Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

REGULATORY
GUIDE

Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills

G–296

March 2006

Canada

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 NSCA 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.

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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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The document can be viewed on the CNSC Internet website at (www.nuclearsafety.gc.ca). Copies may be ordered in English or French using the contact information below:

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DEVELOPING ENVIRONMENTAL PROTECTION POLICIES, PROGRAMS AND PROCEDURES AT CLASS I NUCLEAR FACILITIES AND URANIUM MINES AND MILLS

1.0 PURPOSE

The purpose of this regulatory guide is to help applicants for licences for Class I nuclear facilities and uranium mines and mills, other than licences to abandon, develop environmental protection policies, programs and procedures, in accordance with the *Nuclear Safety and Control Act* (NSCA)[1] and regulations.

2.0 SCOPE

This document describes the elements of typical environmental protection policies, programs and procedures at Class I nuclear facilities and uranium mines and mills.

3.0 RELEVANT LEGISLATION

The following provisions of the regulations made pursuant to the NSCA are relevant to this guide:

1. Paragraph 3(g) of the *Class I Nuclear Facilities Regulations*[2] stipulates that an application for a Canadian Nuclear Safety Commission (CNSC) licence, other than a licence to abandon, shall contain, in addition to other information, "the proposed environmental protection policies and procedures"; and
2. Subparagraph 3(c)(v) of the *Uranium Mines and Mills Regulations*[3] stipulates that an application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain, in addition to other information, "the proposed environmental protection policies and programs."

The Reference section at the end of the document includes sections of the regulations that are referenced in this regulatory guide.

4.0 DEFINITIONS

The Glossary at the end of the document defines the special terms used in this regulatory guide.

5.0 ENVIRONMENTAL PROTECTION POLICIES, PROGRAMS AND PROCEDURES

5.1 Introduction

Environmental protection policies, programs, and procedures are an important component of the overall requirement for licensees to make adequate provision for protection of the environment.[1] Licensees also have specific obligations to take all reasonable precautions to protect the environment and to control the releases of nuclear and hazardous substances.[4][5] The respective regulations require submission of environmental protection policies and procedures at Class I nuclear facilities[2] and submission of environmental protection policies and programs at uranium mines and mills.[3] The choice of words relates to the level of detail expected in documentation for the different facilities. For uranium mines and mills, higher-level program documents are submitted with reference to lower-level procedures.

Policies, programs and procedures together form an integrated set of documented activities, usually referred to as an Environmental Management System (EMS). An EMS provides a framework for action with respect to environmental protection. This includes the overall management of the prevention of unreasonable risk to the environment through integrated activities. Such activities include the management of releases, wastes, training and public information. As a whole, an EMS addresses effective control measures on releases and wastes to prevent or mitigate environmental effects in the context of pollution prevention. The demonstration of the effectiveness of controls through effluent and environmental monitoring activities is a major element of an EMS.[6][7]

The EMS may consist of one or several documents. The EMS may incorporate pertinent information directly or by reference. For large facilities, complex facilities, or both with a high level of environmental risk, documentation may be in the form of an EMS manual. Information may also be incorporated in similar documents (e.g., in an integrated quality management system manual). For all facilities, sufficient detail should be provided to demonstrate that releases, wastes and potential environmental effects have been identified and will be monitored and managed in a proactive and preventive fashion.

In determining the scope of documentation to be submitted, the applicant may consult with CNSC staff for specific guidance.

5.2 EMS Scope

For all facilities, the complexity of EMS documentation should be commensurate with the nature and scale of the environmental effects that may result from licensed activities. ISO 14001, with a few additional CNSC-specific requirements, is the basis for the CNSC Regulatory Standard S-296, *Environmental Protection Policies, Programs and Procedures for Class I Nuclear Facilities and Uranium Mines and Mills*. S-296 may be incorporated in a licence as a legal requirement. For all licences, the information provided in this guide, and in ISO 14001 and ISO 14004, can be used to develop an EMS that will meet the CNSC requirement for policies, programs or procedures in environmental protection.

Use of ISO guidance for the design of an EMS is acceptable in both cases, as long as differences between key concepts in federal legislation and those in ISO 14001 are considered in the scope. In the NSCA and the *Canadian Environmental Protection Act* (CEPA),[8] risk is a key concept in environmental protection. ISO 14001 does not use the term risk in the context of an EMS. Rather, ISO 14001 addresses significant environmental aspects and impacts. It also provides only minimal guidance on the interpretation of adverse environmental effects. Definitions of the environment and pollution prevention are also much narrower. Expanded definitions from federal legislation of the "environment," "environmental effect" (impact) and "pollution prevention" (prevention of pollution) are therefore provided in the Glossary to avoid misinterpretation. Implications to the scope of the EMS are elaborated below.

