (Mw hrs)

Total unplanned energy loss per quarter (UEL) = Total unplanned energy loss over referenced period (Mw hrs)

Unplanned capability loss factor (UCL) = UEL x 100% / REG

Notes:

SPIs 10, 11 and 12 are reported on the same data sheet.

B.12 Forced Loss Rate

Purpose:

To monitor industry progress in minimizing outage time and power reductions that result from unplanned equipment failures, human errors, or other conditions during the operating period (excluding planned outages and their possible unplanned extensions). This indicator reflects the effectiveness of plant programs and practices in maintaining systems available for safe electrical generation when the plant is expected to be at the grid dispatcher's disposal.

Definition:

The forced loss rate (FLR) is defined as the ratio of all unplanned forced energy losses during a given period of time to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions of planned outages, during the same period, expressed as a percentage.

Calculations:

The forced loss rate is calculated for a period as shown below.

$$FLR\ for\ a\ unit\ (\%) = \frac{(FEL)}{(REG\ -\ (PEL\ +\ OEL))}\ x\ 100$$

where:

FLR = forced loss rate

FEL = unplanned forced energy losses

REG = reference energy generation

PEL = planned energy losses

OEL = unplanned outage extension energy losses

Notes:

SPIs 10, 11 and 12 are reported on the same data sheet.

B.13 Reactor Trip Rate

Purpose:

To monitor performance of unplanned reactor shutdowns.

To provide an indication of how well a plant is operated and maintained.

Definition:

Unplanned reactor trips per 7,000 hours critical.

Calculations:

The unit and industry values for this the reactor trip rate (RTR) indicator are determined for a period as shown below:

$$RTR = \frac{(total\ unplanned\ reactor\ trips\ over\ last\ 4\ quarters)\ \times 7000}{(total\ number\ of\ hours\ in\ critical\ during\ last\ 4\ quarters)}$$

Notes:

Unplanned reactor trips include both automatic and manual reactor trips that occur while the reactor is in critical state. These reactor trips are events resulting from internal plant equipment failure, spurious signal, human error, or an external event.

Use data from SPI 8, Number of Unplanned Transients, as an input for this SPI.

B.14 Corrective Maintenance Backlog

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Corrective maintenance work is required when a structure, system or component (SSC) has failed and can no longer perform its design function. The corrective maintenance backlog consists of all corrective work generated through work order requests and appears in the work management system as uncompleted work.

Corrective maintenance work should include only critical and non-critical corrective work. This excludes the corrective maintenance to be performed on run-to-failure components and critical and non-critical components of very low consequence if not corrected. The criteria used for determining critical components are in accordance with INPO AP-913, *Equipment Reliability Process Description* [11].

Calculations:

The indicator consists of the total number of online corrective maintenance work orders at the end of the quarter, which appears as uncompleted work. The corrective maintenance work orders should be reported on 2 different priorities (critical and non-critical components). The indicator is in the form of work orders per unit.

Notes:

Common service should be treated as a separate unit, such as unit 0.

Outage corrective maintenance work is not included in this indicator.

B.15 Deficient Maintenance Backlog

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Deficient maintenance is planned when structures, systems, or components have been identified as degrading but still capable of performing their design function. The deficient maintenance backlog consists of all deficient work generated through work requests and appears in the work management system as uncompleted work.

The criteria used for determining critical components are in accordance with INPO AP-913, *Equipment Reliability Process Description* [11].

Calculations:

The indicator consists of the total number of deficient maintenance work orders at the end of the quarter, which appears as uncompleted work. The deficient maintenance work orders should be reported on two 2 different priorities (critical and non-critical components). The indicator is in the form of work orders per unit.

Notes:

Common service should be treated as a separate unit, such as unit 0.

Outage deficient maintenance work is not included in this indicator.

B.16 Deferral of Preventive Maintenance

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Deferred preventive maintenance is preventive maintenance that has received an approved technical justification for extension prior to its late date.

Calculations:

The value includes 2 parts:

- number of deferrals of critical preventive maintenance work orders per unit per quarter
- number of total deferred preventive maintenance work orders per unit per quarter

Notes:

Identification and count is for the primary preventive maintenance tasks only; e.g., do not include secondary tasks such as maintaining scaffolding.

Common service should be treated as a separate unit, such as unit 0.

The work orders include both online and outage work orders.

The number of total deferred preventive maintenance work orders includes the number of deferrals of critical preventive maintenance work orders and the number of deferrals of non-critical preventive maintenance work orders. Therefore, the number of total deferred preventive maintenance work orders is greater than or at least equal to the number of deferrals of critical preventive maintenance work orders.

This SPI should not count the number of deferred surveillance tests, such as tests on SSCs important to safety.

The criteria used for determining critical components are in accordance with INPO AP-913, *Equipment Reliability Process Description* [11].

B.17 Safety System Test Performance

Purpose:

To indicate successful completion of tests required by a licence condition, including those referenced in documents submitted in support of a licence application.

To monitor performance in meeting regulatory and licensee availability requirements.

Definition:

The safety system test (SST) performance is the sum of those tests that are not completed for each of the 3 three groups of SSCs important to safety (i.e., the special safety systems, the standby safety systems, and other process systems) in a quarter.

Calculations:

Number of missed tests = a + b + c

where:

a = number of missed tests for the special safety systems
b = number of missed tests for the standby safety systems
c = number of missed tests for the process systems

Notes:

This safety performance indicator was renamed from “number of missed mandatory safety system tests” for improved clarity and application.

For the purpose of this safety performance indicator, the following shall apply:

- special safety systems: shutdown system 1 (SDS1), SDS2 (SDSE for PNGS-A), emergency core cooling (ECC), and containment
- standby safety systems: boiler emergency cooling, emergency power supply, standby generators, emergency filtered air discharge, emergency water, inter-unit feedwater tie
    - process systems: reactor regulating; heat transport; moderator; Class I, II and III power; auxiliary boiler feed; service water

This list may be expanded in the future.

Missed tests refer to those not completed, as opposed to those that fail. Missed tests do not include tests deferred in accordance with procedures that are permitted by the licence.

Tests conducted beyond the maximum allowable time interval permitted by the reliability calculation or by an applicable engineering code will count as a missed test, unless approval has been obtained from the CNSC to extend the test interval.

For multi-unit stations, station-wide tests shall be reported under unit 0.

For benchmarking, report the total number of tests performed for each category (a, b, and c).

