



# Human Performance Management **Minimum Staff Complement**

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## **Minimum Staff Complement**

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## Preface

This regulatory document is part of the CNSC's human performance management series of regulatory documents, which also covers personnel training, personnel certification and fitness for duty. The full list of regulatory document series is included at the end of this document and can also be found on the [CNSC's website](#).

Regulatory document REGDOC-2.2.5, *Minimum Staff Complement*, provides guidance to assist Class I nuclear facility licensees and licence applicants in demonstrating to the CNSC that they will ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the *Nuclear Safety and Control Act*.

This document supersedes guidance document G-323, *Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement*, published in July 2007.

**Note:** In 2013, the CNSC adopted a revised regulatory framework structure with a new system for naming and numbering regulatory documents. This document has been published as part of the CNSC's initiative to bring regulatory documents that were published before the current framework was adopted into the new system. The requirements and guidance in this document have not changed.

For information on the implementation of regulatory documents in the licensing basis, and on the graded approach, see REGDOC-3.5.3, *Regulatory Fundamentals*.

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

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

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## Minimum Staff Complement

### 1. Introduction

#### 1.1 Purpose

The purpose of this regulatory document is to assist Class I nuclear facility licensees and applicants for a Class I nuclear facility licence to demonstrate to the CNSC that they will ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the *Nuclear Safety and Control Act* (NSCA, the Act) [1], the regulations made under the NSCA, and their licence.

#### 1.2 Scope

This regulatory document sets out information related to the staffing of a Class I nuclear facility that should typically be included in an application for the issuance, renewal, amendment, or replacement of a licence to operate a facility. The document sets out the key factors that CNSC staff will take into account when assessing whether the licensee has made or the applicant will make adequate provision for ensuring the presence of a sufficient number of qualified staff. This document addresses staffing levels required to respond to the most resource-intensive conditions under all operating states, including normal operations, anticipated operational occurrences, design-basis accidents, and emergencies.

Expectations for use of this document will vary with the complexity of facility operations and the consequences of potential events on the environment, health and safety of persons, and maintenance of national security and measures required to implement international obligations.

#### 1.3 Relevant legislation

The following provisions of the NSCA and the regulations made under it are relevant to this document:

1. Paragraph 24(4)(a) of the NSCA states “No licence shall be issued, renewed, amended or replaced — and no authorization to transfer one given — unless, in the opinion of the Commission, the applicant or, in the case of an application for an authorization to transfer the licence, the transferee  
(a) is qualified to carry on the activity that the licence will authorize the licensee to carry on;”
2. Subsection 24(5) of the NSCA states “A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.”
3. Paragraph 12(1)(a) of the *General Nuclear Safety and Control Regulations* [2] states “Every licensee shall  
(a) ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the Act, the regulations made under the Act and the licence;”
4. Section 5 of the *General Nuclear Safety and Control Regulations* states “An application for the renewal of a licence shall contain  
(a) the information required to be contained in an application for that licence by the applicable regulations made under the Act; and  
(b) a statement identifying the changes in the information that was previously submitted.”

