



DRAFT
REGULATORY
GUIDE

**Life Extension of
Nuclear Power Plants**

G-360

Issued for public comment
May 2006

TYPES OF REGULATORY DOCUMENTS

Regulatory documents support the Canadian Nuclear Safety Commission (CNSC) regulatory framework. By expanding on expectations set out in general terms in the *Nuclear Safety and Control Act* and associated regulations, regulatory documents provide one of the core management tools upon which the CNSC relies to fulfill its legislated obligations.

The regulatory documents most commonly published by the CNSC are *regulatory policies*, *regulatory standards*, and *regulatory guides*. At the highest level, regulatory policies provide the direction for regulatory standards and guides, which serve as the policy “instruments.” A fourth type of regulatory document, the *regulatory notice*, is issued when warranted. Because the information in a *regulatory notice* must be conveyed with relative urgency, the development process is faster than that applied to the other documents.

Regulatory Policy (P): The regulatory policy describes the philosophy, principles or fundamental factors on which the regulatory activities associated with a particular topic or area of concern are based. It describes why a regulatory activity is warranted, and therefore promotes consistency in the interpretation of regulatory requirements.

Regulatory Standard (S): The regulatory standard clarifies CNSC expectations of what the licensee should do, and becomes a legal requirement when it is referenced in a licence or other legally enforceable instrument. The regulatory standard provides detailed explanation of the outcomes the CNSC expects the licensee to achieve.

Regulatory Guide (G): The regulatory guide informs licensees about how they can meet CNSC expectations and requirements. It provides licensees with a recommended approach for meeting particular aspects of the requirements and expectations associated with their respective licensed activities.

Regulatory Notice (N): The regulatory notice notifies licensees and other stakeholders about significant matters that warrant timely action.

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About this Document

This draft regulatory guide informs licensees about the steps and phases to consider when undertaking a project to extend the life of a nuclear power plant.

Comments

The CNSC invites interested persons to assist in the further development of this draft regulatory document by commenting in writing on its content and potential usefulness. Please respond by July 21, 2006. Direct your comments to the postal or e-mail address provided below, referencing file 1-8-8-360.

The CNSC will take the comments received on this draft into account when developing it further. Any comments submitted including names and affiliations, may be made public.

Document availability

This document can be viewed on the CNSC Internet web site at www.nuclearsafety.gc.ca. To order a printed copy in English or French, please contact:

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LIFE EXTENSION OF NUCLEAR POWER PLANTS

Issued for Public Comment by the
Canadian Nuclear Safety Commission
May 2006

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LIFE EXTENSION OF NUCLEAR POWER PLANTS

1.0 PURPOSE

The purpose of this regulatory guide is to inform licensees about the steps and phases to consider when undertaking a project to extend the life of a nuclear power plant (NPP).

2.0 SCOPE

This regulatory guide addresses:

1. Key elements to consider when establishing the scope of the life extension project; and
2. Considerations to be taken into account in managing and executing a life extension project.

3.0 RELEVANT LEGISLATION

The following provisions of the *Nuclear Safety and Control Act* (NSCA) and regulations made under the NSCA, and legislation associated with the *Canadian Environmental Assessment Act* (CEAA) are relevant to this regulatory guide:

1. Section 3 of the NSCA provides for, “the limitation, to a reasonable level and in a manner that is consistent with Canada’s international obligations, of the risks to national security, the health and safety of persons and the environment that are associated with the development, production and use of nuclear energy...”;
2. Section 9 of the NSCA provides the objects of the Commission, which are, “to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information...”;
3. Subsection 24(4) of the NSCA stipulates that, “No licence may be issued, renewed, amended or replaced unless, in the opinion of the Commission, the applicant

(a) is qualified to carry on the activity that the licence will authorize the licensee to carry on; and

(b) will, in carrying on that activity, make 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”;
4. Subsection 24(5) of the NSCA provides that “a licence may contain any term or condition that the Commission considers necessary for the purposes of the Act...”;

