Financial Guarantees

Regulatory Guide

Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities

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Preface

This regulatory document is part of the CNSC’s financial guarantees series of regulatory documents. 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-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, sets out requirements and guidance for applicants and licensees regarding the establishment and maintenance of funding for the decommissioning of facilities and termination of activities licensed by the Canadian Nuclear Safety Commission.

REGDOC-3.3.1 provides information on financial guarantees used to ensure a licensee will have sufficient funds to decommission a licensed location and dispose of any associated nuclear substances. The document is intended to form part of the licensing basis for a regulated facility or activity within the scope of the document. It is intended for inclusion in licences as either part of the conditions and safety and control measures in a licence, or as part of the safety and control measures to be described in a licence application and the documents needed to support that application.

This document supersedes G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*, published in June 2000. 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.
## Table of Contents

1. **Introduction**............................................................................................................. 4
   1.1 Purpose................................................................................................................. 4
   1.2 Scope................................................................................................................... 4
   1.3 Relevant legislation............................................................................................ 4

2. **Background** ........................................................................................................... 4

3. **Acceptance Criteria for Financial Guarantees** ....................................................... 5
   3.1 Liquidity.............................................................................................................. 6
   3.2 Certainty of value.............................................................................................. 6
   3.3 Adequacy of value............................................................................................. 6
   3.4 Continuity ......................................................................................................... 6

4. **Acceptable Financial Guarantee Instruments** .......................................................... 6
   4.1 Cash funds......................................................................................................... 6
   4.2 Investment funds .............................................................................................. 7
   4.3 Letters of credit................................................................................................. 7
   4.4 Surety bonds .................................................................................................... 7
   4.5 Insurance ......................................................................................................... 7
   4.6 Expressed commitments from Canadian government entities.......................... 8
   4.7 Other types of instruments............................................................................... 8

5. **Administration of Financial Guarantees** ................................................................. 8
   5.1 Access to funds upon demand........................................................................... 8
   5.2 Separation of financial guarantee from licensee’s other assets............................ 9
   5.3 Maintenance on a continuous basis .................................................................... 9
   5.4 Replacement of financial guarantee .................................................................. 9
   5.5 Signing officers.................................................................................................. 9

6. **Reporting requirements** .......................................................................................... 9

Part I: Financial Guarantees for the Decommissioning of Nuclear Facilities and Activities.... 10

7. **Introduction** ......................................................................................................... 10
   7.1 Scope................................................................................................................ 10
   7.2 Background........................................................................................................ 10

8. **Planning for Decommissioning** ............................................................................. 10

9. **Cost Estimates for Decommissioning** ................................................................ 10

10. **Requirements for Costs to Be Included** ............................................................. 11

11. **Cost Categories** .................................................................................................. 11

12. **Presentation of Cost Estimate** ............................................................................. 11
13. Elements of Cost Estimates

13.1 Basis of estimate

13.2 Structure of estimate

13.2.1 Activity-dependent costs

13.2.2 Period-dependent costs

13.3 Collateral and special item costs

13.3.1 Contingency

13.4 Schedule

13.5 Uncertainty analysis


14.1 Constant dollars

14.2 Cash flow and planned disbursements

14.3 Net present value

15. Review of Financial Guarantees

Part II: Financial Guarantees for Termination of Licensed Activities

16. Introduction

16.1 Scope

17. Financial Guarantee Program

18. Alternatives to Financial Guarantee Program


Appendix A: Example of Letter of Credit

Appendix B: Cost Estimate Grades and Classification

Appendix C: Standardized Definitions for Cost Categories

Appendix D: International Structure for Decommissioning Costing Cost Item Hierarchy

Appendix E: Approaches to Cost Estimation
Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities

1. Introduction

1.1 Purpose

Financial guarantees for decommissioning of nuclear facilities and termination of licensed activities are implemented in accordance with the Nuclear Safety and Control Act (NSCA) and the regulations made under the NSCA.

Applicants and licensees are required to make adequate provision for the safe decommissioning of existing or proposed new nuclear facilities by ensuring that sufficient financial resources are available to fund all approved decommissioning activities should the licensee not be able to fulfill its obligations. Operationally, the Commission may also require that financial resources be available for termination of licensed activities other than for decommissioning of nuclear facilities.

This document provides requirements and guidance to applicants and licensees regarding the establishment and maintenance of funding for the decommissioning of facilities and termination of activities licensed by the Canadian Nuclear Safety Commission (CNSC).

1.2 Scope

This document presents information for those who have incurred, or expect to incur, obligations with respect to the decommissioning of nuclear facilities or the termination of activities licensed by the CNSC.

Part I of this document pertains to financial guarantees for decommissioning of nuclear facilities or activities for Class IA and IB licences issued in accordance with the Class I Nuclear Facilities Regulations, uranium mines and mills licences and waste nuclear substances licences.

Part II of this document pertains to financial guarantees for the termination of licensed activities, such as for nuclear substances and radiation devices, prescribed equipment, and Class II facilities.