5. Paragraph 3(1)(k) of the *General Nuclear Safety and Control Regulations* states “An application for a licence shall contain the following information: [...] (k) the applicant’s organizational management structure insofar as it may bear on the applicant’s compliance with the Act and the regulations made under the Act, including the internal allocation of functions, responsibilities and authority;”
6. Paragraph 6(a) of the *General Nuclear Safety and Control Regulations* states “An application for the amendment, revocation or replacement of a licence shall contain the following information:  
(a) a description of the amendment, revocation or replacement and of the measures that will be taken and the methods and procedures that will be used to implement it;”
7. Paragraph 6(b) of the *General Nuclear Safety and Control Regulations* states “An application for the amendment, revocation or replacement of a licence shall contain the following information: [...] (b) a statement identifying the changes in the information contained in the most recent application for the licence;”
8. Paragraph 6(d) of the *Class I Nuclear Facilities Regulations* [3] states “An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3: [...] (d) the proposed measures, policies, methods and procedures for operating and maintaining the nuclear facility;”
9. Paragraph 6(m) of the *Class I Nuclear Facilities Regulations* states “An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3: [...] (m) the proposed responsibilities of and qualification requirements and training program for workers, including the procedures for the requalification of workers;”
10. Paragraph 6(n) of the *Class I Nuclear Facilities Regulations* states “An application for a licence to operate a Class I nuclear facility shall contain the following information in addition to the information required by section 3: [...] (n) the results that have been achieved in implementing the program for recruiting, training and qualifying workers in respect of the operation and maintenance of the nuclear facility.”
11. Subsection 9(2) of the *Class I Nuclear Facilities Regulations* states “The Commission or a designated officer authorized under paragraph 37(2)(b) of the Act may certify a person referred to in paragraph 44(1)(k) of the Act for a position referred to in a licence after receiving from the licensee an application stating that the person  
(a) meets the applicable qualification requirements referred to in the licence;  
(b) has successfully completed the applicable training program and examination referred to in the licence; and  
(c) is capable, in the opinion of the licensee, of performing the duties of the position.”

## 2. Background

All Class I nuclear facility licensees are required to ensure the presence of a sufficient number of qualified workers to carry on the licensed activity safely and in accordance with the NSCA, the regulations made under the NSCA, and the facility licence. One aspect of ensuring the presence of a sufficient number of qualified workers is defining the minimum number of workers with specific qualifications who will be available to the nuclear facility at all times, known as the minimum staff complement. The number and qualifications of workers in the minimum staff complement should be adequate to successfully respond to all credible events, including the most resource-intensive conditions for any facility state.

### 3. Expectations

#### 3.1 Basis for minimum staff complement of qualified workers

##### 3.1.1 Use of a systematic analysis

It is expected that the minimum staff complement is determined by the licensee through a systematic analysis. An analysis of tasks should be performed to determine the minimum staff complement requirements for personnel available to the nuclear facility. The analysis should include those tasks carried out in the main control room (MCR) and in secondary control areas, where they exist. For Class I nuclear facilities that modify their minimum staff complement for different operational states, the most resource-intensive conditions for each operational state should be analyzed.

The analysis to determine the minimum staff complement requirements should consider the following:

1. The actions required in the facility and their timing for the full range of the most resource-intensive conditions under all operating states, including normal operations, anticipated operational occurrences, design-basis accidents, and/or emergencies;
2. The most resource-intensive initiating events and credible failures considered in the safety analysis report and the probabilistic safety assessment;
3. The operating strategies that define how the nuclear facility personnel respond to anticipated operational occurrences, design-basis accidents, and emergencies;
4. The required interactions among facility personnel for the purpose of diagnosing, planning, communicating, coordinating and controlling anticipated operational occurrences, design-basis accidents, and emergencies;
5. The staffing demands required for the possible concurrent use of procedures related to anticipated operational occurrences, design-basis accidents, and emergencies;
6. The staffing demands required to monitor indicators, displays and alarms and to promptly and effectively operate the facility's equipment controls using procedures related to anticipated operational occurrences, design-basis accidents, and emergencies;
7. The staffing demands required to perform tasks in field locations using procedures related to anticipated operational occurrences, design-basis accidents, and emergencies;
8. The staffing demands required for the successful completion of any safety-critical human actions using procedures related to anticipated operational occurrences, design-basis accidents, and emergencies;
9. The additional staffing demands when independent verification of task completion is specified in procedures related to anticipated operational occurrences, design-basis accidents, and emergencies;
10. The staffing strategy to provide for qualified staff for unplanned situations under anticipated operational occurrences, design basis-accidents, and emergencies;
11. The staffing strategy to ensure the provision of qualified relief for workers; and
12. The restrictions on the location of workers within the nuclear facility.

