



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

REGULATORY
STANDARD

Reporting Requirements for Operating Nuclear Power Plants

S-99

March 2003

REGULATORY DOCUMENTS

The Canadian Nuclear Safety Commission (CNSC) operates within a legal framework that includes law and supporting regulatory documents. Law includes such legally enforceable instruments as acts, regulations, licences and orders. Regulatory documents such as policies, standards, guides, notices, procedures and information documents support and provide further information on these legally enforceable instruments. Together, law and regulatory documents form the framework for the regulatory activities of the CNSC.

The main classes of regulatory documents developed by the CNSC are:

Regulatory policy: a document that describes the philosophy, principles and fundamental factors used by the CNSC in its regulatory program.

Regulatory standard: a document that is suitable for use in compliance assessment and describes rules, characteristics or practices which the CNSC accepts as meeting the regulatory requirements.

Regulatory guide: a document that provides guidance or describes characteristics or practices that the CNSC recommends for meeting regulatory requirements or improving administrative effectiveness.

Regulatory notice: a document that provides case-specific guidance or information to alert licensees and others about significant health, safety or compliance issues that should be acted upon in a timely manner.

Regulatory procedure: a document that describes work processes that the CNSC follows to administer the regulatory requirements for which it is responsible.

Document types such as regulatory policies, standards, guides, notices and procedures do not create legally enforceable requirements. They support regulatory requirements found in regulations, licences and other legally enforceable instruments. However, where appropriate, a regulatory document may be made into a legally enforceable requirement by incorporation in a CNSC regulation, a licence or other legally enforceable instrument made pursuant to the *Nuclear Safety and Control Act*.

REGULATORY STANDARD

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Operating Nuclear Power Plants**

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**Published by the
Canadian Nuclear Safety Commission
March 2003**

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REPORTING REQUIREMENTS FOR OPERATING NUCLEAR POWER PLANTS

1.0 PURPOSE

The purposes of this Regulatory Standard are:

- To help the Canadian Nuclear Safety Commission (CNSC, Commission) collect information that it needs to assure that a “nuclear power plant” is operating safely, and to verify that the *licensee* is complying with regulatory requirements;
- To help applicants for operating licences for nuclear power plants design programs for collecting and reporting information in accordance with regulatory requirements; and
- To facilitate CNSC evaluations of the appropriateness, completeness and timeliness of information reported to the CNSC by the operators of nuclear power plants.

2.0 SCOPE

This Regulatory Standard incorporates, and expands upon, reporting requirements for operating nuclear power plants that derive from the *General Nuclear Safety and Control Regulations*, the *Class I Nuclear Facilities Regulations*, and the *Radiation Protection Regulations*. It describes the information that the CNSC may require of a licensee who operates a nuclear power plant, and how, when and to whom the information is to be provided.

When appropriately incorporated into an operating licence for a nuclear power plant, this Regulatory Standard and its contents are mandatory. In other situations, the document and its contents constitute guidance to interested persons, such as licence applicants, licensees and CNSC staff, on the typical reporting requirements for nuclear power plants.

3.0 BACKGROUND

3.1 Regulatory framework

The CNSC is the federal agency that regulates the use of nuclear energy and materials to protect health, safety, security and the “environment”, and to respect Canada’s international commitments on the peaceful uses of *nuclear energy*.

The *Nuclear Safety and Control Act (NSC Act, Act)* requires persons or organizations to be licensed by the CNSC for carrying out the activities referred to in section 26 of the *Act*, unless otherwise exempted. The associated regulations stipulate prerequisites for CNSC licensing, and the obligations of licensees and *workers*.

3.2 CNSC licensing process

The CNSC typically applies a phased process to its licensing of nuclear facilities and activities. For major facilities, this process begins with a consideration of the environmental impacts of the

proposed project, and proceeds progressively through site preparation, construction, operation, decommissioning, and abandonment phases.

The *NSC Act* and regulations require licence applicants to provide certain information at each licensing stage. The type and level of detail of this information will vary to accommodate the licensing stage and specific circumstances.

At all licensing stages, applications may incorporate (directly or by reference) new or previously submitted information, in accordance with legislated requirements and the best judgement of the applicant. An application that is submitted at one licensing stage can become a building block for the next stage.

Upon receipt of an application that is complete, the CNSC reviews it to determine whether the applicant is qualified to carry on the proposed activity, and has made adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. If satisfied, the CNSC may issue, renew, amend or replace a licence that contains relevant conditions. Typically, this licence will incorporate the applicant's undertakings and will contain other conditions that the CNSC considers necessary, including those that reference or incorporate a CNSC Regulatory Standard.

3.3 The legislative basis of this Regulatory Standard

Under the *NSC Act*, a nuclear power plant is a *nuclear facility*. Accordingly, the sections of the *NSC Act* and its regulations that are directly relevant to the contents and application of this Regulatory Standard on reporting requirements for nuclear power plants are subsections 24(1) and 24(5), and paragraph 27(b), of the *NSC Act*; sections 15, 29, 30, 31 and 32 of the *General Nuclear Safety and Control Regulations*; paragraphs 6(2)(c), 16(a) and 16(e) of the *Radiation Protection Regulations*; and subparagraphs 6(k)(ii) and 6(k)(iii) of the *Class I Nuclear Facilities Regulations*.

In particular:

- Subsections 24(1) and 24(5) of the *NSC Act* give the Commission the authority to establish classes of licences, and to include in those licences any terms or conditions that the Commission considers necessary for the purposes that are laid out in section 3 of the *NSC Act*. Pursuant to this authority, the Commission has established operating licences for nuclear power plants, and, for the purposes of the *Act*, proposes to incorporate this Regulatory Standard into these licences.
- Paragraph 27(b) of the *NSC Act* requires every licensee and every prescribed person to make the prescribed reports and to file them in the prescribed manner. In accordance with section 2 of the *Act*, *prescribed* means prescribed by regulation of the Commission. Accordingly, this paragraph obliges licensees who operate a nuclear power plant to file reports in accordance with any relevant requirements in the regulations of the Commission. Such requirements apply independently of this Regulatory Standard.
- Section 15 of the *General Nuclear Safety and Control Regulations* stipulates that every licensee shall notify the Commission of (a) the persons who have authority to act for the

licensee in the licensee's dealings with the Commission, (b) the names and position titles of the persons who are responsible for the management and control of the plant, and (c) any change in the information referred to in (a) and (b), immediately preceding, within 15 days after the change occurs. This requirement has not been included in this Regulatory Standard.

- The *General Nuclear Safety and Control Regulations* specify various reporting requirements and exceptions for every CNSC licensee, including an operator of a nuclear power plant. Accordingly, when this Regulatory Standard is made a condition of a nuclear power plant operating licence, then under the provisions of subsections 29(3) and 31(2) of the *General Nuclear Safety and Control Regulations*, the reporting requirements of this Regulatory Standard supersede those of subsections 29(1), 29(2), and 31(1).
- Section 32 of the *General Nuclear Safety and Control Regulations* requires every report to include the name and address of the sender, as well as the date. The section also defines the date of the filing of a report to be the date that the report is received by the Commission.
- Paragraph 6(2)(c) of the *Radiation Protection Regulations* requires a licensee, including an operator of a nuclear power plant, to notify the Commission within the period specified in the licence, when the licensee becomes aware that an action level referred to in the licence has been reached.
- Paragraph 16(a) of the *Radiation Protection Regulations* stipulates that, when a licensee becomes aware that a dose of *radiation* received by and *committed* to a person or an organ or tissue may have exceeded an applicable dose limit prescribed by section 13, 14, or 15, the licensee shall immediately notify the person and the Commission of the dose. In accordance with paragraph 16(e) of the same regulations, the licensee shall also report to the Commission, within 21 days after becoming aware that the dose limit has been exceeded, the results of the investigation or on the progress that has been made in conducting the investigation.
- Subparagraphs 6(k)(ii) and 6(k)(iii) of the *Class I Nuclear Facilities Regulations*, although they address the information to be included in an application for a licence to operate a *Class I nuclear facility*, such as a nuclear power plant, imply that licensees are, during operation, to notify off-site authorities of accidental releases or the imminence of accidental releases, and to report information on any accidental releases to off-site authorities. Paragraphs 12(1)(e) and (f) of the *General Nuclear Safety and Control Regulations* stipulate obligations consistent with such notification and reporting.

4.0 TERMINOLOGY

The Glossary at the end of the body of this document defines some of the special terms used herein. Terms which are contained in the glossary are identified by quotation marks the first time they appear in the body of this document. Other special terms (shown in italics) used in this document derive from the *NSC Act*, the *General Nuclear Safety and Control Regulations*, the *Radiation Protection Regulations*, the *Class I Nuclear Facilities Regulations*, the *Nuclear Security Regulations*, and the *Nuclear Non-proliferation Import and Export Control Regulations*.

5.0 REQUIREMENT TO REPORT INFORMATION

A licensee shall, when required to do so by a condition of the applicable CNSC operating licence, report information to the CNSC in accordance with this Regulatory Standard. The required reports shall be of the types and forms specified in this Regulatory Standard, and shall be made to, or filed with, the designated CNSC contact at the frequency, or within the time frames, specified herein.

6.0 SPECIFIC REPORTING REQUIREMENTS

6.1 Introduction

The following sections and appendices of this standard describe the information that the licensee shall report to the CNSC, and when, how, and to whom the information is to be provided, to meet the requirements of section 5 of this standard.

In particular:

- The reporting of information that is required pursuant to 6.3 of this standard, Requirements for Unscheduled Reporting, is to be made on an as-required basis, in response to any occurrence of the situations or events described.
- Section 6.4 of this standard, Requirements for Scheduled Reporting, covers the reporting of information on a scheduled, or anticipatory, basis, as described therein. The associated information requirements are organized and presented under report titles that variously reflect subject matter, regulatory use, or industry or CNSC conventions.

6.2 Preliminary vs. Detailed Reporting

To meet this standard, a licensee must make or file preliminary and detailed reports, orally or in writing, in accordance with this standard.

A preliminary report is an initial report, made or filed at an immediate or very early stage following the occurrence of a precipitating situation or event. Accordingly, a preliminary report will typically contain only preliminary, readily-available or provisional information on the situation or event being reported.

A preliminary report may be made orally, or in writing, and shall be made to the designated CNSC contact, in accordance with the licence and this standard.

For various situations or events where a preliminary report has been made to the CNSC, a follow-up detailed report must also be filed with the CNSC. Typically, this detailed report will be a complete, or full, report that, once filed, satisfies the relevant regulatory requirement to report. However, situations may arise where it is not reasonable to expect the licensee to file, within the time period specified, a detailed report that is truly complete for the intended purposes. Accordingly, this standard provides for the follow-up reporting of additional information, where a licensee has committed, in a detailed report in accordance with the requirements of this standard, to the submission of such information.