5. Section 3 of the *General Nuclear Safety and Control Regulations* contains the general licence application requirements;
6. Paragraph 12(1)(c) of the *General Nuclear Safety and Control Regulations* says that every licensee shall “take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security”;
7. Paragraph 12(1)(f) of the *General Nuclear Safety and Control Regulations* says that every licensee shall “take all reasonable precautions to control the release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment as a result of the licensed activity”;
8. Paragraph 12(1)(i) of the *General Nuclear Safety and Control Regulations* stipulates that every licensee shall “take all necessary measures to facilitate Canada's compliance with any applicable safeguards agreement”;
9. Section 3 of the *Class I Nuclear Facilities Regulations* outlines the general licence application requirements specific to nuclear power plants;
10. Section 6 of the *Class I Nuclear Facilities Regulations* stipulates the information that is required in applications for a nuclear power plant operating licence;
11. Subsection 5(1) of the CEAA requires that an environmental assessment of a project be undertaken before a federal authority can exercise one of the listed powers or performs one of the listed duties or functions in respect of a project;
12. Subsection 16(1) of the CEAA requires that:

“Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:

 - a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
 - b) the significance of the effects referred to in paragraph (a);
 - c) comments from the public that are received in accordance with this Act and the regulations;
 - d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and
 - e) any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered”;

13. Subsection 17(1) of the CEAA states that, “A responsible authority may delegate to any person, body or jurisdiction ... any part of the screening or comprehensive study of a project or the preparation of the screening report or comprehensive study report, and may delegate any part of the design and implementation of a follow-up program, but shall not delegate the duty to take a course of action...”;
14. Subsection 17(2) of the CEAA requires that “For greater certainty, a responsible authority shall not take a course of action ... unless it is satisfied that any duty or function delegated pursuant to subsection (1) has been carried out in accordance with this Act and the regulations”;
15. Subsection 20 (1) of the CEAA states courses of action that the responsible authority shall take with respect to a life extension project after taking the screening report into consideration;
16. CEAA section 24 stipulates that a previously conducted environmental assessment may be used, incorporating necessary adjustments to take into account any significant changes in the environment, in the circumstances of the project, or any significant new information relating to the environmental effects of the project;
17. Under section 25 of the CEAA, the responsible authority may request that the Minister of Environment refer the project to a mediator or a review panel;
18. CEAA’s *Law List Regulations* stipulate the federal legislation that is subject to the CEAA; and
19. CEAA’s *Exclusion List Regulations* prescribe the projects and classes of projects for which an environmental assessment is not required.

Other relevant legislation is listed in the Associated Documents section at the end of this regulatory guide.

4.0 INTRODUCTION

NPPs in Canada have been in operation for several years and are subject to the CNSC’s ongoing regulatory oversight, including periodic licence renewal. However, the licensee may decide, for the purpose of long-term operation, to implement a life extension project. The decision to continue operation is largely dependent on the work that will be required for long term safe operation of the plant.

A life extension project involves the replacement or refurbishment of major components, or substantial modifications to the plant, or both. As such, these projects represent a commitment to long-term, continued operation of the facility. In keeping with the objectives of the NSCA, the CNSC is mandated to ensure that facility operation continues to pose no unreasonable risk to health, safety, security, or the environment, and will conform to Canada’s international obligations.

The CNSC therefore considers it to be in the public interest that the facilities meet modern high-level safety goals and applicable regulatory requirements for safe and secure operation over its life. To this end, NPP licences are amended to introduce specific licence conditions for the regulatory control of life extension projects. The licensee is expected to adhere to the NSCA, and the CEAA, all associated regulations, and its licence throughout the life extension project and subsequent reactor operation.

Approval for return-to-service is contingent upon demonstration by the licensee that all relevant licence conditions have been met.