##### 3.1.2 Validation of minimum staff complement requirements

It is expected that the minimum staff complement requirements are validated by the licensee to provide assurance that there is, at all times, a sufficient number of qualified workers available to operate the facility safely and to respond to the most resource-intensive conditions under all operating states, including normal operations, anticipated operational occurrences, design-basis accidents, and/or emergencies.

When designing the method of validation, licensees should meet the expectations found in the CNSC's G-278, *Human Factors Verification and Validation Plans* [4], and international standards on human performance evaluation techniques, such as the Institute of Electrical and Electronics Engineers' *IEEE Guide for the Evaluation of Human-System Performance in Nuclear Power Generating Stations*, as referenced in the "Additional Information" section of this regulatory document.

### **3.1.2.1 Range of validation scenarios**

Validation scenarios should include the most resource-intensive credible events, including those that involve coincident anticipated operational occurrences, design-basis accidents and emergencies.

For Class I nuclear facilities that modify their minimum staff complement for different operational states, the most resource-intensive scenarios for each operational state should be validated.

For multi-unit nuclear power plants, validation scenarios should include the most resource-intensive events that could affect more than one unit, such as, but not limited to, seismic events, loss of off-site power and steam line or feedwater line breaks.

### **3.1.2.2 Objectives of validation exercises**

The validation exercises should demonstrate that the following can be achieved by the minimum staff complement for all validation scenarios:

1. The relevant procedures can be effectively implemented in a timely manner;
2. There is an effective and timely response to anticipated operational occurrences, design-basis accidents, and emergencies;
3. The facility can be effectively monitored, controlled and stabilized;
4. There is effective communication and coordination of required actions;
5. Workers are able to maintain awareness of facility conditions;
6. The physical and mental workload of minimum staff complement is achievable; and
7. All safety-critical human actions are achievable.

### **3.1.3 Systematic approach to training**

It is expected that the principles of a systematic approach to training are applied to all positions included in the minimum staff complement.

### **3.1.4 Minimum staff complement for nuclear power plants**

In addition to certified operations personnel, it is expected that the minimum staff complement at nuclear power plants will include a number of workers with specialized qualifications, such as:

1. Fuel handling operators when fuelling;
2. Chemical, mechanical, and electrical maintainers;
3. Emergency response personnel;

A decision not to include any of these positions should be justified by the licensee.

### **3.2 Implementation of the minimum staff complement**

#### **3.2.1 Documentation**

The method followed to determine the minimum staff complement requirements and the results obtained from the analysis should be documented.

#### **3.2.2 Minimum staffing procedures**

Minimum staffing requirements should be formalized by the licensee in a procedure. This minimum staff complement procedure should include the following:

1. The specific number of staff to be present onsite, in the facility, and in the MCR (if one exists), and the composition of the minimum staff complement with reference to specific positions or qualifications;
2. For nuclear facilities that modify their minimum staff complement for different operational states, the specific number and composition of the minimum staff complement with reference to specific positions or qualifications for each operational state;
3. Consistent terminology when referring to specific positions or staff qualifications;
4. The specific restrictions on the location of individuals in the facility (for example, it may be necessary to limit the location of certain workers within the facility if they must be able to return to the MCR within a specified time limit);
5. A description of the measures in place to monitor compliance with the minimum staff complement and to prevent non-compliance with the minimum staff complement; and
6. Specific actions to be taken to reduce the risk to the facility in the event of non-compliance with the minimum staff complement.

#### **3.2.3 Design-basis accident procedures**

There should be a documented basis for staffing requirements for each design-basis accident procedure that is based on an analysis using sections 3.1.1 and 3.1.2 of this regulatory document. The number of qualified workers required in the MCR (if one exists) and in the remainder of the nuclear facility should be clearly stated on the coversheet of the design-basis accident procedure. Where there are separate procedures for field actions, the number of qualified workers required to successfully complete these actions should be clearly stated in each procedure.