These figures do not include panel check SSTs.

B.18 Preventive Maintenance Completion Ratio

Purpose:

To indicate the fraction of preventive maintenance jobs to total maintenance jobs completed.

To monitor performance in meeting expectations in the area of preventive maintenance.

Definition:

The ratio of preventive maintenance (PM) jobs completed divided by the preventive maintenance PM plus corrective maintenance (CM) jobs completed for all SSCs important to safety.

Calculations:

$$PM\ Completion\ (\%) = \frac{(PM\ jobs\ per\ quarter)}{(PM\ jobs\ per\ quarter\ +\ CM\ jobs\ per\ quarter)}\ x\ 100$$

Notes:

PM jobs are those jobs performed on the SSC important to safety in the field that is in working order when the job commences. The PM jobs shall include those that are frequency- or condition -based.

Corrective maintenance jobs are those jobs performed as a result of a reported failure of SSCs important to safety. It shall not include design modifications.

Work orders on SSCs important to safety are those work orders that are written during the quarter. They and must have undergone a preliminary review by the NPP work management group and be designated as valid to be included in the count for a quarter. Work orders include online work orders.

The data is to be reported by unit, including the common unit for multi-unit NPPs. Jobs are counted by work order issued to each discipline, not on a task basis. A work order that covers repetitive jobs for multiple equipment shall be counted as one work order for each separate piece of equipment.

Common service should be treated as a separate unit, such as unit 0.

Only include the critical corrective (CC) and non-critical corrective (CN) work in the completed corrective maintenance work.

Corrective maintenance on run-to-failure components or critical and non-critical components (CL) is not included.

B.19 Chemistry Index

Purpose:

To indicate long-term unit control of important chemical parameters.

To monitor performance in meeting licensee's requirements in chemistry.

To compare performance between Canadian CANDU units.

Definition:

The average percentage of time that the selected chemical parameters are in specification during the quarter.

Calculations:

$$\text{Chemistry index (\%)} = \frac{\sum_{i=1}^{m} IS_i}{\sum_{i=1}^{m} O_i} \times 100$$

where:

IS_i	=	the number of hours that parameter "i" is in specification during the quarter
O_i	=	the number of hours the plant is in an operational state during the quarter, as defined by licensee-specific documentation
m	=	the number of parameters monitored during the period, usually the 15 parameters on the list below

All data is dimensionless. The chemistry index (CI) results will range between 0% and 100%.

Parameters monitored:

Annulus gas:	$[O_2]$	Condensate extraction pump:	dissolved O_2
			pH
Feedwater:	dissolved O_2		
	total iron	Primary heat transport system:	pH_a (calc)
	total copper		dissolved D_2
	hydrazine		chloride
			fluoride
Steam generators:	$[Cl^-]$		conductivity
	$[SO_4^{2-}]$		
	$[Na^+]$		

Note 1:

The chemistry index shall be reported as the percentage of time in specification. For each parameter, the index is calculated as follows:

$$time\ in\ specification\ (\%) = \frac{(hours\ in\ specification)}{(total\ operating\ hours\ in\ period)}\ x\ 100$$

The initiation of an out-of-specification event occurs with the first result measured outside the range of the specification, as indicated in licensee-specific chemistry program documentation.

Termination of the event is achieved only by reducing the control parameter within the specification range. The duration of the out-of-specification condition will be calculated as the time between the first out-of-specification sample and the next measured in-specification sample. The time in specification (%) is then calculated as 100% - S (time of measurement period out-of-specification (%)).

The total operating hours in the period refers to the total operating hours during which the chemical parameter needed to be controlled.

Note 2:

Parameters that are included in the indicator but that were not measured (because the monitoring capability did not exist or the measurements were not obtained during the period; e.g., an instrument was not available) will be reported as being out-of-specification. In cases where the parameter is out-of-specification due to the unavailability of a facility, the parameter shall be reported as being out-of-specification.

When the safety of chemical technicians or employees could be adversely affected by new hazards during normal execution of their tasks, or when the status of the plant is such that the chemical measure is useless or unrepresentative, the representative period will be adjusted without penalty. Such measures will be qualified as “void”. The data shall be auditable.

It is recognized that in some cases a temporary exemption is granted for measurement of a parameter, or for deviation of a specification from the range specified in program documentation. This exemption is to be granted by the chemistry program authority. It is acceptable to indicate “not applicable (N/A)” for the parameter for the specific time period. If the temporary exemption applies for less than one quarter, the time-in-specification for the parameter shall be calculated as the time that the temporary exemption does not apply. Temporary exemptions are intended to be used when instruments or facilities are not available for a significant period of time, where there are temporary modifications to licensee procedures due to new concerns regarding unsafe conditions, or when short- duration trials are being carried out. Records pertaining to the temporary exemption shall be auditable.

Whenever the parameter is deemed to be “not applicable (N/A)”, a short explanatory note and a reference to the licensee’s documentation for any temporary exemption should accompany the submission on these performance indicators.

In cases where the parameter is deemed to be “not applicable (N/A)” for a particular period of time, the number of parameters in the chemistry index % equation should be adjusted to reflect the number of parameters actually tracked during the specific quarter.

If a parameter is out of specification and then misses the sampling frequency, the time is not counted as double. The time out of specification is what is counted.

Note 3:

For systems whose performance is reported only for unit operating conditions – if a parameter is in (or out of) specification before a shutdown, it is considered to remain in (or out of) specification once the system is back in service until it is re-analyzed and found to be otherwise.

Note 4:

Performance must be reported for all chemistry index and chemistry compliance index parameters using the specifications documented in the most current revision of the licensee’s chemical specifications manual. Performance must be reported for all time periods when the system is considered to be in an operational state, as defined by licensee-specific documents.

Note 5:

The reference chemical specifications and sampling frequency for each parameter shall be as documented in the most current revision of the licensee's chemistry specifications manuals. Any deviations from these reference values for reporting on these performance indicators shall be noted in report submissions. Any changes to the specifications and sampling frequency shall be documented in the chemistry specifications manuals and supporting documentation.

The minimum sampling/monitoring frequency is determined by the licensee's current requirements.

Note 6:

Each station will determine whether results from grab samples or on-line instrument readings will be used to calculate the performance. Online instrument readings are the preferred method if an adequate quality assurance / quality control (QA/QC) program is in place to ensure accuracy.