In keeping with its regulatory mandate, the CNSC expects the licensee to demonstrate that the following objectives are met for any life extension project:

1. The technical scope of the project is adequately determined through a *Safety Improvement Plan* that takes into account the results of an environmental assessment (EA) and an *Integrated Safety Review (ISR)*;
2. Programs and processes that take into account the special considerations of the project are established; and
3. The project is appropriately planned and executed.

5.0 PROJECT INITIATION

The licensee needs to formally advise the CNSC of the intention to conduct a life extension project, and submit a project description with this notification. The project description indicates the licensee's initial understanding of the project, and includes:

1. Definition of project scope and objectives;
2. Status of current plant design and operation;
3. Project components and structures (such as permanent and temporary structures, infrastructure, construction equipment, etc.);
4. Expected project activities (such as operational phases, timing and scheduling of each phase, etc.);
5. Site information (such as location, environmental features, and land use);
6. Waste issues; and
7. Anticipated milestones.

The project description forms the basis of the EA. It is also used as a point of reference for the project.

Information to assist the licensee in developing the project description is provided in Section 6.0, below, and in the Canadian Environmental Assessment Agency's document titled, *Preparing Project Descriptions under the Canadian Environmental Assessment Act*.

6.0 ESTABLISHING A SAFETY IMPROVEMENT PLAN FOR THE PROJECT

Once the licensee decides to undertake a life extension project, the licensee needs to systematically identify and address all environmental and safety concerns and integrate them into a *Safety Improvement Plan*. To do this, the licensee:

1. Participates in the EA process (6.1, below);
2. Carries out an ISR (6.2, below); and
3. Applies the results of these assessments to establish the *Safety Improvement Plan* (6.3, below).

Since the EA and the ISR are interdependent, these assessments should be done in parallel.

6.1 Environmental Assessment

In accordance with the CEAA, the life extension project may be subject to an environmental assessment. Where an EA is required, a decision that the life extension project will not have significant adverse environmental effects is needed prior to any licensing action being taken under the NSCA.

As the responsible authority for the conduct of the EA process, the CNSC is responsible for determining whether an EA is required, and ensuring that the process is carried out appropriately.

6.1.1 Determinations

An EA is required for the life extension project if:

1. The proposed life extension work is a project as defined in the CEAA; and
2. The life extension project requires a decision under the NSCA; and
3. The project does not meet the requirements of the CEAA *Exclusion List Regulations*.

Is there a project subject to the CEAA?

k. If the proposed life extension work described in the project description meets the definition of a project, then an EA may be required.

Is a decision under the NSCA required? Section 5(1)(d) of the CEAA stipulates that an EA must be carried out before any federal authority issues a permit or licence, grants an approval, or takes any other action for the purpose of enabling the project to be carried out in whole or in part.

Is the project excluded? If the CEAA *Exclusion List Regulations* have been met, or if the proposed work has been subjected to a previous EA, a new EA may not be required.

6.1.2 Screening EA

Pursuant to the CEAA and its regulations, life extension projects fall under the screening EA process. A screening EA is an approach to document the environmental effects of a proposed project and determine the need to eliminate or mitigate adverse effects.

The CNSC refers to screening EA results to decide whether the project has potential adverse environmental effects. Regulatory approvals and licensing decisions under the NSCA regarding the life extension project can be rendered if a decision is made that significant adverse environmental effects are not likely.

6.1.3 EA Scope

As the responsible authority, the CNSC determines the scope of the screening EA, which includes all the factors identified in Section 16 of the CEAA. Section 16 further allows the CNSC to include other factors, such as:

1. The purpose of, and need for, the project;
2. Consideration of traditional and local knowledge;
3. Anticipated incremental environmental effects of continued operation following completion of refurbishment activities; and
4. The need for, and requirements of, a follow-up program in respect of the project.

Additional factors or issues to be addressed in the EA may be identified following consultation with federal and provincial authorities and other stakeholders during the EA process.