6.3 Requirements for Unscheduled Reporting

6.3.1 Situations and events that require both preliminary and detailed reports

To meet this standard, a licensee shall make both preliminary and detailed reports for any of the following situations or events:

Non-compliance

- (1) A contravention of, or a failure to comply with, the *NSC Act*, regulations made pursuant to the *NSC Act*, or an order of the Commission, a *designated officer* or an *inspector* that is not otherwise addressed in this standard.
- (2) A contravention of, or a failure to comply with, a licence condition that is not otherwise addressed in this standard.
- (3) A “safety-significant” contravention of, or failure to comply with, licensee-produced “licensing documents” that is not otherwise addressed in this standard.

Deficiency in records

- (4) An inaccuracy or incompleteness in a *record* that the licensee is required to keep by the *NSC Act*, the regulations made under the *NSC Act* or the licence, where the inaccuracy or incompleteness could lead to a situation in which the environment, the health and safety of persons or national security is adversely affected.

Health and safety

- (5) The death of any person at the nuclear power plant including anywhere within the *exclusion zone* which is specified in the licence.
- (6) The serious illness or injury of any person incurred or possibly incurred as a result of the operation of the nuclear power plant.
- (7) The occurrence of an event that has resulted, that is likely to result, or that may result, in the exposure of a person or organ or tissue to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations*.
- (8) An event 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.
- (9) The misuse, by any person, of any thing that is intended to protect the health or safety of persons or the environment from risks associated with the operation of the nuclear power plant.

Releases

- (10) A release of a *nuclear substance* into the environment in a quantity, at a rate, or in a manner, that is not authorized by the governing acts and regulations, or the licence.
- (11) A release of a *hazardous substance* that has adversely affected, or has the potential to adversely affect, the environment.
- (12) An unmeasured release of a nuclear substance into the environment, where the release cannot be shown to be authorized by the governing acts and regulations, or the licence.

Process failures

- (13) A “serious process failure”.
- (14) A “potential serious process failure”.
- (15) A situation or event requiring a reactor shutdown in accordance with a licence condition or a licensing document.
- (16) An event that results in an acute and unrecoverable loss of more than 100 kg. of heavy water.

Safety systems

- (17) An actuation, at any power level, of one or both shutdown systems, except where:
 - (a) the actuation occurs while the reactor unit is in a guaranteed shutdown state, and does not indicate that the shutdown guarantee has failed; or
 - (b) the actuation was deliberate, as part of a pre-planned test sequence.
- (18) An actuation of an emergency core cooling system or an actuation of an emergency core cooling subsystem as a consequence of an “initiating parameter” exceeding a set point.
- (19) A spurious operation, or a 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.
- (20) An actuation of a containment system or an actuation of a containment subsystem as a consequence of an initiating parameter exceeding a set point.
- (21) A degradation, of a “special safety system” or “standby safety-related system”, that:
 - (a) prevents any special safety system or standby safety-related system from performing its safety-related function as intended, or meeting its “defined specifications”; or
 - (b) that could result in a hazard to the health and safety of any person required for the operation of the system.

Pressure boundaries

- (22) A degradation, of a “pressure boundary” of a “safety-related system”, that exceeds a relevant limit specified in the applicable design analysis, design codes or standards, or inspection codes or standards, except a non-safety-significant deformation or crack, a pinhole that does not have the potential to significantly impair the operating ability of the system, and a degradation that causes a leak that does not exceed a limit specified in a licensing document. Accordingly, the degradations to be reported include:
 - (a) a rupture;
 - (b) a safety-significant deformation or crack;
 - (c) the formation of a pinhole that is due to degradation, and that has the potential to significantly impair the operating ability of the system;
 - (d) a degradation that causes a leak that exceeds a limit specified in a licensing document;
 - (e) a change, 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) a local, or general, reduction in wall thickness beyond that allowed by the applicable pressure vessel code, standard or act under which the

- safety-related-system's pressure boundary was registered, or could have been registered; and
- (g) a degradation of over-pressure protection equipment (other than a relief device that, during the testing of its set-point(s), activates at a point between its maximum set-point and the hydrostatic test pressure of the associated system) that caused or would have caused the equipment to fail to operate in accordance with the over-pressure protection report or another licensing document.
- (23) 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.
 - (24) An analysis related to a pressure boundary of a safety-related system that concludes that an applicable limit that is specified in the associated design analyses, the design and inspection codes, or the design and inspection standards, has been exceeded.
 - (25) A pressure boundary failure within the *protected area* of a nuclear power plant that results in injury or property damage.
 - (26) A situation where the configuration of a valve or other device associated with a pressure boundary contravenes relevant requirements in the over-pressure protection report or another licensing document.

Reactor and turbine control

- (27) A reduction below defined specifications of the effectiveness of a system for:
 - (a) controlling reactor-power;
 - (b) controlling the pressure and inventory of the primary heat transport system; or
 - (c) protecting the steam turbine.

Safeguards

- (28) 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 *NSC Act*, the regulations made under the *Act* or the licence [Paragraph 30(1)(a) of the *General Nuclear Safety and Control Regulations*].
- (29) 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 [Paragraph 30(1)(b) of the *General Nuclear Safety and Control Regulations*].

Security

- (30) A theft or loss of a *nuclear substance* (except for a loss of heavy water), *prescribed equipment*, or *prescribed information* that is used in carrying on any activity that is authorized by the *NSC Act* and the licence.
- (31) A transfer or disclosure of prescribed information that is not permitted by the *NSC Act* and the regulations made under the *Act*.
- (32) An attempted or actual breach of security or an attempted or actual act of sabotage at the nuclear power plant.

- (33) A misuse of security-related equipment or a threat made against the nuclear power plant.
- (34) An actual, impending, planned or threatened work disruption, including a slowdown, walkout, or strike, or another action, such as civil demonstrations, that could affect the safety or security of operations at the nuclear power plant or the capability of the licensee to maintain the staffing levels required by the licence.

Emergency

- (35) A situation or event that requires the implementation of a contingency or emergency plan in accordance with the licence.
- (36) A declaration of an alert or emergency, within the nuclear power plant, where personnel or resources are mobilized by the licensee in response to an unexpected occurrence that creates a hazard to the safe operation of the nuclear power plant, to the environment or to the health and safety of persons.

External events

- (37) An earthquake that gives rise to a free-field motion, at a nuclear power plant site, that exceeds the trigger range that the Canadian Standards Association publication, CAN/CSA N289.5: *Seismic Instrumentation Requirements for CANDU Nuclear Power Plants*, specifies for seismic-measurement instruments; or where instruments that meet CAN/CSA N289.5 are not available, any earthquake that occurs within 500 kilometres of the nuclear power plant site and is greater than magnitude 5 on the Richter scale.
- (38) The occurrence of any unusual external conditions at the site, including “fires”, floods, plane crashes, gas explosions, gas releases, high winds, missiles or ice conditions, that resulted in, or that had significant potential to result in operating transients at the nuclear power plant.

Testing and monitoring

- (39) A failure to perform a test that is required by a licence condition, including any routine test of a safety-related system that is required by a licensing document that has not been deferred in accordance with procedures that are permitted by the licence.
- (40) A failure to monitor or control the release of a nuclear substance except where the failure is in accordance with procedures that are permitted by the licence.
- (41) A failure to monitor or control the release of a hazardous substance as required by the licence except where the failure is in accordance with procedures that are permitted by the licence.

Hazards not addressed in licensing documents

- (42) A situation or an event arising from nuclear power plant operating experience that reveals a hazard to the health and safety of persons, security or the environment, that is different in nature, greater in probability, or greater in magnitude than was previously represented to the Commission in the licensing documents, including:
 - (a) a special safety system that does not meet its defined specifications;

- (b) a reactor that is operating in a state that was not considered in the safety analysis;
- (c) the occurrence of an event of a type that was not considered in the safety analysis;
- (d) an unexplained and unexpected behaviour of a reactor-core;
- (e) an event where two or more systems or components, which were assumed in the safety analysis to be mutually independent, are in fact interdependent;
- (f) a mistake in a licensing document that, if relied upon or acted upon, would increase the risk to the health and safety of persons, security or the environment; or
- (g) a release of a *nuclear substance* or a *hazardous substance*, in a quantity or rate, that is found to be greater than those predicted in the safety analysis.

Financial status

- (43) The occurrence of any of the following situations or events:
 - (a) the making of an assignment by or in respect of the licensee under the *Bankruptcy and Insolvency Act*,
 - (b) the making of a proposal by or in respect of the licensee under the *Bankruptcy and Insolvency Act*,
 - (c) the filing of a notice of intention by the licensee under the *Bankruptcy and Insolvency Act*,
 - (d) the filing of a petition for a receiving order against the licensee under the *Bankruptcy and Insolvency Act*,
 - (e) 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,
 - (f) 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*,
 - (g) 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*,
 - (h) the making of an application for a winding-up order by or in respect of the licensee under the *Winding-up and Restructuring Act*,
 - (i) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of the licensee under provincial or foreign legislation, or
 - (j) 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.

6.3.2 Situations and events that require notifications or reports

6.3.2.1 The reaching of an action level

- (a) When a licensee becomes aware that an action level referred to in the licence for the purpose of subsection 6(2) of the *Radiation Protection Regulations* has been

reached, the licensee shall notify the designated CNSC contact within the time specified in the licence.

- (b) When a licensee becomes aware that an action level referred to in the licence for the purpose of subsection 6(2) of the *Radiation Protection Regulations* has been reached, the licensee shall, within 45 days of the date that the licensee became aware that the action level had been reached, file with the designated CNSC contact, a report that:
 - (i) describes the results of the investigation conducted to establish the cause for reaching the action level;
 - (ii) describes the actions identified and taken to restore the effectiveness of the radiation protection program implemented in accordance with section 4 of the *Radiation Protection Regulations*;
 - (iii) identifies any missing information, and describes how and when the missing information will be provided to the CNSC; and
 - (iv) includes the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.3.2.2 Performance and status of certified personnel

To meet this standard, a licensee shall file a report with the CNSC within 21 days of the occurrence of certain situations or events relating to the performance or status of personnel who have been *certified* by the Commission. The required report shall be filed with the designated CNSC contact, in response to any of the following situations or events:

- (a) a termination of the employment of a certified person in the position for which the person is certified by the Commission;
- (b) a removal of a certified person from the duties of the position for which the person is certified by the Commission, and any subsequent reinstatement of the person to the duties of the position; and
- (c) a failure, by a certified person, to pass a re-qualification test referred to in the licence or a failure of a certified person to take a re-qualification test referred to in the licence.

The report shall contain the following information, if the information is relevant to the situation or event being reported:

- (a) the full name and position of the certified person;
- (b) The date of any termination of employment of a certified person in a position for which the person has been certified;
- (c) the date of any removal of a certified person from the duties of a position for which the person is certified by the Commission and the reasons for the removal of the certified person;
- (d) the date of any reinstatement of a certified person to the duties of a position for which the person is certified by the Commission and the remedial action taken prior to the reinstatement;
- (e) for any situation where a certified person failed a re-qualification test referred to in the licence, or failed to take any re-qualification test referred to in the licence, the type and date of the test that the person failed or did not take; and

- (f) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.3.2.3 Reports of problems identified by research findings or revised analyses

To meet this standard, a licensee shall, within 21 days of becoming aware, through research findings or new or revised safety analyses, of a problem or potential problem that represents a hazard or potential hazard to the health and safety of persons, security or the environment, or that is different in nature, greater in probability, or greater in magnitude than was previously represented to the Commission in licensing documents, file a report with the designated CNSC contact.