Where online monitoring equipment is available, the success ratio will be calculated as the ratio of time where the monitoring is online and valid data is available and within range over total time. When monitoring equipment fails, it is permissible to replace the monitoring with manual sampling techniques at a reasonable frequency.

Note 7:

On an operating unit basis:

$$time\ in\ specification\ (\%) = \frac{\sum(time\ in\ specification\ for\ index\ parameters\ (\%))}{(number\ of\ parameters\ in\ the\ index)}$$

Note 8:

For multi-unit sites, the unit performance is the average of the performance of the individual control parameters. The station result is the time-weighted average of the operating units' chemistry index or chemistry compliance index values; this ensures that units that were operating for only part of the period are not given the same weight as those that operated for the whole period.

$$station\ index = \frac{\sum(index\ for\ each\ unit\ X\ operating\ hours\ for\ unit)}{\sum(operating\ hours\ for\ all\ units)}$$

Note 9:

Performance does not need to be reported for parameters during short- duration trials or tests being conducted to optimize chemistry and which that affect those parameters.

Note 10:

Parameters making up the list of the index, and the definitions of time-in-specification and voiding, are reviewed by the CNSC.

B.20 Chemistry Compliance Index (non-GSS and GSS)

Purpose:

To indicate unit control of safety-related chemical and radiochemical parameters, in both non-guaranteed shutdown state (non-GSS) and in guaranteed shutdown state (GSS).

To monitor performance in meeting regulatory and licensee requirements in chemistry control.

To compare performance between Canadian CANDU units.

Definition:

The average percentage of time that the selected chemical parameters are in specification during the quarter.

Calculations:

Sampling frequencies and specifications shall be defined in the licensee's operating documentation. The method for calculation of the chemistry index also applies to the chemistry compliance index (non-GSS and GSS). The parameters are selected as compliance parameters in accordance with the safe operating envelope (SOE), and on the basis of safety.

Parameters monitored:

Non-GSS operating conditions:

Gadolinium ([Gd]) in liquid injection safety system poison injection tanks
[Gd] in moderator (unit in poison outage after SDS2 actuated)
moderator D_2O isotopic
moderator H^3
moderator cover gas D_2
moderator conductivity

primary heat transport system D_2O isotopic
primary heat transport system H^3
primary heat transport system I^{131}
primary heat transport system D_2O storage tank cover gas D_2
moderator to primary heat transport system D_2O isotopic purity difference check

annulus gas system dew point

end shield cooling water pH
end shield cooling cover gas H_2 (for Point Lepreau and Pickering 5-8)

emergency coolant injection (ECI) or emergency core cooling (ECC) system high-pressure water tank(s) pH
ECI or ECC high-pressure water tank(s) hydrazine concentration

liquid zone control system cover gas [H_2]
liquid zone control system conductivity

GSS conditions:

liquid injection safety system poison injection tanks pH_a (when SDS2 is available)
[Gd] in moderator
moderator D_2O conductivity
moderator D_2O pH_a
supplementary parameter(s) sampled

Notes:

The chemistry compliance indices (non-GSS and GSS) shall be reported as the percentage of time in specification. For each parameter, the index is calculated as follows:

$$time\ in\ specification\ (\%) = \frac{(hours\ in\ specification)}{(total\ operating\ hours\ in\ period)}\ x\ 100$$

For further information, refer to notes 1 through 10 of the chemistry index (SPI 19).

B.21 Conventional Health and Safety

Purpose:

To indicate the accident severity rate, accident frequency, and industrial safety accident rate at NPPs.

To monitor performance in the area of worker safety.

To compare Canadian NPP performance internationally.

Definition:

The accident severity rate is the total number of days lost for lost- time injuries per 200,000 person -hours worked at an NPP.

Accident frequency is the number of fatalities, lost-time injuries and medically treated injuries per 200,000 person- hours worked at a NPP.

Industrial safety accident rate is a frequency rate based on the number of lost-time injuries for NPP personnel per 200,000 person-hours worked.

A lost-time injury is an injury or illness resulting in lost days beyond the date of injury as a direct result of an occupational injury or illness incident. A fatality is not considered a lost-time injury.

A medically treated injury (also referred to as “medical treatment”) is an injury or illness beyond a first aid injury, where there have been no lost days that are the direct result of an occupational injury or illness incident.

Lost days are the number of calendar days, recommended by a physician or other healthcare professional, that a worker is unable to work beyond the day of injury or illness. Lost time ends as of the date that the worker is deemed fit to work either full or restricted work, or up to a maximum of 180 calendar days for any individual case.

Exposure hours are the total number of hours of employment of all workers for each member utility for each reporting period. This includes regular hires, direct contractors, augmented / supplemented staff , and contractors working through a separate company.

Restricted work is when a worker, due to a work-related injury or illness, is unable to perform their regular permanent job or is unable to work the normal time period of their pre-injury/illness work days.

Calculations:

$$accident\ severity\ rate = \frac{\#\ of\ lost\ days\ x\ 200{,}000\ person\ hours}{\#of\ exposure\ hours} \frac{\#\ of\ lost\ days\ x\ 200{,}000 person\ hours}{\#of\ exposure\ hours}$$

$$accident\ frequency = \frac{(\#\ fatalities\ +\ \#\ lost\ time\ injuries\ +\ \#\ medically\ treated\ injuries)\ x\ 200{,}000\ person\ hours}{\#of\ exposure\ hours}$$

$$industrial\ safety\ accident\ rate = \frac{number\ of\ lost\ time\ injuries\ x\ 200{,}000\ person\ hours}{\#of\ exposure\ hours}$$

$$recordable\ injury\ frequency\ rate = \frac{(\#fatalities + \#lost\ time\ injuries + \#medically\ treated\ injuries + \#restricted\ work\ injuries) \times 200{,}000\ person\ hours}{\#\ exposure\ hours}$$

Notes:

Injuries should only be counted once and counted as the most severe type, based on the hierarchy that lost- time injuries are more severe than medically treated injuries, which are more severe than restricted work injuries.

Licensees should report on data for all regular hires, direct contractors, augmented / supplemented staff, and contractors working through a separate company.

The Canadian federal reporting requirement for severity includes shifts not worked. For example, suppose a person is hurt on the last regularly scheduled shift and then is away for 2 days that were regularly scheduled off. If the person would not have been able to work those 2 days but was able to return to work on the first regularly scheduled day, those 2 days would be counted as lost days.