6.1.4 EA Documentation

Documentation generated during the screening EA includes the CNSC's *EA Guidelines*, the *EA Study Report* (preparation of which can be delegated to the licensee), and the *EA Screening Report*, which is prepared by the CNSC.

6.1.4.1 EA Guidelines

The CNSC determines the factors to be considered in the screening EA, and publishes them in an *EA Guidelines* document. This document describes the basis for the conduct of the EA, and focuses the assessment on relevant issues and concerns. It provides direction during performance of the technical studies, and in the preparation of the resulting *EA Study Report*.

The following structure is typically identified in the *EA Guidelines* as a framework for the reporting of the assessment factors required by the CEAA.

1. Introduction;
2. Application of the *Canadian Environmental Assessment Act*;
3. Scope of the project;
4. Scope of the environmental assessment;
5. Project description;
6. Spatial and temporal boundaries of the assessment;
7. Description of the existing environment;
8. Assessment and mitigation of environmental effects, including:
 - a) description of assessment methodology,
 - b) anticipated effects of each phase of the project, (e.g., site preparation, construction),
 - c) effects of normal operations, malfunctions, accidents, and natural hazards,
 - d) cumulative environmental effects, and
 - e) Significance of residual effects;
9. Stakeholder consultation;
10. Follow-up program; and
11. Conclusions.

6.1.4.2 EA Study Report

In accordance with Section 17 of the CEAA, the technical studies related to the EA may be delegated to the licensee. The results of these studies are documented in the form of an *EA Study Report*, which presents the licensee's findings regarding the existing environment and the environmental effects of the project.

The *EA Study Report* undergoes a detailed review by CNSC staff and other federal and provincial authorities, and is then used as the foundation for the *EA Screening Report*.

6.1.4.3 EA Screening Report

The *EA Screening Report* reflects the CNSC's assessment of the licensee's findings. This document is prepared by CNSC staff and refers to the finalized *EA Study Report*.

6.1.5 Confirmation of the Adequacy of the EA

CNSC staff submits the screening EA documentation to the Commission, and the Commission then considers this material, along with stakeholder input, in rendering its decision on the significance of the effects of the life extension project on the environment, and whether the project may proceed.

6.2 Integrated Safety Review

The *Integrated Safety Review (ISR)* is a comprehensive assessment of plant design, condition and operation. It is conducted at the time that a licensee is considering life extension of an NPP. The ISR is performed in accordance with the *Periodic Safety Review of Nuclear Power Plants (PSR)* safety guide published by the International Atomic Energy Agency (IAEA). It is referred to as an ISR due to its one-time application of the PSR to the life extension project. Additional guidance on the ISR is provided in the above IAEA safety guide.

Performed by the licensee, the ISR is an effective way to obtain an overall view of plant safety. This enables determination of reasonable and practical modifications that should be made to enhance the safety of the facility to a level approaching that of modern plants, and to allow for long term operation.

The objectives of the ISR are to determine:

1. The extent to which the plant conforms to modern high-level safety goals and requirements;
2. The extent to which the licensing basis remains valid;
3. The adequacy of the arrangements that are in place to maintain plant safety for long-term operation; and
4. The improvements to be implemented to resolve the safety issues that have been identified.

6.2.1 ISR Scope

The ISR involves an assessment of the current state of the plant and plant performance to determine the extent to which the plant conforms to modern high-level safety goals and requirements. Operating experience in Canada and around the world, new knowledge from research and development activities, and advances in technology, are taken into account.

Prior to performing the ISR, the licensee is expected to prepare an *ISR Basis Document*, which sets out the scope and methodology for the conduct of the ISR. The *ISR Basis Document* should include:

1. The topics to be considered in the ISR;
2. A clear statement of modern high-level safety goals, applicable regulatory requirements, and relevant industry standards;
3. The licensing basis of the plant at the time of initiating the ISR; and
4. The process for identifying and addressing gaps between current and desired plant state and performance.