The problems, or potential problems, that the licensee shall report to the CNSC under this standard include the following occurrences:

- (a) when a final safety analysis report for a nuclear power plant contains an assumption, input, analytical method or safety analysis result that is, or that may be, invalid;
- (b) when a limit defined in the nuclear power plant licensing documents, or in appendices to these documents, is or may be inadequate to assure safety;
- (c) when an analysis, from which a limit in a licensing document was derived, may be invalid or uncertain such that the margin of safety may be less than predicted;
- (d) when the defined specifications of a special safety system or of a safety-related system of a nuclear power plant are or may be invalid;
- (e) when a nuclear power plant licensing document contains an error that, if accepted, relied or acted upon as being valid, could give rise to increased risks to the health and safety of persons, security or the environment; and
- (f) when the measures that are in place for the purpose of protecting the environment from the operating impacts of a nuclear power plant are, or may be, inadequate.

The report shall include the following information:

- (a) the identification of the nuclear power plant and any reactor unit(s) that is or may be affected by the problem or potential problem;
- (b) the identification of any structure, system, component or function of the nuclear power plant that is or may be affected by the problem or potential problem;
- (c) a description of the problem or potential problem, and its actual or potential safety-significance;
- (d) a summary of the research or analysis that led to awareness of the problem or potential problem;
- (e) an evaluation of the degree of any impairment of a special safety system or safety-related system;
- (f) a description of the corrective actions that have been taken, or that are proposed to be taken, to address the problem or potential problem; and
- (g) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.3.3 Making and filing preliminary and detailed reports

6.3.3.1 Preliminary reports

6.3.3.1.1 Making preliminary reports

To meet this standard, the licensee shall make preliminary reports, as specified herein. For those situations or events identified in 6.3.3.1.2, a preliminary report of the situation or event is required immediately, where immediately means immediately after the licensee becomes aware of the situation or event and initiates any required response actions, such as alerting the staff of the nuclear power plant, or alerting any municipal or provincial authorities who are responsible for responding to the situation or event. For all other situations or events that require a preliminary report to the CNSC, the licensee shall make the preliminary report on or before the first business day after the day that the licensee determines that this standard requires the situation or event to be reported to the CNSC.

A preliminary report that is required by this standard shall be made to the designated CNSC contact, as follows:

- (a) A preliminary report that is to be made to the CNSC immediately shall be made to the designated CNSC contact, or, where the licensee cannot, to the CNSC emergency duty officer.
- (b) A preliminary report to the CNSC that is not required immediately shall be made to the designated CNSC contact.

6.3.3.1.2 Reporting schedules

To meet this standard, a licensee shall:

- (a) immediately make a preliminary report to the CNSC for any of the following situations or events:
 - (i) a death at the nuclear power plant, as described in 6.3.1(5) of this standard;
 - (ii) an overexposure, or possible overexposure of a person, or of an organ or a tissue of a person, as described in 6.3.1(7) of this standard;
 - (iii) an unauthorized quantity, rate, or manner of release, of a *nuclear substance*, as described in 6.3.1(10) of this standard;
 - (iv) a release, of a *hazardous substance*, that has an adverse affect on the environment, as described in 6.3.1(11) of this standard;
 - (v) an unmeasured release into the environment of a nuclear substance, as described in 6.3.1(12) of this standard;
 - (vi) any situation described in 6.3.1(28) or 6.3.1(29) of this standard that involves *safeguards*;
 - (vii) a loss or theft of a nuclear substance, *prescribed equipment* or *prescribed information*, as described in 6.3.1(30) of this standard;
 - (viii) any security-related incident described in 6.3.1(30), 6.3.1(31), 6.3.1(32) or 6.3.1(33) of this standard, where a hazard to the health and safety of persons, to the environment or to the security of the *nuclear facility* continues to exist; and

- (ix) an emergency, as described in 6.3.1(35) or 6.3.1(36) of this standard which is ongoing; and
- (b) for any situation or event described in 6.3.1 of this standard, other than a situation or event described in (a) or a situation or event that was anticipated and described in any preliminary report to the CNSC during the previous 45 days, make a preliminary report to the CNSC of the situation or event by the end of the first normal day of business after the day that the licensee determines that the situation or event is to be reported.

6.3.3.1.3 Contents of preliminary reports

To meet this standard, any preliminary report to the CNSC of a situation or event shall:

- (a) state the date, time and circumstances of the discovery of the situation or event;
- (b) state the date and time of the onset, and the duration, of the situation or event, or a best estimate thereof ;
- (c) identify the affected nuclear power plant, and any associated reactor units, structures, systems, components, functions or personnel affected by the situation or event;
- (d) describe the occurrence and consequences of the situation or event, and any actions that the licensee has taken, or proposes to take, with respect to the situation or event; and
- (e) describe any exposure of a person to radiation as a consequence of the situation or event.

6.3.3.2 Detailed reports

6.3.3.2.1 Reporting schedules

To meet this standard, a licensee shall file detailed reports of situations and events described in 6.3.1 of this standard, as follows:

- (a) For any situation or event that results in the exposure of a person or organ or tissue to radiation in excess of an applicable radiation dose limit prescribed by the *Radiation Protection Regulations*, [see 6.3.1(7) of this standard] or for any situation or event related to safeguards [see 6.3.1(28), 6.3.1(29) of this standard] or financial status [see 6.3.1(43) of this standard], the licensee shall file a detailed report of the situation or event with the CNSC within 21 days of making the preliminary report of the situation or event; and
- (b) For all situations and events described in 6.3.1 of this standard, except those described in 6.3.1(7), 6.3.1(28), 6.3.1(29) and 6.3.1(43), the licensee shall file the detailed report with the CNSC within 45 days of making the preliminary report of the situation or event.

6.3.3.2.2 Contents of detailed reports

To meet this standard, detailed reports are required for situations or events described in section 6.3.1 of this standard. These reports shall contain certain information, as described below.

- (a) A detailed report that is filed with the CNSC for any situation or event described in 6.3.1 of this standard, except a situation or event described in 6.3.1(4), 6.3.1(7), 6.3.1(28), 6.3.1(29) or 6.3.1(43), shall contain the following information:
- (i) the information that was contained in the preliminary report and any updates that are necessary to better reflect new information, with the changes from the preliminary report clearly indicated;
 - (ii) the reporting provision in section 6.3.1 of this standard that best describes the situation or event;
 - (iii) a description of the condition of the site where the situation or event has occurred and the operating conditions of any power reactor unit involved in the situation or event, including the power level at which the reactor was operating immediately prior to the situation or event;
 - (iv) a description of any actions taken in immediate response to the situation or event;
 - (v) the names of any municipal, provincial and federal authorities that were notified of the situation or event;
 - (iv) a detailed description of the occurrence of the situation or event, including the associated circumstances, causes and consequences, and any relevant conclusions or findings established by investigative process;
 - (vii) a statement of the safety significance of the situation or event, including, if there is an actuation of either shutdown system, a statement as to whether the situation or event was a serious process failure;
 - (viii) an evaluation of the degree of impairment of special safety systems or of standby safety-related systems;
 - (ix) for situations or events of safety-significance, the “root-cause analysis” of the situation or event;
 - (x) the measured or estimated doses to the nuclear power plant personnel and to the public, as a consequence of the situation or event;
 - (xi) a description of any resulting impact on the environment;
 - (xii) the conclusions reached, and any actions taken, as a result of any review of a comparable situation or event;
 - (xiii) a description of the actions taken, or proposed to be taken, to correct the situation or event and to prevent a recurrence of the situation or event, including those actions that result from a root-cause analysis;
 - (xiv) the comments and recommendations of the nuclear power plant management, including comments on the appropriateness of the actions taken by operating staff;
 - (xv) a statement addressing whether the detailed report is complete, or whether a report of additional information will be made and, if so, the associated number or identifier; and
 - (xvi) the name and address of the sender of the detailed report, the date of completion of the report and the signature of the designated representative of the licensee.
- (b) A detailed report that is filed with the CNSC, for any situation or event involving an inaccuracy or incompleteness in a *record* that the licensee is required to keep [see 6.3.1(4) of this standard], shall contain the following information:

- (i) the details of the inaccuracy or incompleteness;
 - (ii) any action that the licensee has taken or proposes to take with respect to the inaccuracy or incompleteness;
 - (iii) a statement addressing whether the detailed report is complete, or whether a report of additional information will be filed and, if so, the associated number or identifier; and
 - (iv) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.
- (c) A detailed report that is filed with the CNSC, for any situation or event that has resulted, that is likely to result, or that may result in the exposure of a person or organ or tissue to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations* [see 6.3.1(7) of this standard], shall contain the following information:
- (i) the results of the investigation conducted to determine the magnitude of the dose and to establish the causes of the exposure, or on the progress that has been made in conducting that investigation;
 - (ii) a description of the action(s) taken to prevent the occurrence of a similar incident;
 - (iii) a statement addressing whether the detailed report is complete, or whether a report of additional information will be filed and, if so, the associated number or identifier; and
 - (iv) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.
- (d) A detailed report that is filed with the CNSC, for any situation or event that involves safeguards provisions [see 6.3.1(28), 6.3.1(29) of this standard], shall contain the following information:
- (i) the date, time and location of discovery of the situation;
 - (ii) a description of the situation and the circumstances;
 - (iii) the probable cause of the situation;
 - (iv) 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;
 - (v) the *effective dose* and *equivalent dose* of radiation received by any person as a result of the situation;
 - (iv) the actions that the licensee has taken or proposes to take with respect to the situation; and
 - (vii) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.
- (e) A detailed report that is filed with the CNSC, for any situation or event described in 6.3.1(43) of this standard, shall contain the following information:
- (i) the date, time and location of the discovery of the situation or event;
 - (ii) a description of the situation or event and its circumstances;
 - (iii) the probable cause of the situation or event;
 - (iv) 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 or event;

- (v) the effective dose and equivalent dose of radiation received by any person as a result of the situation or event;
- (vi) the actions that the licensee has taken or proposes to take with respect to the situation or event; and
- (vii) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.3.3.3 Submission of additional information

Situations or events can occur at nuclear power plants where detailed, final or validated information is not immediately available or attainable by the reporting deadline. Such situations or events are those where a relevant analysis, assessment, measurement or investigation has not been completed, or dynamic situations which have not attained or maintained a requisite level of stability and predictability.

Accordingly, and as noted in section 6.2 of this standard, this standard expressly provides for the submission of additional information where a detailed report is filed incomplete. The provision does not extend to all situations or events that require detailed reporting under the regulations and this standard. For the situations or events described in 6.3.1 (28) and 6.3.1(29) of this standard, the reporting requirement in the regulations and this standard are identical (i.e., they require preliminary and full reports), and do not allow for the submission of incomplete reports.