Recurrent injuries are attributed back to the originating accident. For example, if an injury from an accident that resulted in a lost-time injury occurred in 1994 and recurred in 1996 (with no new accident), the lost days would not appear in the 1996 totals. These days are attributed back to 1994.

Lost-time and medically treated injuries or illnesses are those that have been treated by a physician or other healthcare professional.

Permanent (partial) disability resulting from a disabling injury can be assigned equivalent lost days by the licensee. Appropriate information showing conversion data for each disabling injury must be submitted.

Whenever possible, the actual employee hours of exposure shall be taken from payroll or other records and shall include only actual straight time and actual overtime hours worked. Employee hours paid for but not worked (e.g., vacation, sickness, holidays) should not be included in the total hours worked. Estimated exposure hours should only be used when actual employee hours of exposure are not available. If estimating is required, it should be noted in the submission.

B.22 Radiological Emergencies Performance Index

Purpose:

To provide a measurement of the performance of a nuclear power plant's emergency preparedness plan during radiological emergencies or simulated radiological emergencies.

Definition:

The radiological emergencies performance (REP) index is the percentage of all the successful performance opportunities over the total number of performance opportunities identified during the quarter. Performance opportunities includes emergencies and simulated emergencies (drills, exercises or practical evaluations, excluding training).

Calculations:

$$\text{REP index} = \frac{(\text{number of successful performance opportunities during the quarter})}{(\text{total \# of performance opportunities during the quarter})} \text{ x } 100$$

Notes:

Performance opportunities are:
- categorizing a radiological emergency
- notifying offsite authorities
- providing decision-making information to stakeholders (i.e., municipal, provincial and federal)
- developing protective action recommendations

A performance opportunity is successful when both the timeliness and the accuracy criteria are fulfilled. The timeliness criteria and the accuracy criteria are specified in the licensee's emergency preparedness plan. These performance criteria shall be included in the explanation-of-data section of the data sheet.

Details of any failed performance opportunity shall be included in the explanation-of-data section of the data sheet.

Include emergencies or drills evaluated by the emergency response organization (ERO), and exercises and other simulated emergencies that are assessed and that interact with one or more of the emergency response facilities or functions as specified in the licensee's emergency preparedness plan.

The ERO consists of, but is not limited to, the following facilities and functions:
- administration facilities
- technical support centres
- control facilities
- off-site centres
- personnel and public assembly areas
- emergency operations coordination centre
- centre to integrate onsite activities with offsite programs
- first aid and/or medical facilities
- laboratory services (fixed or mobile)
- decontamination facility
- field monitoring teams

- damage control teams
- joint information or local media centre
- offsite governmental authorities

Training practices shall not be included in this indicator.

B.23 Emergency Response Organization (ERO) Drill Participation Index

Purpose:

To track the participation of emergency response organization (ERO) personnel in simulated emergencies (drills, exercises or practical evaluations, except training) within a nuclear power plant.

Definition:

The percentage of the total available ERO personnel who have participated in simulated emergencies during the quarter.

Calculations:

ERO drill participation index = $\frac{A}{B}\ x\ 100$

where:

A = number of ERO personnel fulfilling designated ERO positions that have participated in a simulated emergency during the quarter

B = total number of qualified ERO personnel fulfilling designated ERO positions during the quarter

Notes:

Designated ERO positions are those performing the following functions:

- categorization of a simulated emergency
- offsite notification
- plant operations
- corporate resources
- radiological monitoring
- dose projection

Changes in the number of designated ERO personnel shall be reflected in both the numerator and denominator of this index.

Multiple assignees to a given designated ERO position may each be counted for their individual participation in performing the designated ERO position at different times in the same proficiency-enhancing drill, exercise, practical evaluation opportunity or event during the quarter.

ERT drills shall not be included in this calculation.

B.24 Emergency Response Resources Completion Index

Purpose:

To indicate the level of verification of emergency response equipment and facilities dedicated to emergency preparedness at the NPPs.

Definition:

The percentage of preventive maintenance items, tests and checks completed for the emergency response equipment and facilities over the total number of preventive maintenance items, tests and inventory checks scheduled during the quarter.

Calculations:

Emergency response resources completion index = $\frac{A}{B}\ x\ 100$

where:

A = the number of preventive maintenance items, tests and inventory checks completed during the quarter

B = the number of preventive maintenance items, tests and inventory checks scheduled during the quarter

Notes:

Licensees shall provide the CNSC with a complete listing of preventive maintenance items, tests and inventory checks pertaining to dedicated equipment and facilities that are used for emergency preparedness, including:

- fixed systems
- portable instruments
- communications equipment
- other equipment identified in the licensee's emergency preparedness plan required to be in a state of readiness
- other dedicated emergency equipment and facilities identified in REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response,* (2016) [12]

The licensee shall provide an explanation of any preventive maintenance items, tests and inventory checks that were done in the quarter being reported that were deferred from the previous quarter.

Pre-determined dates for the preventive maintenance items, tests and inventory checks shall be used to measure schedule compliance. This index measures the number of preventive maintenance items, tests and inventory checks performed and compares them with the pre-determined fixed schedule. It is not concerned with whether a test has failed or if equipment was missing.

B.25 Low- and Intermediate-Level Radioactive Solid Waste Generated

Purpose:

To indicate the amount of low- and intermediate-level radioactive solid waste generated.

Definitions:

Low-level radioactive solid waste contains material with radionuclide content above established clearance levels and exemption quantities, but generally has limited amounts of long-lived activity. The volume of waste generated is reported in m^3 for the quarter.

Intermediate-level radioactive solid waste typically exhibits levels of penetrating radiation sufficient to require shielding during handling and interim storage. The volume of waste generated is reported in m^3 for the quarter.

Calculations:

Data only.

Notes:

Detailed definitions for waste classifications are as per licensee procedures.

For further information on low- and intermediate-level radioactive waste, refer to CSA N292.0, *General principles for the management of radioactive waste and irradiated fuel* [13].

Appendix C: Content Requirements for the Annual Risk and Reliability Report

This appendix provides the requirements for the content of the annual risk and reliability report.

C.1 Summary

Provide a summary of major findings or major changes during the calendar year including:

1. changes in the list of systems important to safety (SIS) or their reliability targets
2. overall performance of SIS, including statistical summary of performance
3. changes having major impact on reliability models
4. major update of reliability or unavailability models for SIS
5. generic discussion on completion of required surveillance activities, including tests, predefines and operator routines
6. the number of initiating events
7. major changes in failure modes and/or failure rates

C.2 Lists of Systems Important to Safety

Provide a list of all identified SIS and include the assigned reliability target of each system. Discuss and explain changes from previous years in the list of SIS or in the assigned reliability targets.