The CNSC reviews the *ISR Basis Document* and either accepts it or requires changes.

In keeping with the IAEA's PSR guidance, the safety factors to be addressed in the ISR typically include:

1) Plant	<ol style="list-style-type: none"> a) Plant design b) Actual condition of systems structures and components c) Equipment qualification d) Ageing
2) Safety analysis	<ol style="list-style-type: none"> a) Deterministic safety analysis b) Probabilistic safety analysis c) Hazard analysis
3) Performance and feedback of experience	<ol style="list-style-type: none"> a) Safety performance b) Use of experience from other plants and research findings
4) Management	<ol style="list-style-type: none"> a) Organization and administration b) Procedures c) Human factors d) Emergency planning
5) Environment	<ol style="list-style-type: none"> a) Impact of nuclear and hazardous substances

In addition, licensees are expected to address factors of quality management, security, and safeguards. Appendix A to this document describes the relationship between the IAEA safety factors and the CNSC safety areas and programs.

6.2.2 ISR Documentation

The licensee considers all pertinent safety factors, including a global assessment of all ISR results, and prepares an *ISR Report* for submission to the CNSC.

All generic action items and station-specific actions items are included in the review, with each being resolved to the extent practicable.

6.2.3 Confirmation of the Adequacy of the ISR

The CNSC reviews the ISR report and either accepts it or requires changes. The final results are incorporated in the development of the *Safety Improvement Plan*.

6.3 Safety Improvement Plan

The licensee incorporates the results of the EA and the ISR to develop the *Safety Improvement Plan*. This plan integrates all necessary corrective actions, proposed plant modifications, safety upgrades, compensatory measures, and improvements to operation and management programs that will apply to the project and to long term operation.

Licensees may elect to submit cost-benefit information in support of their *Safety Improvement Plan* documentation.

6.3.1 Confirmation of the Adequacy of the Safety Improvement Plan

The licensee submits the *Safety Improvement Plan* for review and assessment by the CNSC. The basis for this assessment includes, but is not limited to:

1. The NSCA, regulations, standards, guides, and the licence;
2. Information gathered on station-specific performance through the regulatory oversight program;
3. Deterministic safety criteria;
4. Station-specific operating experience (CANDU-specific and world-wide);
5. Expert knowledge;
6. Insights from probabilistic safety analyses and severe accident management considerations;
7. Modern international standards and industry good practices; and
8. The completeness and quality of the EA and ISR processes and documentation.

If the *Safety Improvement Plan* includes any elements not included in the project description, then additional EA work may need to be completed.

The CNSC either accepts the *Safety Improvement Plan*, or requires changes. The licensee may proceed with the life extension activities upon CNSC acceptance of the plan.

Upon completion of the *Safety Improvement Plan*, the licence is amended accordingly to include the licence conditions that will need to be met in the return to service phase of the project.

6.3.1.1 Scope Change Approvals

The licensee should have a well defined process for control of any changes to the *Safety Improvement Plan*.

CNSC approval is required for:

1. Changes in the plan associated with work that is needed to fulfil the requirements identified by the screening EA; and
2. Changes in the plan for items subject to conditions of the operating licence.

CNSC agreement is needed for any other proposed changes to the plan.

7.0 PROJECT EXECUTION

7.1 Project Execution Planning

The licensee prepares a *Project Execution Plan* that identifies what needs to be done to achieve the desired outcomes for the project. Areas that may require special attention when planning the project execution typically include:

1. Historical design issues;
2. Non-identical component replacement;
3. Resource requirements;
4. Use of contractors;
5. Unique or unusual plant configurations; and
6. Return to service plans.