A report of additional information, to complete a previously-filed detailed report, shall:

- (a) contain the information that the licensee, in the corresponding detailed report to the CNSC, undertook to file with the CNSC by means of an additional report;
- (b) describe the impacts of the additional information on the substance, conclusions or interpretation of the detailed report to which the additional report refers,
- (c) state whether the information contained in the report is complete, or further information will be filed; and
- (d) include the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.3.4 Request for retraction of a preliminary or detailed report

A licensee may, for any situation or event described in 6.3.1 of this standard, other than the event referred to in 6.3.1(7), request the retraction of any preliminary or detailed report that the licensee has made to, or filed with, the CNSC pursuant to this standard.

The request for retraction shall be filed with the designated CNSC contact, and shall contain:

- (a) the title, the identifying number and the date of submission of the report to which the request pertains;
- (b) a description of the grounds for the request, including the reasons that the licensee believes that the report is not required by the licence or the regulations; and
- (c) 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 from a licensee for the retraction of a previously-made preliminary or filed detailed report, the CNSC will review the grounds for the request to determine if the report is required under the regulations, the licence, or this standard, and will provide the results of this review in writing to the licensee.

If the CNSC grants the licensee's request for a retraction of a preliminary or detailed report, then the information on the situation or event that the licensee has already made to, or filed with the CNSC will not be treated as information required by this standard, but will remain a part of CNSC records.

If the CNSC refuses the licensee's request for retraction of a preliminary or detailed report, the licensee shall resume reporting on the situation or event which was the subject of the retraction request, in accordance with this standard except that the reporting schedule for any directly related detailed report or additional report shall be extended by the length of time that was taken by the CNSC to review the request for retraction.

6.4 Requirements for Scheduled Reporting

6.4.1 Quarterly Operations Reports

To meet this standard, a licensee shall, within 90 days of the end of each quarter of a calendar year of operation, file with the designated CNSC contact, a quarterly operations report that contains the following information for the quarter:

- (a) a summary of any changes in the organization of station personnel, staffing levels, procedures, or equipment or fuel design, which could be inconsistent with the Safety Report or other licensing documents;
- (b) a list of the names of all persons who were *certified* by the Commission and worked at the nuclear power plant during the quarter, and the number of shifts that each of these persons worked in the quarter;
- (c) a brief description of any contraventions of, or failures to comply with licensee-produced licensing documents, that were not reported under 6.3.1(3) of this standard;
- (d) the results of any trend analysis of contraventions of, or failures to comply with licensee-produced licensing documents, that were reported under 6.4.1(c);
- (e) a brief description of the corrective actions taken in response to contraventions of, or failures to comply with licensee-produced licensing documents, that were reported under 6.4.1(c);
- (f) the titles, reference numbers and brief descriptions of any preliminary or detailed reports that were non-security related, and that were made to, or filed with, the CNSC pursuant to 6.3.1 of this standard;
- (g) a brief description of any additional information, regarding non-security related situations or events, that was filed with the CNSC, or that remained to be filed with the CNSC, under the provisions of 6.3.3.3 of this standard, as well as the titles and numbers of the detailed reports to which the additional information relates;

- (h) a description of any situations or events that occurred when a “risk-significant system” (excluding security systems) was unable to meet its defined specifications;
- (i) a description of any situations or events that were cause for an abnormal or unplanned change in the power level of a reactor, whether the change was induced by the operator or by the reactor regulating system (e.g., setbacks and stepbacks in power);
- (j) the results of the monitoring, in accordance with the licence, of routinely-discharged radioactive effluents and hazardous substances, including, for each month of the quarter, the total activity or total amount released, as appropriate, and the total flow volume of condenser cooling water;
- (k) the results of any offsite monitoring in response to an unplanned release of a nuclear or hazardous substance;
- (l) the results of:
 - (i) routine surveys of radiation fields at the nuclear power plant,
 - (ii) routine measurements of the levels of radioactive contamination of surfaces at the nuclear power plant,
 - (iii) routine measurements of the concentrations of airborne nuclear substances at the nuclear power plant, and
 - (iv) any assessment to detect whether radiation hazards are increasing with time;
- (m) any radiation dose to a person, or to the person’s organs or tissues, during the occurrence of a situation or event described in 6.3.1(7) or 6.3.1(8) of this standard;
- (n) the radiation dose collectively received by each group of *workers* at the nuclear power plant;
- (o) a summary of the non-security related emergency exercises and drills that were carried out at the nuclear power plant;
- (p) a description of any revisions of non-security related emergency procedures;
- (q) where the review has been completed and the results not previously reported in a quarterly Operations Report, the results of the licensee’s annual review of the licensee’s offsite emergency procedures for the nuclear power plant and of the licensee’s arrangements with the offsite authorities involved in emergency preparedness;
- (r) a summary of the licensee’s acquisition, transfer and possession of nuclear substances, including any adjustments to be made to the inventory in order to account for radioactive decay;
- (s) where the report is for the last quarter of the calendar year, a statement of the cumulative inventory of nuclear substances at the end of the calendar year;
- (t) a description of any fires that occurred at the nuclear power plant, and an assessment of their safety significance; and
- (u) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.2 Quarterly report of performance indicators

To meet this standard, a licensee shall, within 90 days of the end of each quarter of a calendar year of operation, file with the designated CNSC contact, a report that contains the following information for the quarter:

- (a) the safety-related station Performance Indicator data in accordance with the Specification Sheets in Appendix A and the Data Sheets in Appendix B; and
- (b) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.3 Quarterly security reports

To meet this standard, a licensee shall, within 90 days of the end of each quarter of a calendar year of operation, file with the designated CNSC contact site, a report that contains security-related information for the nuclear power plant. The top, right corner of each page of the report shall be marked [PROTECTED - SECURITY] or with a higher security classification as appropriate, and the report shall be handled and filed with the CNSC under appropriate security precautions. The report shall contain the following information for the quarter:

- (a) a summary of any changes in the security organization, staffing levels, procedures or equipment of the nuclear power plant security program that could be inconsistent with the security program information contained in the licensing documents;
- (b) a brief description of any situation or event at the nuclear power plant that had or could have had security-related implications or consequences;
- (c) the titles, reference numbers and brief descriptions of any preliminary or detailed reports that were security related, and that were made to, or filed with, the CNSC pursuant to 6.3.1 of this standard;
- (d) a brief description of any additional information, regarding security related situations or events, that was filed with the CNSC, or that remained to be filed with the CNSC, under the provisions of 6.3.3.3 of this standard, as well as the titles and numbers of the detailed reports to which the additional information relates;
- (e) a summary of the security related exercises and drills that were carried out at the nuclear power plant;
- (f) a description of any revisions of security-related emergency procedures;
- (g) where completed and not previously reported in a quarterly report, the results of the licensee's annual review of the security-related emergency procedures for the nuclear power plant, including the licensee's arrangements with the emergency *response force*;
- (h) a brief description of the circumstances and causes of any failure or impairment of the security structures, systems, or components of the nuclear power plant, including any faults, combinations of faults, situations or events that prevented the security structures, systems or components from meeting their defined specifications;
- (i) a description of any mitigating measures taken when security structures, systems or components of the nuclear power plant failed to meet their defined specifications; and

- (j) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.4 Updates to facility descriptions and final safety analysis reports

Under paragraphs 6(a) and 6(b) of the *Class I Nuclear Facilities Regulations*, an application for a licence to operate a *Class I nuclear facility* shall contain descriptions of the systems, structures and equipment of the facility, including their design and design operating conditions. Paragraph 6(c) further requires the application to contain a final safety analysis report demonstrating the adequacy of the design of the nuclear facility.

Accordingly, to meet this standard, a licensee shall, within three years of the date of the last submission of the nuclear power plant facility description and final safety analysis report, unless otherwise approved in writing by the Commission or a person authorized by the Commission, file with the designated CNSC contact, a report that consists of an updated facility description and an updated final safety analysis for the nuclear power plant. This report shall include:

- (a) a description of the changes made to the site, structures, systems, and components of the nuclear power plant, including any changes to the design and design operating conditions of the structures, systems and components;
- (b) safety analyses that have been appropriately reviewed and revised, and that take into account the most up-to-date and relevant information and methods, including the experience gained and lessons learned from the situations, events, problems or other information reported pursuant to this standard; and
- (c) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.5 Reports of environmental monitoring information

To meet this standard, a licensee shall, by April 30 of each calendar year, unless otherwise approved in writing by the Commission or a person authorized by the Commission, file with the designated CNSC contact, a report that contains information pertaining to environmental monitoring activities for the previous calendar year. The report shall include:

- (a) a summary of the results of the environmental monitoring program;
- (b) an analysis of the significance, with respect to the health and safety of persons, and the protection of the environment, of the results of the environmental monitoring program;
- (c) calculations of the radiation doses to the critical group, via the environmental pathways associated with the operation of the nuclear power plant;
- (d) a description of the dosimetric models used to calculate the radiation doses reported in the report;
- (e) a description of the results of the quality assurance program that was implemented to assure the quality of the environmental monitoring;
- (f) a description of any significant events or findings with respect to the conduct of, or results of, the environmental monitoring program; and

- (g) the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.6 Reports on the progress of research and development activities

To meet this standard, a licensee shall, by June 30 of each calendar year, unless otherwise approved in writing by the Commission or a person authorized by the Commission, file with the designated CNSC contact, a progress report that documents relevant research and development activities for the previous calendar year. The report shall:

- (a) describe any research or development activities to resolve safety issues that were completed, underway or planned during the calendar year, or that were planned for future years, including the nature of the safety issues to be resolved, the progress made over the calendar year to resolve the safety issues, the actual or anticipated results of the research or development activities, and any work that remains to be done to complete the research and development activities that were not completed (i.e., that remained underway or planned) at the end of the calendar year;
- (b) include a schedule, with relevant milestones, for completing any research or development activities that were not completed at the end of the calendar year; and
- (c) include the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.7 Reports of the results of periodic inspections

To meet this standard, a licensee shall file, with the designated CNSC contact, reports that:

- (a) describe the results of any periodic inspections that the licensee has carried out in accordance with the Canadian Standards Association publications, CAN/CSA-N285.4: *Periodic Inspection of CANDU Nuclear Power Plant Components* and CAN/CSA-N285.5: *Periodic Inspection of CANDU Nuclear Power Plant Containment Components*; and
- (b) include the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

The licensee shall file the results of the periodic inspections in accordance with the relevant schedules in CAN/CSA-N285.4 and CAN/CSA-N285.5.