Guidance

This section may list structures and components important to safety and their reliability targets (if these structures and components have been identified).

Table C.1: List of systems important to safety and reliability targets

System important to safety	Reliability target

C.3 System Performance

Include a section for each SIS, according to the format below.

C.3.1 Systems important to safety

Include a comparative assessment of the reliability and reliability target for each SIS of the NPP. Provide reliability information on relevant components important for mission reliability, including:

1. the predicted reliability of the system, where the predicted reliability is calculated using an up-to-date model and recent data
2. the observed reliability of the system during the previous year
3. a comparison between the predicted reliability, observed reliability and reliability target of the system
4. an explanation of changes in the predicted reliability, observed reliability and reliability target of the system
5. an explanation of notable changes in the predicted reliability of the system from the predicted reliability reported in previous years
6. specific reliability indices for major components such as class III power systems, and emergency or qualified power systems that include the failures to start (in failures per demand) and failures to run (in failures per hour) for each generator.

C.3.1.1 Predicted reliability

In this section, the licensee reports the future reliability predicted using current data and compares it to the value obtained for the present and previous years, as well as to the target (see table C.2). The reliability assessment must be re-evaluated annually using the latest relevant failure data.

Guidance

This section should include information regarding the assessment, such as computer code, model freeze date, cut-off value, electronic file name, revision information and the report number, where available. If this information is presented in the appendices, this section may refer to it. If the reliability assessment uses supporting data different from the data presented in this section, the rationale should be described in this section.

Table C.2: Predicted reliability

Failure criteria	Predicted reliability			Target
	Previous years		Present year	
	Year X-2	Year X-1	Current (Year X)	

Failure criteria	Predicted reliability			Target
	Previous years		Present year	
	Year X-2	Year X-1	Current (Year X)	

C.3.1.2 Observed reliability

This section is intended to capture the trends in the reliability of SIS.

Table C.3: Observed reliability of system

Failure criteria	Unit no. ___	Unit no. ___	Unit no. ___	Unit no. ___	Previous year predicted reliability	Target

Table C.4: Standby generator (SG) reliability indices

A. Test results (should provide the indices for both current year and previous year)

SG#	Start		Running	
	Attempts	Failures	Hours	Failures
1				
2				
3				
4				
Total:				

This data is included to provide plant -specific reliability indices for major components of class III power systems, and emergency or qualified power systems, section C.3.1.5 of this regulatory document.

B. Outage statistics

SG#	Maintenance		Forced	
	Occurrences	Hours	Occurrences	Hours
1				
2				
3				
4				
Total:				

Table C.5: Emergency power generator (EPG) reliability indices

A. Test results

EPG#	Start		Running	
	Attempts	Failures	Hours	Failures
1				
2				
Total:				

B. Outage statistics

EPG#	Maintenance		Forced	
	Occurrences	Hours	Occurrences	Hours
1				
2				
Total:				

C.3.1.3 Incidents

For each SIS, identify and briefly describe occurrences during the calendar year where the system was unavailable to perform its function, and the dispositions of these incidents. If the occurrence was reported under an event report, then provide the event report number and a statement of the nature of the impairment.

This information is requested because the type of impairment may not correspond to the incident title.

This section describes incidents (also known as major impairments) of the systems and the effect on the system reliability. In relation to SIS, "incident" refers to any system fault reducing the effectiveness of the system such that it would fail to perform its safety function, even if the system would still operate.

Table C.6: Reliability of systems important to safety

Licensee event number	System affected	Component(s) affected	Level of impairment	Length of time system unavailable

C.3.1.4 Minor impairments

For each SIS, identify and briefly describe occurrences, during the calendar year, of minor impairments of the system. Describe the nature and duration of the impairment. A "minor impairment" is defined as a fault that reduces the redundancy of a SIS, which is equivalent to Impairment Level 3. In other words, it is a fault that causes degradation of a system but in which the system would still have met its design and performance specifications.

This section describes any minor impairment of the SIS and the assessment of the impairment on system reliability.

Guidance

Level 3 impairment, as defined by some licensees, includes Type 3 or Type C faults.

Assessment of the impact of "minor impairments" on the SIS reliability may include:

- minor impairments experienced should be used to determine predicted reliability of the SIS
- a review and identification of concurrent or overlapping minor impairments will result in a Type 1 or Type 2 fault; a Type 1 or Type 2 fault discovered as a result of an overlapping minor impairment should be reported as described in C.3.1.3. Fault information for the nature of the impairment should be reported under section 4 of this annual risk and reliability report.

Scheduled removal of service of equipment that is reflected in the reliability model does not need to be described.

If the event also causes impairments of other SIS, these should be described in this section as a shared dependent event.

Table C.7: Minor impairment and effect on system reliability

Fault	Component / primary event	Failure mode	Failure duration

C.3.1.5 Changes

Describe changes for each SIS, identified as part of REGDOC-2.6.1, *Reliability Programs for Nuclear Power Plants* [14], that occurred during the calendar year that affected reliability due to: (i) design, (ii) operating or maintenance practice and (iii) models used to assess reliability.

Report changes to design or operating and maintenance practice affecting the reliability of the systems; e.g., the duty cycle of equipment may affect the test frequency of the equipment.

Discuss changes to the model and the effect on the system's reliability.

C.3.1.6 Performance of surveillance activities

Provide the following information for systems important to safety:

1. a list of scheduled activities to inspect, monitor, test or verify the reliability of a system important to safety of the NPP, that were not completed on schedule during the calendar year
2. indication of the specific and cumulative impact on system reliability of the probabilistic safety assessment (PSA)-credited scheduled activities not being completed on schedule.

Report any missed and postponed scheduled activities credited in the reliability assessment. The reasons for missing or postponing the scheduled activities and the impact on the system reliability should be discussed. These activities include required tests, predefines (call-ups) and operator routines.

Additional information on the essential elements of a reliability program, including reliability assessment, modelling, evaluation and monitoring, can be found in REGDOC-2.6.1, *Reliability Programs for Nuclear Power Plants* [14].

Guidance

For systems important to safety, the licensee may choose to use bounding evaluations for specific impact calculations. The cumulative impact of test deferrals needs to account for all test deferrals for the system over the year.