7.2 Programs and Processes

To enable project implementation, the licensee needs acceptable programs and processes to control and execute the life extension project. These programs and processes may include consideration of such areas as:

1. Change Control;
2. Commissioning;
3. Configuration Management;
4. Construction;
5. Emergency Preparedness;
6. Engineering Design;
7. Environmental Protection;
8. Fire Protection;
9. Human Factors;
10. Nuclear Criticality Safety Program;
11. Occupational Health and Safety;
12. Outage Management;
13. Training and Personnel Qualification;
14. Procurement;
15. Quality Management;
16. Radiation Protection;
17. Safeguards;
18. Safety Management;
19. Security;
20. Stakeholder Communication;
21. Waste Management; and
22. Work Control.

The licensee should refer to CNSC requirements and appropriate legislation and standards when addressing these considerations, both for guidance in their development, and to determine how program outcomes will be measured.

The program and process documents for control of the life extension project are submitted to the CNSC for review. The CNSC either accepts these documents or returns them to the licensee with indication of required changes.

7.3 Project Monitoring

The licensee is expected to monitor the project for progress, safety, and quality at all phases of execution. Items to be monitored may include:

1. Complete redesigns or design modifications;
2. Engineering field changes;
3. Installation rework;
4. Procedure non-compliances;
5. Plant configuration;
6. Missed completion dates;
7. Worker safety events involving injuries, near misses, unsafe practices, unplanned dose uptakes; and
8. Environmental performance.

Project monitoring includes verifying that the work has been done correctly, and may reveal the need for:

1. Creation of new programs and procedures;
2. Revision of existing programs and procedures;
3. Resource changes;
4. New training programs or material; or
5. Revision of existing training programs or material.

The licensee should assess all identified shortcomings to determine their causes and the impact of those causes on other aspects of the project.

8.0 RETURN TO SERVICE

The licensee needs to establish a *Return to Service Plan* for the life extension project. Return to service involves returning the reactor, the nuclear systems, and the non-nuclear systems, back to commercial operation. Return to service includes demonstration by the licensee that all relevant licence conditions have been met and that the associated work has been done to the satisfaction of the CNSC. The licensee is expected to submit design completion and construction completion assurance reports, as well as completion assurance reports for each phase of commissioning.

8.1 Commissioning Phases

Return to service is dependent on the licensee's ability to demonstrate that new and existing plant systems, structures, and components conform to the defined physical, functional, performance, safety, and control requirements. This is accomplished through four commissioning phases:

1. **Phase A:** confirms correct installation of new and modified equipment, and confirms fitness for service of new and existing plant systems, structures, and components, through a program of individual component and integrated system testing. This phase must be successfully completed prior to loading fuel in the reactor;
2. **Phase B:** focuses on ensuring the fuel is loaded into the reactor safely and confirming that the reactor is in a suitable condition to be started up and that all prerequisites for permitting the reactor to go critical have been met. This phase must be successfully completed prior to removal of the guaranteed shutdown state (GSS);
3. **Phase C:** focuses on confirming reactor behaviour at the stage of initial criticality and subsequent low power tests, and includes activities that cannot be done during the GSS; and
4. **Phase D:** focuses on demonstrating reactor and systems behaviour at higher power levels, including activities that could not be carried out at the power levels in Phase C.

System baseline data from past commissioning activities is referenced if available, or new baseline data is established. This may include inaugural and baseline inspections of existing and newly installed systems, structures, and components. In addition, the licensee is expected to define the acceptance criteria for the commissioning tests.

8.2 Milestones

Return to service is achieved through the accomplishment of numerous milestones. Milestones that might be reflected in the return to service stage of a life extension project include:

1. Loading fuel;
2. Removing the guaranteed shutdown state;
3. Heat transport operation;
4. Turbine operation;
5. Turbine synchronization to the grid;
6. Full reactor power; and
7. Specific commissioning tests.

8.3 Hold Points

The process of returning to service includes progressing to regulatory hold points. These hold points are typically aligned with commissioning phases, and may include the milestones listed above. Licence conditions are established for the administration of the hold points, which are then incorporated by the licensee in the *Return to Service Plan*.