6.4.8 Reports on the degradation of nuclear power plant pressure boundaries

To meet this standard, a licensee shall, within 30 days of the end of each quarter of a calendar year, file with the designated CNSC contact, a report that describes, for the pressure boundaries of safety-related systems of the nuclear power plant, any associated degradation over the quarter that exceeds any limit specified in an applicable design analysis, applicable design code, applicable design standard, applicable inspection code or applicable inspection standard. The report shall:

- (a) contain a brief description of any occurrence of a pressure boundary deformation or crack that was not reported under 6.3.1(22) of this standard, including the date of discovery and magnitude of the deformation or crack, and the associated circumstances, causes and consequences;
- (b) contain a brief description of any occurrence of a pinhole, in a pressure boundary, that did not have the potential to significantly impair the operation or effectiveness of the system, including the date of discovery and magnitude of the pinhole, and the associated circumstances, causes and consequences;
- (c) contain a brief description of any occurrence of a leak, in a pressure boundary, that did not exceed any relevant limit specified in a licensing document, including the date of discovery and magnitude of the leak, and the associated circumstances, causes and consequences;
- (d) contain a brief description of the occurrence of any degradation or fault of a pressure relief device that resulted in the pressure-relief device opening during testing, at a pressure which lies between its maximum set-point pressure and the hydrostatic test pressure of the associated system, including the date of discovery of the degradation or fault, and the associated circumstances, causes and consequences;
- (e) identify any supporting documents that are relevant to the descriptions required in paragraphs (a), (b), (c) and (d); and
- (f) include the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.9 Report on the reliability of the nuclear power plant

To meet this standard, a licensee shall, by March 31 of each calendar-year, unless otherwise approved in writing by the Commission or a person authorized by the Commission, file with the designated CNSC contact, a report that covers the licensee's "reliability" program for the previous calendar-year. This report shall:

- (a) list any identified risk-significant systems, and for each, include the assigned reliability target;
- (b) predict, using current data, the probability that each risk-significant system of the nuclear power plant will perform as intended when it is required to do so;
- (c) identify, and briefly describe, any incidents over the calendar year where a risk-significant system of the nuclear power plant failed to meet its design and performance specifications;
- (d) identify, and briefly describe, any situation over the calendar year where, as a consequence of the failure or removal from service of a component of the nuclear power plant, there was an increase in the probability that a risk-significant system of the nuclear power plant might fail to perform as intended;
- (e) include, for each risk-significant system of the nuclear power plant, a comparative assessment of the reliability target for the system, the predicted reliability of the system, and the observed reliability of the system over the calendar year;
- (f) describe, for each risk-significant system of the nuclear power plant, the occurrence, nature, duration of any impairment of the system over the calendar year, and the effect of the impairment on the reliability of the system;

- (g) describe any “initiating event” that occurred over the calendar year at the nuclear power plant;
- (h) describe any change over the calendar year to the design of a risk-significant system, or to an operating practice or a maintenance practice for a risk-significant system;
- (i) describe any changes made over the calendar year to any model used to assess the reliability of a risk-significant system of the nuclear power plant;
- (j) list any scheduled activities to inspect, monitor, test or verify the reliability of a risk-significant system of the nuclear power plant that were not completed on-schedule during the calendar year;
- (k) contain the data that supports the licensee’s assessments over the calendar year of the reliability of the risk-significant systems of the nuclear power plant, including the assumed rates of failure of system components, the input data regarding human performance, the 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, and any other relevant plant-specific data ; and
- (l) include the name and address of the sender of the report, the date of completion of the report and the signature of the designated representative of the licensee.

6.4.10 Report on the fuel monitoring and inspection program

To meet this standard, a licensee shall, by April 30 of each calendar-year, unless otherwise approved in writing by the Commission or a person authorized by the Commission, file with the designated CNSC contact, a report that describes the licensee’s fuel monitoring and inspection program over the previous calendar-year.

The report shall:

- (a) describe the objectives, elements, procedures, limitations, results and conclusions of the program that the licensee conducted over the calendar year for the purpose of monitoring, inspecting and assessing the condition of the irradiated reactor fuel; and
- (b) include the name and address of the sender of the report, the date of completion of the report, and the signature of the designated representative of the licensee.

6.4.11 Reports on fissionable and fertile substances

To meet this standard, a licensee shall report to the CNSC certain information on the inventory and transfer of fissionable and fertile substances at the plant. The information to be filed with the CNSC, and the associated form, procedures and schedules for filing such information, is as stipulated in AECB-1049/Rev 2, *Reporting Requirements for Fissionable and Fertile Substances*, for the reporting of information on fissionable and fertile substances to the Atomic Energy Control Board, or as otherwise stipulated by the CNSC in any standard that replaces AECB-1049/Rev 2.

GLOSSARY

ASME

American Society of Mechanical Engineers.

defined specifications

the criteria, as set out in the nuclear power plant licensing documents, that specify the capability or performance level that a system, structure, or component of the nuclear power plant must possess or attain, in order that the plant will be able to function effectively and reliably in accordance with its safety targets.

environment

the components of the Earth, including:

- (a) land, water, and air, including all layers of the atmosphere;
- (b) all organic and inorganic matter and living organisms; and
- (c) the interacting natural systems that include components referred to in (a) and (b) above.

fire

any uncontrolled combustion, not restricted to open flame, that causes personal injury, death, property damage or results in the mobilization of the emergency response team.

initiating event

- (a) an event that initiates a sequence of events that could lead to a severe accident in the absence of action by a risk-significant system; or
- (b) an event involving a risk-significant system, that initiates a sequence of events that could have lead to a severe accident if other risk-significant systems had not acted.

initiating parameter

the physical property being measured or monitored by the triggering device for a special safety system or its subsystems.

licensing document

a document listed or referred to in a licence issued by the CNSC.

nuclear power plant

any fission-reactor installation that has been constructed to generate electricity on a commercial scale. (A nuclear power plant is a Class IA nuclear facility, as defined in the *Class I Nuclear Facilities Regulations*).

potential serious process-failure

an event that could have become a serious process failure, but, due to fortuitous circumstances rather than to design provisions or approved procedures, did not.

pressure boundary

a boundary of any pressure-retaining vessel, system or component of a nuclear or non-nuclear system, where the vessel, system or component is registered, or eligible for registration, under boiler or pressure vessel legislation.

reliability

the ability of a system, structure or component to perform, in accordance with its defined specifications, its required function under given conditions for a defined time period, or upon demand.

risk-significant system

any system of the plant that, if it fails to meet its design or performance specifications, could result in unreasonable risk to the health and safety of persons, to national security or to the environment.

root-cause analysis

an objective, structured, systematic and comprehensive analysis that is designed to determine the underlying reason(s) for a situation or event, and that is conducted with a level of effort that is consistent with the safety significance of the event.

safety-related system

as specified by the licensee in accordance with the version of the Canadian Standards Association publication, CAN/CSA-N286.0, *Overall Quality Assurance Program Requirements for Nuclear Power Plants* that is specified in the nuclear power plant licence.

safety-significant

that has potential to result in an increased risk to the health and safety of persons, security or the environment.

serious process failure

a failure of a process system, a component or a structure:

- (a) that lead to a systematic fuel failure or to a significant release from the nuclear power plant, or
- (b) that could have lead to a systematic fuel failure or a significant release in the absence of action by any special safety system.

significant release

a release of radioactive material that results in an effective dose, received by or committed to a typical member of the critical group, in excess of 500 μSv (50 mrem).

special safety system

the shutdown system no.1, the shutdown system no. 2, the containment system, or the emergency core cooling system, of a nuclear power plant.

standby safety-related system

as specified by the licensee in accordance with the version of the Canadian Standards Association publication, CAN/CSA-N286.0, *Overall Quality Assurance Program Requirements for Nuclear Power Plants* that is specified in the nuclear power plant licence.

systematic fuel failure

fuel that has no defect prior to an event, fails or exceeds the fuel integrity criteria defined in the licensing documents as a result of the event.

APPENDICES**A. Performance Indicator Specification Sheets****B. Performance Indicator Data Sheets**

The Performance Indicator Data Sheets in Appendix B are provided for illustrative purposes. The licensee may choose to use the data sheets herein, develop their own, or use a combination of both. However, it is essential that all information requested on the data sheets be provided. An electronic version of this document is available from the CNSC to permit computer generated copies of the data sheets.

APPENDIX A

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1. **Title:** ACCIDENT SEVERITY RATE / ACCIDENT FREQUENCY
2. **Purpose:**
To indicate the accident severity rate and accident frequency at NPPs.
To monitor performance in meeting nuclear industry standards in the area of worker safety.
To compare Canadian NPP performance internationally.
3. **Definition:**
The accident severity rate is the total number of days lost or charged for all disabling injuries per 200,000 person hours worked at a NPP.
Accident frequency is the number of disabling injuries per 200,000 person hours worked at a NPP.
4. **Calculation:**
Accident Severity Rate = Number of days lost / 200,000 person hours
Accident Frequency = Number of disabling injuries / 200,000 person hours
5. **Notes:**
 - 5.1 A disabling injury is one that prevents an employee from reporting for work or from effectively performing all the duties connected with the employee's regular work.
 - 5.2 An employee is any individual (contractor, temporary staff) performing work at the NPP.
 - 5.3 The Canadian federal reporting requirement for severity includes shifts not worked. For example, a person is hurt on the last regularly scheduled shift and then is away for two days that were regularly scheduled off. If the person would not have been able to work those two days, but was able to return to work on the first regularly scheduled day, those two days would be counted as lost days.
 - 5.4 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, recurred in 1996 (with no new accident) the lost days would not appear in 1996 totals. These days are attributed back to 1994.
 - 5.5 Permanent (partial) disability resulting from a disabling injury can be assigned equivalent lost days by the licensee. Submit appropriate information showing conversion data for each disabling injury.

1. **Title:** CHEMISTRY INDEX

2. **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.

3. **Definition:**

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

4. **Calculation:**

$$\text{Chemistry Index (\%)} = \frac{\sum_{i=1}^m \frac{a_i}{A}}{m}$$

a_i the number of hours that parameter "i" is in specification during the quarter;

A the number of hours the plant is in an operational state during the quarter, as defined by licensee-specific documentation;

a_i/A the fraction of time that parameter "i" is in specification during the quarter;

m the number of parameters monitored during the period, usually the 15 parameters on the list below.

$\sum_{i=1}^m \frac{a_i}{A}$ sum of individual time-in-specification fractions for each parameter monitored in the index.

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

5. **Parameters Monitored:**

Primary Heat Transport System:

- pH_a (calc)
- dissolved D₂
- chloride
- fluoride
- conductivity

Steam Generators:

- [Cl⁻]
- [SO₄²⁻]
- [Na⁺]

Annulus Gas [O₂]

Feedwater:

- dissolved [O₂]
- total iron
- total copper
- hydrazine

Condensate Extraction Pump:

- dissolved [O₂]
- pH

6. **Notes:**

- 6.1 The Chemistry index shall be reported as the percentage of time in specification and is calculated as follows for each parameter:

$$\% \text{ time in-specification} = \frac{\text{Hours in-specification}}{\text{Total operating hours in period}} \times 100$$

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 for the system that the chemical parameter pertains to.

- 6.2 Parameters which are included in the indicator but were not measured (because the monitoring capability did not exist or the measurements were not obtained during the period, e.g. an instrument 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 "void". The data shall be auditable.