Pollution prevention has a specific meaning in federal legislation; this meaning has implications for how an EMS addresses environmental impacts. The expanded definition in federal legislation is fundamentally more demanding than the corresponding ISO definition. It specifies "avoiding or minimizing" pollution relative to "overall risk," whereas the ISO definition includes "avoids, reduces or controls" pollution relative to "adverse environmental impacts." Hence, it is the CNSC's expectation that the concept of minimizing releases be included in the scope of the EMS, along with a broader interpretation of impacts.

Pollution prevention is the key principle underlying the management of hazardous substances in Canada. Section 64 of the CEPA[8] defines the nature of toxic substances, explicitly defining unreasonable risk for certain scheduled substances. For other potentially hazardous substances that are not subject to legislation, unreasonable risk may be interpreted in terms of likely significant adverse effects. This concept is nearly equivalent to the ISO 14001 concept of significant environmental impacts. Guidance documents that support assessments required under the *Canadian Environmental Assessment Act* (CEAA) [9] elaborate in detail on how environmental effects or impacts are typically interpreted.[10] In the CNSC licensing process for Class I facilities and uranium mines and mills, the CEAA process provides an initial framework for identification and assessment of the equivalent of ISO significant environmental aspects in an appropriate context. This information can provide the initial foundation for the scope of the EMS.

For nuclear substances, the *Radiation Protection Regulations*[11] require that exposure and dose to persons be managed according to the principle of ALARA (As Low As Reasonably Achievable), while taking into account social and economic factors.[12] Regulatory Guide G-129 expands on how to manage exposure and doses through ALARA.[13] The *Radiation Protection Regulations* further define unreasonable risk explicitly for workers and the public through prescribed dose limits,[14] and require these risks to be monitored by direct measurement or by estimation of the quantities and concentrations of any nuclear substance released as a result of the licensed activity. [40]

For non-human biota, assessment of risks from nuclear substances is an evolving issue. Guidance on methodology should be taken from recognized, authoritative sources (e.g., the framework published by the International Commission on Radiological Protection [ICRP]).[15] CNSC staff assessment of programs to manage these risks complements their assessment of programs to manage risks from hazardous substances. This approach is consistent with approaches adopted by provincial and federal agencies (e.g., Ontario Ministry of the Environment [OMOE], Environment Canada, Canadian Council of Ministers of the Environment [CCME]).

5.3 EMS Framework

A licence application requires the description of the effects of licensed activities on the environment.[16][17] Typically, an environmental assessment[18] will meet this major requirement (e.g., conducted for the purposes of CEAA and updated as appropriate). The assessment may be used to refine practical details in the EMS for managing releases and wastes in order to prevent unreasonable risk to the environment. As appropriate for the facility type and phase of licensing, the EMS should include the proposed measures to control releases of nuclear substances, hazardous substances, or both into the environment,[19][20] and the measures that will be taken to prevent or mitigate the effect.[16][17]

5.3.1 Releases

In terms of releases, the EMS should be commensurate with the overall regulatory requirements,[4][5] and the specific information provided on the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics.[21][22] [40]

5.3.2 Wastes

In terms of wastes, the EMS should be commensurate with the overall regulatory requirements[4][5] and the specific information provided on the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed. This includes waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and

the proposed method for managing and disposing of that waste.[23] For uranium mines and mills, there is a further requirement to address management of the anticipated liquid and solid waste streams within the mine or mill, including

1. the ingress of fresh water and any diversion or control of uncontaminated surface and ground water;[24]
2. the anticipated quantities, composition and characteristics of backfill;[25] and
3. the proposed waste management system.[26]

5.3.3 Other Considerations

As a further consideration, the EMS should address environmental emergency preparedness and response in terms of

1. the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment; and
2. the health and safety of persons.[27][28]

In addition, reporting requirements for certain potential or real emergency situations should be included in the EMS.[29] Lastly, additional elements relating to worker training or qualifications,[30][31] and the environmental protection obligations of workers should be included.[32] Training programs should enable workers to meet their obligations with respect to environmental protection.[27][28]

Generic guidance on environmental assessment,[33] historical operating information, and experience from similar facilities may be used to justify the degree of management proposed in all areas of environmental protection. All pertinent information may be used for scoping the management of controls on releases and wastes, and for determining the appropriate balance between effluent and environmental monitoring.