### **3.3 Compliance with the minimum staff complement**

Compliance with the minimum staff complement should be ensured by the following:

1. Licensees should have a process for shift scheduling and accounting that ensures that each minimum staff complement position is filled at all times;
2. The shift scheduling process should ensure that planned and unplanned absences do not lead to non-compliance with the minimum staff complement;
3. The shift turnover process should ensure that minimum staff complement positions are filled at all times;
4. Licensees should have in place a documented fitness-for-duty program that provides confirmation that any person filling a minimum staff complement position does not have a physical or mental limitation that would make the person incapable of performing the duties of the applicable position; and
5. Licensees should have adequate plans in place for addressing short-term (e.g., severe weather) and long-term (e.g., pandemic) threats to the minimum staff complement.

### **3.4 Periodic review of the minimum staff complement**

The adequacy of the minimum staff complement should be reviewed periodically for the following:

1. There should be methods for ongoing testing of the adequacy of the minimum staff complement. For example, emergency drills and exercises should be carried out regularly using only minimum complement personnel;
2. Internal and external operating experience that identifies performance deficiencies, coordination problems, communications problems, or inadequacies in the availability of workers with the necessary skills should be considered; and
3. Relevant international standards and guidelines should be considered.

### **3.5 Changes to minimum staff complement**

When a change in the minimum staff complement is required, an implementation plan should be developed that demonstrates that the potential for adverse effects on facility operations is minimized.

The plan for implementing changes to the minimum staff complement should consider the following:

1. The basis for the modified staffing levels is analyzed, as described in section 3.1 of this regulatory document;
2. The transition from existing to new requirements is effectively managed;
3. Any changes to documentation, staff qualifications, and training programs are effectively implemented in a timely manner;
4. There is an appropriate allocation of time for regulatory review and approval of the proposed changes; and
5. There is an application of lessons learned from the implementation of previous changes.

## Glossary

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

## References

1. [\*Nuclear Safety and Control Act\*](#), S.C. 1997, c. 9.
2. [\*General Nuclear Safety and Control Regulations\*](#), SOR/2000-202.
3. [\*Class I Nuclear Facilities Regulations\*](#), SOR/2000-204.
4. CNSC. [\*G-278, Human Factors Verification and Validation Plans\*](#), 2003.

## Additional Information

The following documents provide additional information that may be relevant and useful for understanding the requirements and guidance provided in this regulatory document:

- IEEE Standard 845-1999, *IEEE Guide for the Evaluation of Human-System Performance in Nuclear Power Generating Stations*.
- Entec UK Ltd. for the Health and Safety Executive (2001). *Assessing the Safety of Staffing Arrangements for Process Operations in the Chemical and Allied Industries*, Contract Research Report 348/2001.
- IP and Health and Safety Executive (2004). *Safe Staffing Arrangements – User Guide for CRR348/2001 Methodology*.
- Hallbert, B., Sebok, A. and Morisseau, D. (2000). *A Study of Control Room Staffing Levels for Advanced Reactors*, NUREG/IA-0137.
- United States Nuclear Regulatory Commission (2004). *Technical Basis for Regulatory Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)*, NUREG/CR-6838.
- United States Nuclear Regulatory Commission (2012). *Human Factors Engineering Program Review Model*, NUREG-0711, Rev. 3.
- United States Nuclear Regulatory Commission (1995). *Results of Shift Staffing Study*, Information Notice 95-48.
- United States Nuclear Regulatory Commission (1997). *Integrated System Validation: Methodology, and Review Criteria*, NUREG/CR-6393.

## CNSC Regulatory Document Series

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

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|        | 2.3  | Operating performance                    |
|        | 2.4  | Safety analysis                          |
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### 3.0 Other regulatory areas

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| Series | 3.1 | Reporting requirements           |
|        | 3.2 | Public and Aboriginal engagement |
|        | 3.3 | Financial guarantees             |
|        | 3.4 | Commission proceedings           |
|        | 3.5 | CNSC processes and practices     |
|        | 3.6 | Glossary of CNSC terminology     |

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