It is recognized that in some cases a temporary exemption is granted for measurement of a parameter, or 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 for the parameter for the specific time period. If 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, as well as 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 equation in Section 14.7 should be adjusted to reflect the number of parameters actually tracked during the specific quarter.

- 6.3 For those systems whose performance is reported only for unit operating conditions, the following guidelines shall be utilized:

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.

- 6.4 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 manuals. 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.
- 6.5 The reference chemical specifications and sampling frequency for each parameter shall be as documented in the most current revision of the licensee's Chemical Specifications Manual. 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.

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

Where on-line monitoring equipment is available, the success ratio will be calculated as the ratio of time where the monitoring is on-line 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.

- 6.7 For multi-unit sites, the unit performance is the average of the performance of the individual control parameters. On an operating unit basis:

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

- 6.8 The station result is the time-weighted average of the operating units' Chemistry or Chemistry Compliance Index values; this ensures that units which were operating for only part of the period are not given the same weight as those which operated for the whole period.

$$\text{Station Index} = \frac{\sum (\text{index for each unit} \times \text{operating hours for unit})}{\sum (\text{operating hours for all units})}$$

- 6.9 Performance does not need to be reported for parameters during short duration trials or tests being conducted to optimize chemistry and which affect those parameters.
- 6.10 Parameters making up the list of the index, and the definitions of time-in-specification and voiding are reviewed by the CNSC.

1. **Title:** CHEMISTRY COMPLIANCE INDEX (Non-GSS and GSS)
2. **Purpose:**
To indicate unit control of safety-related chemical and radiochemical parameters.
To monitor performance in meeting regulatory and licensee requirements in chemistry.
To compare performance between Canadian CANDU units.
3. **Definition:**
The average percentage of time that the selected chemical parameters are in specification during the quarter.
4. **Calculation:**
Sampling frequencies and specifications shall be defined in the licensee's operating documentation. The method for calculation of the Chemistry Index also applies to this Chemistry Compliance indices (Non-GSS, GSS). The parameters are selected as compliance parameters in accordance with most OP&P requirements, and on the basis of safety.
5. **Parameters Monitored:**

Non-GSS Operating Conditions

[Gd] in Liquid Injection Safety System Poison Injection Tanks

[Gd] in Moderator (unit in poison outage, SDS2 actuated)

Moderator D₂O Isotopic

Moderator H³

Moderator Cover gas D₂

Moderator Conductivity

Primary Heat Transport System D₂O isotopic

Primary Heat Transport System H³

Primary Heat Transport System I¹³¹

Primary Heat Transport System D₂O Storage Tank Cover Gas D₂

Moderator to Primary Heat Transport System D₂O Isotopic Purity Difference Check

Annulus Gas System Dewpoint

End Shield Cooling Water pH

End Shield Cooling Cover Gas H₂ (for Point Lepreau, Gentilly-2, Pickering B)

Emergency Coolant Injection System High Pressure Water Tank(s) pH

ECI HP Water Tank(s) Hydrazine Concentration

Liquid Zone Control System Cover Gas [H₂]

Liquid Zone Control System Conductivity

GSS Conditions

Liquid Injection Safety System Poison Injection Tanks pH_a (when SDS2 is available)

[Gd] in Moderator
Moderator D₂O Conductivity (except for Gentilly-2)
Moderator D₂O pH_a
Supplementary parameter(s) sampled

6. Notes:

- 6.1 The Chemistry Compliance indices (Non-GSS and GSS) shall be reported as the percentage of time in specification and is calculated as follows for each parameter:

$$\% \text{ time in specification} = \frac{\text{Hours in specification}}{\text{Total operating hours in period}} \times 100$$

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 for the system that the chemical parameter pertains to.

- 6.2 Parameters which are included in the indicator but were not measured (because the monitoring capability did not exist or measurements were not obtained during the period, e.g. an instrument 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 "void". The data shall be auditable.

It is recognized that in some cases a temporary exemption is granted for measurement of a parameter, or 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 for the parameter for the specific time period. If 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, as well as 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 equation in Section 14.7 should be adjusted to reflect the number of parameters actually tracked during the specific quarter.

- 6.3 For those systems whose performance is reported only for unit operating conditions, the following guidelines shall be utilized:

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.

- 6.4 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 manuals. 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.
- 6.5 The reference chemical specifications and sampling frequency for each parameter shall be as documented in the most current revision of the licensee's Chemical Specifications Manual. 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.

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

Where on-line monitoring equipment is available, the success ratio will be calculated as the ratio of time where the monitoring is on-line 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.

- 6.7 For multi-unit sites, the unit performance is the average of the performance of the individual control parameters. On an operating unit basis:

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

- 6.8 The station result is the time-weighted average of the operating units' Chemistry or Chemistry Compliance Index values; this ensures that units which were operating for only part of the period are not given the same weight as those which operated for the whole period.

$$\text{Station Index} = \frac{\sum (\text{index for each unit} \times \text{oper. hrs. for unit})}{\sum (\text{operating hrs. for all units})}$$

- 6.9 Performance need not be reported for parameters during short duration trials or tests being conducted to optimize chemistry and which affect those parameters.
- 6.10 Parameters making up the list of the index, and the definitions of time-in-specification and voiding are reviewed by the CNSC.

1. **Title:** CHANGE CONTROL INDEX
2. **Purpose:**
To indicate the control over changes in equipment and procedures for safety-related systems.
To monitor performance in the management of change for the safety-related systems.
3. **Definition:**
Change control index is the count of the number of temporary changes used to maintain control over NPP equipment and procedures.
4. **Calculation:**
 - 4.1 Total number of pages of temporary procedural changes.
 - 4.2 Total number of pages of temporary procedural changes over six months old.
 - 4.3 Total number of temporary equipment changes.
 - 4.4 Total number of temporary equipment changes over six months old.
 - 4.5 Total number of incomplete permanent equipment changes.
5. **Notes:**
 - 5.1 All equipment or procedural changes for the indicator shall include the safety-related systems identified by the NPP staff.
 - 5.2 Permanent changes are considered incomplete until all testing, design, installation and operating documentation have been amended.
 - 5.3 Data is collected on a unit basis, include data for common unit (unit 0) for multi-unit NPPs.

1. **Title:** **RADIOLOGICAL EMERGENCIES PERFORMANCE INDEX**
2. **Purpose:**
To provide a measurement of the performance of a nuclear power plant's emergency preparedness plan during radiological emergencies.
3. **Definition:**
This index is the percentage of all the successful Performance Opportunities to the total number of Performance Opportunities identified during the previous eight quarters.
4. **Calculation:**
 - 4.1 Radiological Emergencies Performance Index =

$$\frac{\text{Number of successful Performance Opportunities during the previous 8 quarters}}{\text{Total number of Performance Opportunities during the previous 8 quarters}} \times 100$$
5. **Notes:**
 - 5.1 Performance Opportunities are:
 - Categorizing a radiological emergency;
 - Notifying offsite authorities;
 - Providing decision making information to local authorities;
 - Developing protective action recommendations.
 - 5.2 A Performance Opportunity is successful when both the Timeliness and the Accuracy criterion are fulfilled.
 - 5.3 The Timeliness Criteria and the Accuracy Criteria are specified in the licensee's Emergency Preparedness Plan.
 - 5.4 Details of any failed Performance Opportunity shall be included in the explanation of data section of the data sheet.
 - 5.5 Emergencies, drills evaluated by the Emergency Response Organization (ERO), exercises, and other simulated emergencies which are assessed and that interact with one or more of the facilities or functions listed in 5.6 shall be included in this indicator.
 - 5.6 The ERO consists of the following facilities and functions:
 - Control Room
 - Technical Support Group, Technical Advisory Group, Site Management Centre
 - Operations Support Group
 - Emergency Operations Facility
 - Emergency Response Teams
 - Field Monitoring Teams
 - Damage Control Teams
 - Joint Information or Local Media Centre
 - Offsite Governmental Authorities
 - 5.7 Training practices shall not be included in this indicator.

1. **Title:** **EMERGENCY RESPONSE ORGANIZATION (ERO)
DRILL PARTICIPATION INDEX**
2. **Purpose:**
To track the participation of Emergency Response Organization (ERO) personnel in drills, exercises, or events within a nuclear power plant.
3. **Definition:**
This index is the percentage of the total available ERO personnel who have participated in proficiency-enhancing drills, exercises, practical evaluation opportunities, or in events during the previous eight quarters.
4. **Calculation:**
ERO Drill Participation Index = $[A / B] \times 100$

Where:
A = number of ERO personnel fulfilling designated ERO positions that have participated in a qualifying drill, exercise, practical evaluation, or event during the previous 8 quarters.
B = total number of ERO personnel fulfilling designated ERO positions during the previous 8 quarters.
5. **Notes:**
 - 5.1 Designated ERO positions are those performing the following functions:
 - Categorization of event
 - Offsite notification
 - Plant operations
 - Corporate resources
 - Radiological monitoring
 - Dose projection
 - 5.2 ERO personnel who have participated in more than one event during the last eight quarters shall be counted only for their most recent participation.
 - 5.3 Changes in the number of designated ERO personnel shall be reflected in both, the numerator and denominator of this index.
 - 5.4 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 previous eight quarters.

1. **Title: EMERGENCY RESPONSE RESOURCES COMPLETION INDEX**
2. **Purpose:**
To indicate the level of verification of emergency response equipment and facilities dedicated to emergency preparedness at the nuclear power plants.
3. **Definition:**
This index is the percentage of preventative maintenance items, tests and checks completed for the emergency response equipment and facilities over the total number of preventative maintenance items, tests and checks scheduled during the quarter.
4. **Calculation:**
ER Resources Completion Index = $[A/B] \times 100$
Where:
A = the number of preventative maintenance items, tests and checks completed during the quarter
B = the number of preventative maintenance items, tests and checks scheduled during the quarter
5. **Notes:**
 - 5.1 Licensees shall provide to the CNSC a complete listing of preventative maintenance items, tests, and inventory checks pertaining dedicated equipment and facilities which 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; and
 - Other dedicated emergency equipment and facilities identified in the CNSC regulatory guide G-225, Emergency Planning at *Class I Nuclear Facilities* and Uranium Mines and Mills.
 - 5.2 Pre-determined dates for the preventative maintenance items, tests and checks shall be used to measure schedule compliance. This index measures the number of preventative 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 nor whether equipment was missing.

1. **Title:** NON-COMPLIANCE INDEX
2. **Purpose:**

To indicate the number of occurrences where the operation of the NPP failed to comply with its licence conditions, or with the *Nuclear Safety and Control Act* and Regulations.
To compare performance between Canadian NPPs.
3. **Definition:**

A non-compliance is a failure to comply with the *Nuclear Safety and Control Act* and regulations, or any condition of the licence, including documents referenced therein.
4. **Calculation:**

Non-compliance index = total number of situations or events that have at least one non-compliance in the following categories.
Non-compliance sub-index = total number of non-compliances for each of the categories.