C.3.1.7 Correction of previous reports

Describe any corrections in previous reports. The correction may be a mistake or new findings over the reporting calendar year. The reason for the correction should be clearly provided.

Guidance

For example, when a design defect of a component is found over the calendar year and it has been dormant since the installation or modification of the component, the previous reliability indices should be modified. If a test reveals an impairment and the test period is long enough to affect the previous reliability indices, the previous reliability indices should also be reported.

C.4 Initiating Events

Describe initiating events that occurred during the calendar year at the NPP, and provide the current frequency assigned to each initiating event. If the occurrence was reported under an event report, provide the event number.

Guidance

The frequency of the initiating event should be reassessed, and a comparison with the initiating event frequency used in the risk analysis should be provided if a plant PSA model is available. The description of the event should indicate whether it affected the plant mitigating system's capability.

The analysis should include any equipment malfunction that occurred during the response to the initiating event. Any of these mitigating system failures should be clearly identified.

C.5 Supporting Data

Provide data that supports the licensee's assessments during the calendar year of the reliability of the systems important to the safety of the NPP. Relevant data includes:

1. rates of failure of system components
2. significant trends in component failure rate data
3. input data regarding human error probabilities
4. changes to the list of PSA-credited scheduled activities to inspect, monitor, test or verify the system's reliability
5. data regarding the impairment (failure, incipient failure or degraded ability) of one or more system components as a direct result of a shared or common cause

Guidance

Data can be provided electronically.

C.5.1 Component failure data

Include a section for each component failure, according to the format below.

C.5.1.1 Failure rates

This section describes major updates of the component failure rate data and the specific changes in failure rates from the failure rate database experienced over the calendar year.

Guidance

The failure database used for the reliability model should be presented in the report appendices. This section should describe any significant failure rate change or significant trend. The definition of significant failure rate change or significant trend should be clearly described.

C.5.1.2 Failure modes

This section describes any failure mode that occurred during the calendar year and that is not modelled in the system fault trees, as well as its effect on system reliability.

C.5.2 Human error probability data

This section describes human actions that could affect the reliability of SIS.

Guidance

Some human actions that directly affect the reliability of the SIS may be included in other sections, but a comparison to the human errors considered in the reliability model should be performed.

C.5.3 Dependent failures

Include a section for each dependent failure, according to the format below.

C.5.3.1 Shared cause

This section describes events that result in inter-system shared dependent impairments, which cause multiple components that belong to different systems to be unavailable and which can be explicitly included in the reliability models.

Guidance

For example, a failure of an instrument air manifold that supplies air to multiple components in more than one independent system would result in an inter-system shared-cause dependent failure and should be reported in this section.

Intra-system dependent impairments that affect one system only are described in the section of an individual system. For example, if the manifold supplies air to multiple components, but in only one system, the failure would be identified as an intra-system shared-cause dependent failure and might be described in the section of the individual system.

C.5.3.2 Common cause

This section describes events that may result in inter/intra-system dependent failure or degradation, but for which the reliability model cannot explicitly include the cause of failure.

Guidance

Even though the report contains human-induced common-cause failures, this section should identify these events as common-cause failures.

C.5.4 List of scheduled maintenance and surveillance activities

Guidance

The changes to the list of PSA-credited scheduled activities to inspect, monitor, test or verify the system's reliability should be included here or in an appendix. Changes should be reported in a manner that can be related to a list of activities that can be referenced.

C.5.5 Other plant-specific data

Guidance

This section includes other plant-specific data important to the reliability program not included above. The reliability statistics of special equipment should be included here.

C.6 Report Appendices

Include an appendix for each reference section, according to the format below.

C.6.1 Appendix A – List of acronyms and abbreviations

In this appendix, provide acronyms and abbreviations used in the report.

C.6.2 Appendix B – Definitions

In this appendix, provide definitions for technical or licensee terms used in this report.

C.6.3 Appendix C – Component failure data

See section C.5.1 for details regarding the information to be placed in this appendix. Component failure data can be provided electronically.

C.6.4 Appendix D – Fault records

Provide details regarding fault records.

C.6.5 Appendix E – Test program summary

This appendix lists the scheduled activities included in the reliability models and describes the changes that are not included in the individual system sections, including routine tests, predefines (scheduled plant activities), operator routines and main control room panel checks.

C.6.6 Appendix F – Models of the systems important to safety

The information presented in this appendix may vary according to the reliability program being implemented by individual NPPs (e.g., one plant may apply a single cut-off to all systems, while another plant may apply different cut-off values to the systems). The following example therefore defines content, not format.

Table C.8: Reliability model information

System	Reliability model				Report	
	File name	Cut-off	Revision	Date	Report #	Date
Computer code*	CAFTA Version XX (month year)			CAFTA Cutset Generator Version YY (month year)		

* Common to all system models

Appendix D: Format for the Annual Report on Radiation Protection

This appendix provides a sample format for data requested in section 2 of the annual report on radiation protection (section 3.5 of this regulatory document).

Table D.1: Total collective effective dose

Collective Dose by NPP:						
	Collective Dose by Activity (p-mSv)			Collective Dose by Exposure Pathway (p-mSv)		Total Collective Effective Dose (p-mSv)
	Routine Operations	Outages (including forced outages)	Major Projects	Internal Dose	External Dose	
Total[1,2]						

Note 1: in the total(s), licensees should provide the collective effective doses for units operating normally (may be grouped together) in a separate row(s) from units undergoing refurbishments or major projects.
Note 2: doses received in support of the licensed activities not captured as part of Note 1 should be provided in a separate row (may be grouped together).