5.4 EMS Elements

The detailed structure of the EMS may be taken from the information provided in ISO 14001 and ISO 14004. Additional guidance concerning ISO 14001 clause 4.5.1 “Monitoring and Measurement” is provided below to illustrate the correspondence between performance elements in ISO 14001 and certain CNSC regulations and CNSC guidance documents.

5.4.1 Monitoring and Measurement

Procedures should be established to measure, monitor and evaluate environmental performance relative to performance indicators and targets that are linked to environmental objectives. On the whole, measurement and evaluation should be key to the verification of the efficacy of controls on contaminants in terms of pollution prevention. The overall process should include both periodic and continual feedback mechanisms to assess and implement actions in order to achieve performance targets. Monitoring should be conducted on a spatial and temporal scale relevant to environmental effects predicted in an environmental assessment.

Performance indicators are objective, verifiable and reproducible measures of operational performance with a foundation in predictions arising from an environmental assessment. Effluent monitoring should be the primary indicator of performance in terms of releases to air, surface waters, groundwater and soils from both facility operations and waste management activities. Effluent monitoring addresses both the nature and quantities of releases of nuclear and hazardous substances (including wastes). Monitoring schedules should be linked to administrative controls to prevent the development of situations that can lead to unreasonable risk to the environment. Targets should be designed to prompt investigation of abnormal situations, and if necessary, result in preventive measures. Measurement and evaluation should also be coordinated to permit timely corrective action.

As appropriate for the level of environmental risk, environmental monitoring should be conducted and integrated with effluent monitoring. Environmental monitoring should provide confidence that mitigation measures are effective, health and environmental effects remain acceptably low, and contaminants in the environment do not exceed levels anticipated at licensing.

As part of a Code of Practice for Uranium Mines and Mills[34] certain prescribed performance targets (Action Levels) must be developed for environmental protection purposes. These and other operational limits should address the management of releases at source in terms of the administrative measures being taken to control releases.[5] All facilities require action levels for the radiation protection program.[35][36] Although specific to radiation protection, Regulatory Guides G-218[37] and G-228[38] provide useful generic guidance on the principles underlying action levels. These principles, along with ALARA as outlined in Regulatory Guide G-129,[13] should be used to develop targets for environmental performance.

For Class I nuclear facilities,[2] a Code of Practice for environmental protection purposes is not required. However, licensees should implement operational targets at source on releases of potential concern under the requirement to control releases.[5] The development of administrative controls typically requires modelling of environmental pathways to derive release targets that can be

interpreted in terms of levels in environmental media. These levels are chosen to protect the environment as a whole, with adequate safety margins. The *Canadian Environmental Quality Guidelines*[39] provide practical guidance on levels that are thought to be sufficiently protective. Alternatively, levels can be derived from assessments performed under the CEAA,[8] the CEPA,[9] or the NSCA.[1]

Facilities with potential for public exposure are also expected to develop Derived Release Limits (DRLs). Historically, DRLs were referred to as Derived Emission Limits (DELs). Facilities calculate DRLs through multimedia pathways modelling; DRLs represent estimates of releases that could result in doses to the public equal to the prescribed public limit for effective dose of 1 mSv[41] or associated equivalent dose limits.[42] If not referenced in the EMS as part of licensing documentation, DRLs may be incorporated separately as a licence condition.

GLOSSARY

ALARA
As Low As Reasonably Achievable

CCME
Canadian Council of Ministers of the Environment

CEAA
Canadian Environmental Assessment Act

CEPA
Canadian Environmental Protection Act

Class 1 NF Regulations
Class 1 Nuclear Facilities Regulations

CNSC
Canadian Nuclear Safety Commission

DEL
Derived Emission Limit

DRL
Derived Release Limit

EMS
Environmental Management System

Environment
Expanding on clause 3.5 of ISO 14001:2004, the environment refers to 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).[8]

Environmental effect
Expanding on "environmental impact" from clause 3.7 of ISO 14001:2004, environmental effect includes

(a) any change that an activity, substance, equipment, facility or prescribed information may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*;[44]

(b) any effect of any change referred to in (a) on

- health and socio-economic conditions;
- physical and cultural heritage;
- the current use of lands and resources for traditional purposes by aboriginal persons; or
- any structure, site, or thing that is of historical, archeological, paleontological, or architectural significance; or

whether any such change or effect occurs within or outside Canada.[adapted from 9]

GNSC Regulations
General Nuclear Safety and Control Regulations

ICRP
International Commission on Radiological Protection

ISO
International Organization for Standardization

Licensed Activity
An activity described in any of paragraphs 26(a) to (f) of the NSCA that a licence authorizes the licensee to carry on.[2]

Licensee
A person who is licensed to carry on an activity described in any of paragraphs 26(a) to (f) of the NSCA.[2]

NSCA
Nuclear Safety and Control Act

OMOE
Ontario Ministry of the Environment

Performance Indicator
A quantifiable variable related to the actions of a proposed or licensed activity that may cause or indicate an adverse environmental effect if a certain threshold value is reached.

Performance Target
A limit on a performance indicator designed to prevent unreasonable risks to the environment. More than one limit may be set or considered for a performance indicator.

Pollution prevention

Expanding on “prevention of pollution” from clause 3.18 of ISO 14001:2004, pollution prevention means the use of processes, practices, materials, products, substances or energy that avoid or minimize the creation of pollutants and waste and reduce overall risk to the environment or human health. [8]

RP Regulations
Radiation Protection Regulations

UMM Regulations
Uranium Mines and Mills Regulations

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2. *Class I Nuclear Facilities Regulations* (Class I NF Regulations). Canadian Nuclear Safety Commission, Ottawa, 2000.

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4. *General Nuclear Safety and Control Regulations* (GNSC Regulations). Canadian Nuclear Safety Commission, Ottawa, 2000, 12(l)(c).

5. GNSC Regulations 12(1)(f).

6. Class I NF Regulations 3(h).

7. UMM Regulations 3(c)(vi).

8. *Canadian Environmental Protection Act* (CEPA). Environment Canada, Ottawa, 1999.

9. *Canadian Environmental Assessment Act* (CEAA). Canadian Environmental Assessment Agency, Ottawa, 2003.

10. *Reference Guide: Determining Whether a Project Is Likely to Cause Significant Adverse Environmental Effects* (updated periodically). Canadian Environmental Assessment Agency, Ottawa, 2002.

11. *Radiation Protection Regulations* (RP Regulations). Canadian Nuclear Safety Commission, Ottawa, 2000.

12. RP Regulations 4(a).

13. *G-129 Guidelines on How to Meet the Requirement to Keep All Exposures As Low As Reasonably Achievable*, Regulatory Guide. Canadian Nuclear Safety Commission, Ottawa, 1997.

14. RP Regulations 13(l).

15. *A Framework for Assessing the Impact of Ionizing Radiation on Non-Human Species,* Annals of the ICRP, ICRP No. 91. International Commission on Radiological Protection, Sweden, 2003.

16. Class I NF Regulations 4(e), 5(i), 6(h), 7(f).

17. UMM Regulations 3(c)(iii).

18. *Environmental Assessments of Priority Substances under the Canadian Environmental Protection Act,* EPS/2/CC/3E. Environment Canada, Ottawa, 1997. *Federal Contaminated Sites Guidance on Human Health Risk Assessment in Canada.* Health Canada, Ottawa, 2003.

19. Class I NF Regulations 5(k), 6(j), 7(h).

20. UMM Regulations 3(c)(viii).

21. Class I NF Regulations 5(j), 6(i), 7(g).

22. UMM Regulations 3(c)(vii).

23. GNSC Regulations 3(j).

24. UMM Regulations 3(c)(ix).

25. UMM Regulations 3(c)(xi).

26. UMM Regulations 3(c)(xii).

27. Class I NF Regulations 6(k), 7(i).

28. UMM Regulations 3(x).

29. GNSC Regulations 29(1)(c)(f).

30. GNSC Regulations 12(1)(b).

31. UMM Regulations 3(c)(iv).

32. GNSC Regulations 17(a), (b), (c), (e).

33. Suter, G. W., II, R. A. Efroymson, B. E. Sample & D. S. Jones, *Ecological Risk Assessment for Contaminated Sites*, Lewis Publishers, Boca Raton, 2000.

34. UMM Regulations 4.

35. GNSC Regulations 3(1)(f).

36. RP Regulations 6.

37. *G-218 Preparing Codes of Practice to Control Radiation Doses at Uranium Mines and Mills,* Regulatory Guide. Canadian Nuclear Safety Commission, Ottawa, 2003.

38. *G-228 Developing and Using Action Levels*, Regulatory Guide. Canadian Nuclear Safety Commission, Ottawa, 2001.

39. *Canadian Environmental Quality Guidelines,* No. 1299 (updated regularly). Canadian Council of Ministers of the Environment, Winnipeg, 1999.

40. RP Regulations 4(b).

41. RP Regulations 13(1).

42. RP Regulations 14(1).

43. *Environmental Management Systems – Requirements with Guidance for Use*, CAN/CSA-ISO 14001:2004. Canadian Standards Association (CSA), Mississauga, 2004.

44. *Species at Risk Act*. Environment Canada, Ottawa, 2003.