Categories:

 - number of non-compliances of the Operating Policies & Principles referenced in the licence;
 - number of non-compliances of the radiation protection requirements referenced in the licence;
 - number of non-compliances with the minimum shift complement referenced in the licence;
 - number of other non-compliances with the licence;
 - number of non-compliances with the *Nuclear Safety and Control Act* and Regulations.
5. **Notes:**
 - 5.1 A reportable situation or event is as defined by the CNSC regulatory standard “Reporting Requirements for Operating Nuclear Power Plants, S-099 (Rev. 1)(E)”.
 - 5.2 The values to be used in the calculation will be based on the date of reporting of the situation or event.
 - 5.3 For each situation or event reported, the licensee must indicate which non-compliance category applies. Use only the non-compliance category which most accurately describes the situation. Do not double count.
 - 5.4 In multi-unit NPPs, the licensee must indicate the applicable unit(s) of each non-compliance.

1. **Title:** NUMBER OF PRESSURE BOUNDARY DEGRADATIONS
2. **Purpose:**
To indicate the number of pressure boundary degradations which have occurred at the NPP.
To monitor the performance in meeting nuclear industry codes and standards.
To compare performance between Canadian NPPs.
3. **Definition:**
Pressure boundary degradation: a degradation of the pressure boundary of a safety-related system that exceeds a limit specified in the applicable design analysis, design codes or standards, or inspection codes or standards.
Pressure boundary: any pressure-retaining vessel, system or component that is subject to registration or that is registered under the applicable boiler and pressure vessel legislation, whether a conventional system or a nuclear system.
4. **Calculation:**
The sum of the number of pressure boundary degradations in each of the following categories:
 a_{n1} = number of pressure boundary degradations in Class 1 nuclear systems reported under S-99 in a given quarter;
 a_{n2} = number of pressure boundary degradations in Class 2 nuclear systems reported under S-99 in a given quarter;
 a_{n3} = number of pressure boundary degradations in Class 3 nuclear systems reported under S-99 in a given quarter;
 a_{n4} = number of pressure boundary degradations in Class 4 nuclear systems reported under S-99 in a given quarter;
 a_{nc} = number of pressure boundary degradations in conventional systems reported under S-99 in a given quarter.
5. **Notes:**
 - 5.1 For examples of pressure boundary degradations, see main body of S-99.
 - 5.2 In the above categorization, classes 1, 2, 3 and 4 refer to what the code class of the failed or degraded component would be under the requirements of the CSA standard N285.0.

- 1 **Title:** PREVENTIVE MAINTENANCE COMPLETION RATIO
- 2 **Purpose:**

To indicate the fraction of preventive maintenance jobs to total maintenance jobs completed.
To monitor performance in meeting nuclear industry expectations in the area of preventative maintenance.
To compare performance between Canadian NPPs.
- 3 **Definition:**

Preventive maintenance completion ratio is the ratio of preventive maintenance (PM) jobs completed divided by the preventive maintenance plus corrective maintenance (CM) jobs completed.
- 4 **Calculation:**

(PM jobs per quarter)

$$\frac{\text{(PM jobs per quarter)}}{\text{(PM jobs per quarter + CM jobs per quarter)}} \times 100 = \text{Preventive Maintenance Completion \%}$$
- 5 **Notes:**
 - 5.1 Preventative maintenance jobs are jobs performed on the safety-related system equipment in the field, that is in working order when the job commences. The preventative maintenance jobs shall include those that are frequency or condition based.
 - 5.2 Corrective maintenance jobs are jobs performed as a result of a reported failure of safety-related system equipment. It shall not include design modifications.
 - 5.3 Work orders on safety-related systems are work orders that are written during the quarter to correct deficiencies in safety-related systems. Work orders 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.
 - 5.4 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.

1. **Title:** **RADIATION OCCURRENCE INDEX**
2. **Purpose:**

To indicate the number and weighted severity of radiation occurrences which have taken place at the NPP.

To monitor the performance in meeting the CNSC's expectations in the area of worker radiation protection.

To compare performance between Canadian NPPs.
3. **Definition:**

A radiation occurrence is an occurrence where one or more of the following has occurred:

 - fixed body contamination exceeding 50 kBq/square metre ($1.35 \mu\text{Ci}/\text{m}^2$) has been detected,
 - an unplanned acute whole body dose (resulting from an external exposure) exceeding 5 mSv (500 mrem) has been received,
 - an unplanned acute intake of radioactive material resulting in an effective dose greater than 2 mSv (200 mrem) has taken place,
 - an acute or committed dose in excess of any of the limits specified in the Radiation Protection Regulations Part 1 (Ontario Power Generation), Directives de Santé et Normes de Radioprotection (Hydro-Quebec), or the Radiation Protection Regulations (New Brunswick Power) has been received.
4. **Calculation:**

Radiation occurrence index = $a + 5b + 5c + 50d$.

where: a = number of occurrences in a quarter, after decontamination attempts, where fixed body contamination in excess of 50 kBq/square metre ($1.35 \mu\text{Ci}/\text{m}^2$) was measured;

b = number of occurrences in a quarter where an unplanned acute whole body dose (resulting from an external exposure) exceeding 5 mSv (500 mrem) was received;

c = number of occurrences in a quarter where an intake of radioactive material resulted in an effective dose greater than 2 mSv (200 mrem), normalized to 2 mSv;

d = number of occurrences in a quarter where an acute or committed dose in excess of any of the limits specified in the Radiation Protection Regulations Part 1 (Ontario Power Generation), the Directives de Santé et Normes de Radioprotection (Hydro-Québec), or the Radiation Protection Regulations (New Brunswick Power) was received.
5. **Notes:**
 - 5.1 The values of the weighting factors (1, 5, 5, 50) required to differentiate between the least safety-significant radiation occurrences and the most serious ones are not risk-based. They are an approximation of the significance for each type of situation or event.
 - 5.2 The total for 'c' above is normalized to 2 mSv. This means that the actual dose received as a result of the occurrence(s) is divided by 2 mSv. For example: two unplanned exposures as a result of separate intake incidents, one of 3 mSv and one of 4 mSv, would result in a value for 'c' = $3 \text{ mSv}/2 \text{ mSv} + 4 \text{ mSv}/2 \text{ mSv} = 1.5 + 2 = 3.5$. This value 'c' would then be multiplied by the weighting factor 5.

- 5.3 Only the higher level of consequence will be calculated for a single occurrence to prevent double counting. For example: If a single occurrence results in an unplanned acute whole body dose exceeding 5 mSv (500 mrem), and in the affected workers whole body dose exceeding the legal limit, the occurrence would be counted as a “d” type of occurrence (the most serious type) and not as one “b” type and one “d” type.

1. **Title:** NPP RADIATION DOSE
2. **Purpose:**

To indicate the total dose due to ionizing radiation received by all individuals working at the NPP and its related facilities.
To monitor the performance in keeping NPP whole body dose as low as reasonably achievable.
To compare Canadian NPP performance internationally.
3. **Definition:**

The sum of the whole body doses due to ionizing radiation received by individuals (including permanent, part-time and temporary staff, external contractors, consultants etc.) working at the NPP and its related facilities, over the year.
The sum of the total estimated external dose from NPP Outages.
4. **Calculation:**

NPP Total Whole Body Dose = Total internal + external dose for the NPP.
Average dose per unit = NPP Total Whole Body Dose/ Number of units Operating or Being Rehabilitated
Average dose per worker in NPP = NPP Total Whole Body Dose/ Number of Workers at NPP (receiving a non-zero dose)
Total estimated external dose per outage = Sum of estimated external doses from NPP outages
5. **Notes:**
 - 5.1 A unit outage is considered “planned” when preparations and the decision to shutdown the unit have been made in advance, regardless if the unit enters into the outage at an earlier time than the target date due to a forced shutdown.
 - 5.2 Dose related to work during unplanned power outages, forced shutdowns or power manoeuvres, or short outages such as poison prevent operation, are not to be reported under “planned outages”. Also doses from activities on a unit which is decommissioned, mothballed or in lay-up are not to be reported under “planned outages”.
 - 5.3 Doses attributed to an outage include the doses directly related to the preparation of the outage, the start-up and related power manoeuvres.
 - 5.4 Doses from neutron exposures should normally be accounted for, in this indicator.
 - 5.5 For the purposes of the CNSC performance indicator program, whole body doses can be considered equivalent to deep doses.
 - 5.6 Total NPP Whole Body Dose is to include all doses (outage and operation) received by individuals (including permanent, part-time and temporary staff, external contractors, consultants etc.) working at the NPP and its related facilities, over the year.
 - 5.7 Dose commitments to staff resulting from common NPP services such as Unit zero, heavy water upgrading, or from activities in facilities directly related to the operation of the unit such as laundry, decontamination, fuelling, waste handling, are to be included in the “Total NPP Whole Body Dose”.

- 5.8 Doses to visitors, or from initiatives related to public information programs are to be excluded from this indicator.
- 5.9 Number of units used in the “ average dose per unit” is the number of units that are operating or being actively rehabilitated and thus contribute significantly to “NPP Total Whole Body Dose”.

1. **Title: NUMBER OF MISSED MANDATORY SAFETY SYSTEM TESTS**
2. **Purpose:**

To indicate successful completion of tests required by licence condition, including those referenced in documents submitted in support of a licence application.
To monitor performance in meeting regulatory and licensee availability requirements.
3. **Definition:**

The number of missed safety system tests is the sum of those tests that are not completed for each of the three groups of safety-related systems (i.e., the Special Safety Systems, the Standby Safety Systems, and other Safety-Related Process Systems) reported under S-99 in a quarter.
4. **Calculation:**

Number of Missed Tests = a + b + c

where:

a = number of missed tests Special Safety Systems;

b = number of missed tests for the Standby Safety Systems;

c = number of missed tests Safety-Related Process Systems;
5. **Notes:**
 - 5.1 For the purpose of this performance indicator, the following shall apply:
Special Safety Systems: SDS1, SDS2 (SDSE for PNGS-A), ECC, and Containment;
Standby Safety Systems: Boiler Emergency Cooling, Emergency Power Supply, Standby Generators, Emergency Filtered Air Discharge, Emergency Water, Inter-Unit Feedwater Tie;
Safety-Related Process Systems: Reactor Regulating, Heat Transport, Moderator, Class I, II, and III, Auxiliary Boiler Feed, Service Water.
This list may be expanded in the future.
 - 5.2 Missed tests refer to those not completed, as opposed to those that fail.
 - 5.3 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.
 - 5.4 For multi-unit stations, station-wide tests shall be reported under unit 0.
 - 5.5 For benchmarking, report the total number of tests performed for each category, a, b, c.