CNSC approval to remove a given hold point is contingent on licensee submission of a *Completion Assurance Document*. This document presents evidence that all project commitments scheduled for completion prior to removal of that hold point have been met. The *Completion Assurance Document* must be accepted by the CNSC before authorization to remove the hold point can be issued.

8.4 Return to Normal Operation

Once all CNSC approvals have been granted and hold points have been removed, the licensee proceeds to normal operation.

9.0 FOLLOW UP

The licensee will be expected to monitor the adequacy of plant performance and new or updated programs after return to service.

GLOSSARY

assessment review by a panel (panel review)

An environmental assessment that is conducted by a review panel established pursuant to Section 33 of the CEAA and that includes a consideration of the factors required to be considered under Subsections 16(1) and (2).

comprehensive study

An environmental assessment that is conducted pursuant to Sections 21 and 21.1 of the CEAA, and that includes a consideration of the factors required to be considered pursuant to Subsections 16(1) and (2).

comprehensive study list

A list of all projects or classes of projects that have been prescribed pursuant to regulations made under Paragraph 59(d) of the CEAA.

design life

The period that the designer assumed for safe operation of the facility.

environmental assessment

An assessment of the environmental effects of the project conducted in accordance with the CEAA and its regulations.

exclusion list

A list of projects or classes of projects that have been exempted from the requirement to conduct an assessment by regulations made under Paragraph 59(c) or (c.1) of the CEAA.

federal authority

For the purposes of the CEAA, a federal authority is:

1. A Minister of the Crown in right of Canada;
2. An agency of the Government of Canada or other body established by or pursuant to an Act of Parliament that is ultimately accountable through a Minister of the Crown in right of Canada to Parliament for the conduct of its affairs; and
3. Any department or departmental corporation set out in Schedule I or II to the *Financial Administration Act*.

generic action item

This term refers to those unresolved safety-related issues which, in addition to being applicable to several CANDU plants, have been singled out by CNSC staff as requiring corrective actions to be taken by the licensees, within a reasonable time frame.

guaranteed shutdown state (GSS)

A set of conditions that provide sufficient guarantee that the reactor will remain in the shutdown state despite any credible failure

hold points

Hold points are specific milestones that are built into the commissioning plan to separate critical phases during commissioning and to allow for regulatory review before transition between phases. Hold points further enable the verification of the resolution of issues so that proceeding to the next stage will not pose unreasonable risk to health, safety, security or the environment.

integrated safety review (ISR)

A comprehensive assessment of plant design and operation performed in accordance with the IAEA's safety guide on the *Periodic Safety Review of Nuclear Power Plants*. It is referred to as an ISR due to its one-time application of the PSR to a life extension project. Additional guidance on the ISR is provided in the above IAEA safety guide.

licensing basis

The licensing basis is the set of information that demonstrates:

1. The facility meets all applicable regulatory and safety requirements, and
2. The applicant/licensee is qualified and has made adequate provisions for safe facility operation.

life extension

Extending the safe operating life of a nuclear power plant beyond its nominal design. It involves the replacement or refurbishment of major components, or substantial modifications to the plant, or both.

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*.

prescribed

Means prescribed by federal regulations.

project

Pursuant to the CEAA, in relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking in relation to that physical work.

refurbishment

An activity or a set of activities aimed at restoring the condition of one or several systems to a state that is comparable to the condition of a new system.

responsible authority

In relation to a project, means a federal authority that is required pursuant to Subsection 11(1) of the CEAA to ensure that an environmental assessment of the project is conducted.

screening EA

An environmental assessment that is conducted pursuant to Section 18 of the CEAA and that includes a consideration of the factors set out in Subsection 16(1).