Table D.2: Effective doses

NPP:								
	Dose (mSv)							
	<0.01*	0.01-1	1.01-5	5.01-10	10.01-15	15.01-20	20.01-50	>50
Number of workers monitored								

*Below the minimum reporting limit of 0.01 mSv

Table D.3: Doses to the lens of the eye

NPP:								
	Dose (mSv)							
	<0.01*	0.01-1	1.01-5	5.01-10	10.01-15	15.01-20	20.01-50	>50

Number of workers monitored								

*Below the minimum reporting limit of 0.01 mSv

Table D.4 Skin doses

NPP:				
	Dose (mSv)			
	<0.01*	0.01-50	50.01-250	>250
Number of workers monitored				

*Below the minimum reporting limit of 0.01 mSv

Table D.5: Extremity doses

NPP:				
	Dose (mSv)			
	<0.01*	0.01-50	50.01-250	>250
Number of workers monitored				

*Below the minimum reporting limit of 0.01 mSv

Table D.6: Miscellaneous

Total number of workers monitored	
Maximum effective dose (non-NEWs)	
Maximum individual whole-body dose for the current 5-year dosimetry period	

Appendix E: Format for the Annual Report on Fuel Monitoring and Inspection

Table E.1: Summary

Station:	**Reporting year:**
Section 1. Summary	State the overall conclusions from the annual evaluation of fuel performance
1.1 Summary of compliance program	Briefly describe the programmatic activities in place to verify the fuel performance
1.2 Summary of surveillance results	Briefly summarize any events of note related to fuel performance. Discuss any changes in fuel performance compared to previous years (20xx-20xx)
1.3 Summary of description of surveillance capabilities	Briefly describe the status of expertise and tools required to monitor and evaluate fuel performance, including any changes in inspection practices
1.4 Summary of description of fuel defect locating and removal capabilities	Briefly describe the status of expertise and tools in place to detect, locate and remove suspected fuel defects from the reactors; note the systems in use, their availability throughout the year, as well as the success rate in locating defective fuel bundles

Table E.2: Fuel operating conditions

Section 2. Fuel operating conditions	State the conclusions regarding conformance of fuel performance to applicable limits		
2.1 Power and burnup envelope	Characterize compliance with power and burnup limits and the power-burnup overpower envelope. For any cases of non-compliance, provide the following details:		
Date of non-compliance	Unit channel, bundle(s)	Cause	Results of in-bay inspections and PIE (if available)
Bundle power (kW)		Burnup (MWh/kgU)	

2.2 Coolant flows	Characterize compliance with flow limits (including cross-flow). For any cases of non-compliance, provide the following details:		
Date of non-compliance	Unit channel, bundle(s)	Cause	Results of in-bay inspections and PIE (if applicable)

Duration (h)		Flow rate (kg/s)	
2.3 Mechanical loads	Characterize compliance to with mechanical load limits (including impacts and loads during fuelling operations). For any cases of non-compliance, provide the following details:		
Date of non-compliance	Unit channel, bundle(s)	Cause	Results of in-bay inspections and PIE (if available)
Maximum load (kN)			
2.4 Degraded cooling conditions	Characterize compliance with limits ensuring adequate fuel cooling (including during fuelling operations). For any cases of non-compliance, provide the following details:		
Date of non-compliance	Unit channel, bundle(s)	Cause	Results of in-bay inspections and PIE (if available)
Duration (s)			
2.5 Coolant chemistry	Characterize compliance with coolant chemistry limits. For any cases of non-compliance, provide the following details:		

Date of non-compliance	Cause	Assessment of impact on fuel

2.6 Operational events	Describe any events that may have imposed conditions affecting safe fuel performance.	
Date of event	Event characterization	Assessment of impact on fuel

Table E.3: Design and manufacturing

Station:	**Reporting year:**
Design and manufacturing	Describe any changes in fuel design, manufacturing processes, and manufacturing requirements
3.1 Design changes	Describe design modifications or concession applications and impact on fuel performance
Date	
3.2 Manufacturing changes	Describe changes in manufacturing process or QA requirements and impact on fuel performance
Date	
3.3 Manufacturing occurrences	Describe any unintended deviations in manufacturing process that may have an impact on fuel performance
Date	

Table E.4: Inspection results

Total planned for inspection	Total inspected during reporting year	Discharged and inspected during reporting year (20XX)		Number of bundles discharged and inspected during 4 preceding years (20XX – 20XX)	
4.1.1 Broken assembly welds		Number	Percentage	Number	Percentage
4.1.2 Endplate cracks		Number	Percentage	Number	Percentage
4.1.3 a) Bundles with significant endplate damage or deformation		Number	Percentage	Number	Percentage
4.1.3 b) Bundles with increased endplate wear[1]		Number	Percentage	Number	Percentage
4.1.4 Trapped debris or debris fretting marks					
4.1.4 a) All observations		Number	Percentage	Number	Percentage
4.1.4 b) Significant observations[2]		Number	Percentage	Number	Percentage
4.1.5 Observable element bow		Number	Percentage	Number	Percentage
4.1.6 Observable sheath strain[3]		Number	Percentage	Number	Percentage
4.1.7 Significant or abnormal bearing pad wear					
4.1.7 a) Full surface wear		Number	Percentage	Number	Percentage

[1] This category includes observations of Type 4 or greater wear, where Type 4 is defined as "medium impression wear", being shallow but with discernible depth, where some part of the wear pattern shows depth (usually in the form of a step).
[2] Observations of debris and/or fretting judged to have the potential to cause fuel defects.
[3] Observations of visible swelling or strain of the sheath. Note that white or black circumferential oxide band at pallet interface locations, historically included in this category, are now included in category 4.1.9 a).

4.1.7 b) Near full surface wear	Number	Percentage	Number	Percentage
4.1.7 c) Abnormal wear	Number	Percentage	Number	Percentage
4.1.7 d) Sculpted wear	Number	Percentage	Number	Percentage
4.1.7 e) Burnish mark interactions	Number	Percentage	Number	Percentage
4.1.7 f) Spacer sleeve interactions	Number	Percentage	Number	Percentage
4.1.8 Bundles with bearing pad crevice corrosion	Number	Percentage	Number	Percentage
4.1.9 Bundles with oxide, stain or crud indications				
4.1.9 a) Bundles with observable sheath oxide	Number	Percentage	Number	Percentage
4.1.9 b) Bundles with observable deposits, stains or crud indications	Number	Percentage	Number	Percentage
4.1.9 c) Bundles with significant deposits, stains or crud indications[4]	Number	Percentage	Number	Percentage
4.1.10 Other miscellaneous observations				
4.1.10 a) Sheath scrapes	Number	Percentage	Number	Percentage
	Number	Percentage	Number	Percentage

[4] Deposits, stains or crud indications on the sheath judged to have the potential to cause a local thermal impact greater than that of a bearing pad, or which could potentially pose a risk to sheath integrity or have significant neutronic impact.

4.1.10 b) Significant sheath scrapes[5]					
4.1.10 c) Bearing pad mechanical damage		Number	Percentage	Number	Percentage
4.1.10 d) Significant bearing pad mechanical damage[6]		Number	Percentage	Number	Percentage
4.1.10 e) Endcap mechanical damage		Number	Percentage	Number	Percentage
4.1.10 f) Significant endcap mechanical damage[7]		Number	Percentage	Number	Percentage
4.1.10 g) Endcap latch marks		Number	Percentage	Number	Percentage
4.1.10 h) Weld flash		Number	Percentage	Number	Percentage
4.1.10 i) Sheath depressions		Number	Percentage	Number	Percentage
4.1.10 j) Interlocked spacer pads		Number	Percentage	Number	Percentage
4.1.11 Bundles with rarely observed or unique unusual indications[8]		Number	Percentage	Number	Percentage
Date of discharge			Unit, bundle serial #		
Description					

[5] Scrapes resulting in the galling of sheath material
[6] Damage resulting in the galling of bearing pad material
[7] Damage resulting in the galling of endcap material
[8] This category identifies unusual fuel indications with an impact on fuel performance that are significant or not fully characterized, and would not otherwise be sufficiently covered in other fuel performance categories of section 4.1

4.1.12 Summarize results of fuel in-bay inspections, noting emerging trends and possible fuel performance implications					
4.2.1 Irradiated fuel post-irradiation examination					
The following elements were shipped for post-irradiation examinations in MMM YYYY. Results will be reported upon completion of the PIE work and documentation.					
Serial - Element		Objectives of post-irradiation examination			
4.2.2 Irradiated fuel post-irradiation examination					
The following elements were shipped for post-irradiation examinations in MMM YYYY. The condition of each element has been assessed for compliance with the fuel bundle design- basis limits for wear and deformation.					
Serial - Element	Discharge data	Objectives of post-irradiation examination and significant results (e.g., visual inspection results, destructive examination conclusions, defect root cause, etc.)			

4.2.3 Irradiated fuel post-irradiation examination									
Shipment date: MMM-YYYY									
Serial-Element	Discharge unit-channel	Discharge date	Inspection date	Sheath strain (%) Limit: 0.5%	Element bow (mm) Limit: 0.47 mm	Endplate deformation (mm) Limit: 0.5 mm	Fission gasrelease (mL) Limit: 40 mL	Oxide layer thickness (µm) Limit: 10 µm	Other observations (as required)

Table E.5: Fuel defects

Station:			**Reporting year:**
5.1 Fuel defects	Summarize trends in occurrence of fuel defects		
Number of defects (20XX)		# in previous 4 years (20XX- 20 XX)	

The table below is repeated for each defect.

Unit-Bundle-Element	Date detected	Date discharged	Date inspected
Channel		Bundle positions in channel	
Range of bundle when defective in-core (i.e., burn-up range from detection to discharge)[9]		Range of bundle power when defective in-core (i.e., power range from detection to discharge)[9]	

Time from detection discharge[9]	Days	Full power days (FPD)

Method of detection
Characterize extent of sheath damage
Characterize cause of defect

	Summarize trends in occurrence of suspected fuel defects

[9] The time of the initial detection is a best estimate, based on available data. The uncertainty in this timing is dependent on a number of factors specific to each individual case (e.g., bundle power and burnup when defected, background radionuclide levels, presence of other defects, and sampling rate).

5.2 Suspected fuel defects			
Number of suspected defects (20XX)		# in previous 4 years (20XX – 20XX)	
Unit-Channel (Repeat remaining rows in table as necessary)		Dates of observation	
Method of detection			
Actions to identify defect location			

Table E.6: Additional information relevant to fuel performance

Station:	**Reporting yYear:**
6.1 Special irradiations	Describe any irradiation of fuel of design other than used for routine fuelling
Unit	Date
Description	
6.2 Plant transients	Describe any plant transient that may affect fuel performance
Unit	Date
Description	
6.3 Operational experience (OPEX)	Describe experiences from other stations that may be relevant to fuel performance
Station	Date
Description	

Glossary

For definitions of terms used in this document, see REGDOC-3.6, *Glossary of CNSC Terminology*, which includes terms and definitions used in the *Nuclear Safety and Control Act* and the regulations made under it, and in CNSC regulatory documents and other publications. REGDOC-3.6 is provided for reference and information.

The following terms are either new terms being defined, or include revisions to the current definition for that term. Following public consultation, the final terms and definitions will be submitted for inclusion in the next version of REGDOC-3.6, *Glossary of CNSC Terminology*.

References

The CNSC may include references to information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC web page "How to gain free access to all nuclear-related CSA standards".

1. CSA Group, CSA N290.7, *Cyber security for nuclear power plants and small reactor facilities*, Toronto, Canada, 2014.

2. Canadian Safety Nuclear Commission (CNSC), REGDOC-3.2.1, *Public Information and Disclosure*, Ottawa, Canada, 2018.

3. CSA Group, CSA N285.0-17, *General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants*, Toronto, Canada, 2017.

4. CNSC, REGDOC-2.2.4, Volume II: *Managing Alcohol and Drug Use*, Ottawa, Canada, 2021

5. CNSC, REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue*, Ottawa, Canada, 2017.

6. CNSC, REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures*, Ottawa, Canada, 2020.

7. CSA Group, CSA N293-12, *Fire Protection for Nuclear Power Plants*, Toronto, Canada, 2012.

8. CSA Group, CSA N289.5, *Seismic instrumentation requirements for nuclear power plants and nuclear facilities*, Toronto, Canada, 2012.

9. CNSC, REGDOC-2.2.3, *Personnel Certification, Volume III : Certification of Persons Working at Nuclear Power Plants*, Ottawa, Canada, 2019.

10. American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, New York, United States of America, 2013.

11. Institute of Nuclear Power Operations, INPO AP-913, *Equipment Reliability Process Description,* Revision 1, Toronto, Canada, 2001.

12. CNSC, REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, Version 2, Ottawa, Canada, 2016.

13. CSA Group, *CSA N290.0, General principles for the management of radioactive waste and irradiated fuel*, Ottawa, Canada, Toronto, Canada, 2014.

14. CNSC, REGDOC-2.6.1, *Reliability Programs for Nuclear Power Plants*, Ottawa, Canada, 2017.

CNSC Regulatory Document Series

Facilities and activities within the nuclear sector in Canada are regulated by the CNSC. In addition to the *Nuclear Safety and Control Act* and associated regulations, these facilities and activities may also be required to comply with other regulatory instruments such as regulatory documents or standards.

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2.6 Fitness for service
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