1. **Title:** NUMBER OF UNPLANNED TRANSIENTS
2. **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.
To compare performance between Canadian NPPs.
3. **Definition:**

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

 - (a) Unplanned reactor setbacks and stepbacks, both automatic and manual, which occur while the reactor is not in a guaranteed shutdown state. These reactor setbacks and stepbacks are the events resulting from the corrective actions taken by operator or the internal plant equipment failure, spurious signal, human error or external events such as severe weather, earthquake, aeroplane strike, grid instability, railway explosion, etc.
 - (b) Unplanned reactor trips, both automatic and manual, which occur while the reactor is not in a guaranteed shutdown state. These reactor trips are the result of the events arising from corrective actions taken by operator or internal plant equipment failure, spurious signal, human error, or external events such as severe weather, earthquake, aeroplane strike, grid instability, railway explosion, etc.
4. **Calculation:**

The total number of unplanned transients in a quarter for a unit. The total number of hours during which the reactor is either being placed in GSS or is in GSS.
5. **Notes:**
 - 5.1 The manual reactor trips, setbacks or stepbacks which are required by planned (as opposed to forced) outage maintenance or routine testing are not to be included.
 - 5.2 If a situation or event results in a combination of a reactor setback, stepback and/or trip in sequence, then the total number of transient will be counted in as one.
 - 5.3 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.
 - 5.4 After a reset of reactor setback, stepback and/or trip by operator and the reactor power is allowed to increase, if another transient occurs again due to failure to correct causes of the initial transient, then the subsequent reactor setback, stepback and/or trip shall be included in the calculation of the number of unplanned transients.

1. **Title:** UNPLANNED CAPABILITY LOSS FACTOR
2. **Purpose:**
To indicate how a unit is managed, operated, maintained in order to avoid unplanned outages.
To compare Canadian NPP performance internationally.
3. **Definition:**
This indicator is defined in WANO, Implementing Guideline 19.1 (1993), addendum September 1996.
4. **Calculation:**
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) = $UEL \times 100\% / REG$
5. **Notes:**
 - 5.1 Referenced WANO document, WANO IG 19.1 ANR1.OR, September 1996.

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ACCIDENT SEVERITY RATE, ACCIDENT FREQUENCY	
NPP: Year: Quarter:	
Number of days lost = Number of person-hours worked at NPP = Number of disabling injuries =	
Explanation of data, if required:	
Prepared By:	Date:

CHEMISTRY INDEX	
NPP: Unit: Year: Quarter:	
a_i the number of hours that parameter “i” is in specification during the quarter	
A the number of hours the plant is in an operational state (as defined by licensee-specific documentation) during the quarter A=	
Primary Heat Transport System pH _a (calc)	a ₁ =
Primary Heat Transport System dissolved D ₂	a ₂ =
Primary Heat Transport System chloride	a ₃ =
Primary Heat Transport System fluoride	a ₄ =
Primary Heat Transport System conductivity	a ₅ =
Annulus Gas [O ₂]	a ₆ =
Steam Generators chloride	a ₇ =
Steam Generators sulphate	a ₈ =
Steam Generators sodium	a ₉ =
Feedwater dissolved O ₂	a ₁₀ =
Feedwater total iron	a ₁₁ =
Feedwater total copper	a ₁₂ =
Feedwater hydrazine	a ₁₃ =
Condensate Extraction Pump dissolved O ₂	a ₁₄ =
Condensate Extraction Pump pH	a ₁₅ =
Chemistry index	= %
Explanation of data, if required (attach supplementary pages as necessary):	
Prepared by:	Date:

CHEMISTRY COMPLIANCE INDEX

NPP:
Unit:
Year:
Quarter:

Non-GSS Operating Conditions

a_i	the number of hours that parameter "i" is in specification during the quarter	
A	the number of hours that the plant is in an operational state (Non-GSS) (as defined by licensee-specific documentation) during the quarter	A=
[Gd] in Liquid Injection Safety System Poison Injection Tanks		$a_1 =$
[Gd] in Moderator (unit in poison outage, SDS2 actuated)		$a_2 =$
Moderator D ₂ O Isotopic		$a_3 =$
Moderator H ³		$a_4 =$
Moderator Cover gas D ₂		$a_5 =$
Moderator Conductivity		$a_6 =$
Primary Heat Transport System D ₂ O Isotopic		$a_7 =$
Primary Heat Transport System H ³		$a_8 =$
Primary Heat Transport System I ¹³¹		$a_9 =$
Primary Heat Transport System D ₂ O Storage Tank Cover Gas D ₂		$a_{10} =$
Moderator to Primary Heat Transport System D ₂ O Isotopic		
Purity Difference Check		$a_{11} =$
Annulus Gas System Dewpoint		$a_{12} =$
End Shield Cooling Water pH		$a_{13} =$
End Shield Cooling Cover Gas H ₂ (for Point Lepreau, Gentilly-2, Pickering B)		$a_{14} =$
ECI HP Water Tank(s) pH		$a_{15} =$
ECI HP Water Tank(s) Hydrazine Concentration		$a_{16} =$
Liquid Zone Control Cover Gas [H ₂]		$a_{17} =$
Liquid Zone Control Conductivity		$a_{18} =$

CHEMISTRY COMPLIANCE INDEX (continued)

GSS Conditions

For all units in guaranteed shutdown state (GSS) during the quarter, or part of the quarter:

- b_i the number of hours that parameter “i” is in specification during the quarter while the plant is in GSS
- B the number of hours that the plant is in a GSS (as defined by licensee-specific documentation) during the quarter B=

Liquid Injection Safety System Poison Injection Tanks pH_a, b₁ =
 (when SDS2 is available)

[Gd] in Moderator b₂ =

Moderator D₂O Conductivity (except for Gentilly-2) b₃ =

Moderator D₂O pH_a b₄ =

Supplementary parameter(s) sampled b₅ =

Chemistry Compliance Index = %

Explanation of data, if required:

Prepared by:

Date:

CHANGE CONTROL INDEX					
NPP: Year: Quarter:					
Indicator	Unit #				
4.1 Total number of pages of temporary procedural changes.					
4.2 Total number of pages of temporary procedural changes over six months old.					
4.3 Total number of temporary equipment changes.					
4.4 Total number of temporary equipment changes over six months old.					
4.5 Total number of incomplete permanent equipment changes.					
Explanation of Data, if required:					
Prepared by:			Date:		

EMERGENCY RESPONSE ORGANIZATION (ERO) DRILL PARTICIPATION INDEX

NPP:
 Year:
 Quarter:

For the previous 8 quarters, submit the number of designated ERO positions, frequencies of participation by ERO members in drills, exercises, or events, and the total number of designated ERO members.

Suggested addition:

Number of key ERO personnel participating in drill/event in previous 8 quarters =
 Total number of key ERO personnel in reporting quarter =
 ERO Drill Participation Index = %

Explanation of data, if required:

Prepared by:

Date:

EMERGENCY RESPONSE RESOURCES COMPLETION INDEX	
NPP: Year: Quarter:	
Submit a table identifying the number of preventative maintenance items completed and the number of preventative maintenance items scheduled during the quarter.	
Explanation of data, if required: Suggested addition: Number of preventative maintenance items, tests and checks completed = Number of items scheduled =	
Prepared by:	Date:

NON-COMPLIANCE INDEX

NPP:
Year:
Quarter:

In the table below, list each event where a non-compliance has taken place. For each event, note which of the following non-compliance categories are applicable by putting an “X” in the appropriate column.

- a = number of non-compliances with the Operating Policies & Principles that are referenced in the licence;
- b = number of non-compliances with the radiation protection requirements that are referenced in the licence;
- c = number of non-compliances with the minimum shift complement that is referenced in the licence;
- d = number of other non-compliances with the licence;
- e = number of non-compliances with the *Nuclear Safety and Control Act* and Regulations.

Licensee Event Number	Applicable Unit(s)	Non-Compliance Category				
		a	b	c	d	e

Explanation of data, if required;

Prepared by:

Date:

NUMBER OF PRESSURE BOUNDARY DEGRADATIONS	
NPP: Unit: Year: Quarter:	
a_{N1} = number of PBD in Class 1 nuclear systems = a_{N2} = number of PBD in Class 2 nuclear systems = a_{N3} = number of PBD in Class 3 nuclear systems = a_{N4} = number of PBD in Class 4 nuclear systems = a_{NC} = number of PBD in conventional systems =	
Note: In this data sheet, PBD means pressure boundary degradation(s)	
Explanation of data, if required:	
Prepared by:	Date:

PREVENTIVE MAINTENANCE COMPLETION RATIO					
NPP: Year: Quarter:					
	Unit #				
(i) Total number of preventive maintenance jobs on safety-related systems completed.					
(ii) Total number of corrective maintenance jobs on safety-related systems completed.					
(iii) Total number of Work Orders on safety-related systems created during quarter.					
Explanation of data, if required:					
Prepared by:			Date:		

RADIATION OCCURRENCE INDEX			
NPP: Year: Quarter:			
Type (a,b,c,d)	Licensee's Event Number	Date of Event	Fixed Contamination (kBq/square metre) or Dose Received (milliSieverts)
Explanation of data, if required:			
Prepared by:		Date:	

NPP RADIATION DOSE				
NPP: YEAR:				
Estimated External Whole Body Dose from Planned Outages (millisievert, no decimals required)				
Unit Number:				
Outage Duration (days):				
Estimated External Dose:				
Total NPP Whole Body Dose (millisievert, no decimals required)				
External Dose:				
Internal Dose:				
Total NPP Whole Body Dose:				
Number of Workers receiving a non zero Radiation Dose:				
Number of Units Operating or being rehabilitated:				
Explanation of data, if required:				
Prepared by:			Date:	

NUMBER OF MISSED MANDATORY SAFETY SYSTEM TESTS	
NPP: Unit: Year: Quarter:	
Number of missed tests for the Special Safety Systems, Total number of Special Safety Systems tests performed	a = =
Number of missed tests for the Standby Safety-Related Systems, Total number of Standby Safety-Related Systems tests performed	b = =
Number of missed tests for the Safety-Related Process Systems, Total number of Safety-Related Process Systems tests performed	c = =
Explanation of data, if required:	
Prepared by:	Date:

NUMBER OF UNPLANNED TRANSIENTS				
NPP: Unit: Year: Quarter:				
Total hours during which the reactor is in guaranteed shutdown state for quarter =				
Reactor Trips:				
Auto or Manual	Affected Trip Parameter(s)	% Full Power Prior to Trip	Event Date	Licensee's Event Reference Number
Reactor Stepbacks:				
Auto or Manual	Affected Trip Parameters	% Full Power Prior to Stepback	Event Date	Licensee's Event Reference Number
Reactor Setbacks:				
Auto or Manual	Affected Trip Parameters	% Full Power Prior to Setback	Event Date	Licensee's Event Reference Number
Explanation of data, if required:				
Prepared by:			Date:	

Performance Indicator Data Sheet

UNPLANNED CAPABILITY LOSS FACTOR	
NPP: Unit: Year: Quarter:	
Reference Capacity (MW) = Reference Period (Quarter Hours) = Total Unplanned Energy Loss per Quarter (MW-Hrs) = Licensee to submit a graphical representation of unit power history for the quarter, a brief description of all energy losses (power reduction, duration in hours, reason for the reduction from the reference capacity) and the classification of the energy loss(es) as either unplanned losses, planned losses or losses due to "external" effects.	
Explanation of data, if required:	
Prepared by:	Date:

