Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

REGULATORY
STANDARD

Reliability Programs for Nuclear Power Plants

S–98 REVISION 1

July 2005

Canada

TYPES OF REGULATORY DOCUMENTS

The legal framework within which the Canadian Nuclear Safety Commission (CNSC) operates includes the *Nuclear Safety and Control Act* (NSCA), its Regulations and other legal instruments such as licences, certificates and orders. The legal framework is supported by regulatory documents issued by the CNSC, the main types of which are:

Regulatory Policy (P): a document that describes the philosophy, principles or fundamental factors that underlie the CNSC's approach to its regulatory mission. It provides direction to CNSC staff and information to stakeholders.

Regulatory Standard (S): a document that describes CNSC requirements. It imposes obligations on the regulated party, once it is referenced in a licence or other legally enforceable instrument.

Regulatory Guide (G): a document that indicates acceptable ways of meeting CNSC requirements, as expressed in the act, Regulations, regulatory standard or other legally-enforceable instrument. It provides guidance to licensees and other stakeholders.

Regulatory Notice (N): a document that provides licensees and other stakeholders with information about significant matters that warrant timely action.

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RELIABILITY PROGRAMS FOR NUCLEAR POWER PLANTS

S–98 Revision 1

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RELIABILITY PROGRAMS FOR NUCLEAR POWER PLANTS

1.0 PURPOSE

The purpose of this regulatory standard is to help assure, in accordance with the purpose of the *Nuclear Safety and Control Act* (NSCA), that a licensee who constructs or operates a nuclear power plant (NPP) develops and implements a reliability program that assures that the systems important to safety at the plant can and will meet their defined design and performance specifications at acceptable levels of reliability throughout the lifetime of the facility.

2.0 SCOPE

This regulatory standard describes the requirements of a reliability program for a nuclear power plant.

The licensee shall implement the requirements described in this regulatory standard when a condition of a licence or other legally enforceable instrument so requires.

3.0 RELEVANT LEGISLATION

The NSCA and its regulations do not contain express references to the reliability program at an NPP. However:

1. The purpose 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. 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";
3. 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 this Act."

To limit the risks from an NPP to a reasonable level, the plant must operate within some requisite bounds of overall safety. This overall safety can only be assured when the systems important to safety at the NPP are (a) capable of adequately performing their purposes, and (b) available to do so. Thus, the systems important to safety at the NPP must function at a certain level of reliability.

4.0 THE RELIABILITY PROGRAM

4.1 Program Objective

The objective of the reliability program described in this standard is to ensure that the systems important to safety at an NPP function reliably, in accordance with the relevant design, performance and safety criteria, including any safety targets of the NPP and CNSC licence requirements.

4.2 Program Requirements

A reliability program for an NPP shall

1. identify, using a systematic method, all systems important to safety by
   a) identifying the structures, systems and components (SSC) of the NPP associated with the initiation, prevention, detection or mitigation of any failure sequence which could lead to damage of fuel or associated release of radionuclide or both;
   b) ranking the identified SSC on the basis of their relative importance to safety; and
   c) screening out those SSC that do not contribute significantly to plant safety.[1] The remaining SSC are the "systems important to safety" at the NPP;
2. specify reliability targets for the systems important to safety at the NPP;
3. identify and describe the potential failure modes of the systems important to safety at the NPP;
4. specify the minimum capabilities and performance levels that the systems important to safety must attain to achieve reliabilities that are consistent with the safety targets at the NPP and the regulatory requirements;
5. provide information to the maintenance program to maintain the effectiveness of the systems important to safety at the NPP;
6. provide for inspections, tests, modelling, monitoring or other measures to effectively assess the reliability of the systems important to safety at the NPP;
7. include provisions to assure, verify and demonstrate that the reliability program is implemented effectively;
8. include provisions for recording and reporting the results of program activities, including the results of reliability assessments, inspections, tests, or monitoring of the reliability of the systems important to safety at the NPP; and

[1] The criteria used for screening shall be accepted by "persons authorized" by the Commission.

9. document, clearly and comprehensively, the activities, attributes, elements, results and administration of the reliability program, including

   a) the activities that make up the program;

   b) procedures and schedules for conducting the program activities;

   c) the licensee's organization for managing and implementing the program including the specific positions, roles and responsibilities of the persons involved;

   d) the methodology used to identify, rank and assign reliability targets to the systems important to safety at the NPP;

   e) the list of systems important to safety at the NPP;

   f) the reliability targets for each of the systems important to safety at the NPP;

   g) potential failure modes of the systems important to safety at the NPP;

   h) methods used to determine the potential failure modes of the systems important to safety at the NPP;

   i) reliability assessments, inspections, monitoring, testing, verifications, recording and reporting activities that the licensee will carry out to assure, verify, demonstrate or document that the reliability program is implemented correctly and effectively in accordance with regulatory requirements; and

   j) the results of the reliability assessments, inspections, monitoring, testing, verifications, and reporting activities that the licensee carried out as part of the reliability program.

GLOSSARY

CNSC
Canadian Nuclear Safety Commission

NPP
Nuclear power plant

NSCA
Nuclear Safety and Control Act

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 IA Nuclear Facilities Regulations.*

SSC
Structures, systems and components