ASSOCIATED DOCUMENTS

3. *Nuclear Safety and Control Act*, S.C. 1997, c. 9;
4. *Packaging and Transport of Nuclear Substances Regulations*, SOR/2000-208, May 2000;
5. *Radiation Protection Regulations*, SOR/2000-203, May 2000;
6. *Nuclear Security Regulations*, SOR/2000-209, May 2000;
7. *Nuclear Non-proliferation Import and Export Control Regulations*, SOR/2000-210, May 2000;
8. *Nuclear Substances and Radiation Devices Regulations*, SOR/2000-207, May 2000;
9. *Canadian Nuclear Safety Commission Rules of Procedure*, SOR/2000-211, May 2000;
10. CNSC Regulatory Standard S-99, *Reporting Requirements for Operating Nuclear Power Plants*, March 2003;
11. CNSC Regulatory Policy P-242, *Considering Cost-benefit Information*, October 2000;
12. *Canadian Nuclear Safety Commission - Guidelines for Environmental Assessment pursuant to the requirements of the Canadian Environmental Assessment Act*, Revision 2, December 2004;
13. INFO-0756, *Licensing Process for New Nuclear Power Plants in Canada*, CNSC, February 2006;
14. *Nuclear Liability Act*, R.S.C., 1985, c. N-28;
15. *Canadian Environmental Assessment Act*, S.C. 1992, c. 37;
16. *CEAA Exclusion List Regulations*, SOR/94-639;
17. *CEAA Inclusion List Regulations*, SOR/94-637
18. *CEAA Comprehensive Study List Regulations*, SOR/94-638;
19. *Procedures for an Assessment by a Review Panel*, guidelines issued pursuant to the CEAA, November 1997;
20. *Preparing Project Descriptions under the Canadian Environmental Assessment Act*, Canadian Environmental Assessment Agency, August 2000;
21. *Law List Regulations*, SOR/94-636, October 1994;
22. *Canadian Environmental Protection Act*, S.C. 1999, c. 33;

23. *Nuclear Fuel Waste Act*, S.C. 2002, c. 23;
24. *Fisheries Act*, R.S.C., 1985, c. F-14;
25. *Species at Risk Act*, S.C. 2002, c. 29;
26. *Migratory Birds Convention Act*, S.C. 1994, c. 22;
27. *Canada Water Act*, R.S.C., 1985, c. C-11; and
28. *Periodic Safety Review of Nuclear Power Plants—Safety Guide*, Safety Standards Series No. NS-G-2.10, IAEA, Vienna, 2003.

APPENDIX A

CNSC Safety Areas and IAEA Safety Factors

CNSC Safety Area	CNSC Program	IAEA Periodic Safety Review Safety Factors*
1. Operating Performance	1. Organization and Plant Management 2. Operations 3. Occupational Health and Safety (non-radiological)	Plant Design Actual Conditions of Systems, Structures and Components Safety Performance Organization/Administration
2. Performance Assurance	1. Quality Management 2. Human Factors 3. Training	Use of Experience of other Plants and Research Findings Organization/Administration Procedures Human Factors
3. Design and Analysis	1. Safety Analysis 2. Safety Issues 3. Design	Plant Design Actual Conditions of Systems, Structures and Components Ageing Deterministic Safety Analysis Probabilistic Safety Analysis Hazard Analysis Use of Experience of other Plants and Research Findings
4. Equipment Fitness for Service	1. Maintenance 2. Structural Integrity 3. Reliability 4. Equipment Qualification	Actual Conditions of Systems, Structures and Components Equipment Qualification Ageing Probabilistic Safety Analysis
5. Emergency Preparedness	1. Emergency Preparedness	Emergency Planning
6. Environmental Performance	1. Environmental Protection Systems 2. Effluent and Environmental Monitoring	Safety Performance Radiological Impact on the Environment
7. Radiation Protection	1. Personnel Exposure 2. Plant Waste Management	Safety Performance
8. Site Security	1. Site Security	
9. Safeguards	1. Safeguards	

APPENDIX B

Life Extension Process Diagram