1.3 Relevant legislation

The provisions of the Nuclear Safety and Control Act and regulations that are relevant to this regulatory document include:

- Nuclear Safety and Control Act, subsection 24(5)
- General Nuclear Safety and Control Regulations, paragraph 3(1)(l)
- General Nuclear Safety and Control Regulations, subparagraph 29(1)(j)(i) to 29(1)(j)(x)
- General Nuclear Safety and Control Regulations subsection 29(2)

2. Background

The CNSC’s mandate is to regulate the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada’s international commitments on the
The CNSC defines decommissioning as the administrative and technical decommissioning actions taken to allow the removal of some or all of the regulatory controls from a facility or location where nuclear substances are managed, possessed or stored. Decommissioning actions are the procedures, processes and work activities that lead to the release of a facility or location from regulatory control, with or without restrictions on its future use (for example, decontamination and/or dismantling of structures, systems and components).

Financial guarantees are a tangible commitment by a licence applicant or a licensee that there will be sufficient resources to safely terminate licensed activities. A financial guarantee does not relieve applicants or licensees from complying with regulatory requirements for decommissioning of nuclear facilities or termination of licensed activities – the financial guarantee ensures that there are funds available to the CNSC if applicants or licensees are unable to carry out safe decommissioning or termination of activities.

Financial obligations are intended to ensure:

- funding is available to make adequate provision for the health and safety of current and future generations
- the applicants and licensees establish adequate funds to pay for the decommissioning and termination of their licensed activities

Financial guarantees must be sufficient to cover the cost of decommissioning of nuclear facilities or termination of licensed activities authorized by the current licence.

The types of instruments for financial guarantees can vary. The applicants and the licensees should select an instrument that suits the scope and the timeframe of their decommissioning plan.

The requirements and guidance for decommissioning planning are provided in REGDOC-2.11.2, Decommissioning [1] and CSA standard N294-19, Decommissioning of Facilities Containing Nuclear Substances [2].

A graded approach may be applied by the CNSC when assessing the financial guarantees. The assessment could take into consideration the facility lifecycle stage, the type and complexity of the activity, and the level of detail provided in the decommissioning plan, which should be consistent with the magnitude of risk arising from the facility’s decommissioning.

3. **Acceptance Criteria for Financial Guarantees**

The following are the CNSC’s general expectations for criteria of liquidity, certainty of value, adequacy of value and continuity. An applicant or licensee may propose alternative approaches to meet the intent of the acceptance criteria for financial guarantees. In all cases the financial guarantees must be accepted by the Commission or, where a designated officer has issued a licence, by the designated officer.
3.1 Liquidity

The proposed financial guarantee must be established so that the only requirement for drawing upon it is a formal request or demand by the Commission or a person authorized by the Commission and so that payout for decommissioning purposes is not prevented, unduly delayed or compromised for any reason.

3.2 Certainty of value

Applicants or licensees must select funding or security instruments or arrangements which provide full assurance of their value.

3.3 Adequacy of value

The value of the financial guarantees for nuclear facilities must be linked to the cost estimate set out in the most recent decommissioning plan for nuclear facilities or activities authorized under Class I uranium mines and mills licences and waste nuclear substances licences.

Financial guarantees for other licensed activities, addressed in Part II of this document, must be linked to the licence for nuclear substances and radiation devices, prescribed equipment and Class II facilities.

3.4 Continuity

The financial guarantees required for decommissioning and termination of licenced activities must be maintained on a continuing basis. This may require periodic renewals, revisions or replacements of securities provided or issued for fixed terms. In order to ensure continuity of coverage, financial guarantees must include provisions for advance notice to the CNSC of termination or the intent to not renew. See section 5 for additional information.

4. Acceptable Financial Guarantee Instruments

The following sections provide examples of acceptable financial guarantee instruments. In all cases the financial guarantee instruments must be accepted by the Commission, or where a designated officer has issued a licence, by the designated officer.

4.1 Cash funds

Cash funds include cash as well as other equivalent securities such as certified cheques, bearer bonds and guaranteed investment certificates.

These instruments can provide certainty and adequacy of value, ease of liquidity, and continuity. Such instruments provide maximum protection against the risk of default.

Any cash collateral or direct funding should be made into an account which is controlled by the federal government (either the CNSC or the Receiver General for Canada) or by a Canadian chartered bank listed in Schedule I or II of the Bank Act.
4.2 Investment funds

Investment funds are financial instruments that are publicly traded or can be easily liquidated if required.

Funds earmarked for financial guarantees purposes may be invested in an investment portfolio in order to earn interest income to help to cover the costs of decommissioning.

When investment funds are used, there are several economic estimates that must be made including the rate of inflation over time, and the estimated rate of return of the portfolio. Information on planned disbursements should be included in order for the CNSC to review the financial guarantee to ensure it is sufficient to cover costs of decommissioning.

4.3 Letters of credit

A letter of credit is an agreement between a licensee or applicant and a financial institution.

A letter of credit can provide for specific sums of money to be paid on demand to designated parties or their agents should a triggering event occur, such as a licensee defaulting on its obligation to decommission. Letters of credit can provide certainty of value, can be easily liquidated, and may be rewritten or revised as the required amount of security changes. Appendix A provides an example of a letter of credit.

Letters of credit should be issued by a Canadian chartered bank listed in Schedule I or II of the Bank Act.

4.4 Surety bonds

Surety bonds include bid bonds, performance bonds, labour and material payment bonds and maintenance bonds. Surety bonds are widely used in the construction industry.

Variations of these bond types may be appropriate as primary security, or to complement other instruments.

For example, under the terms of a performance bond agreement, a surety company could commit to responsibility for all claims and expenses for decommissioning up to a specified limit. Another form of financial guarantee will be required where the estimated cost of the decommissioning exceeds the value of the surety bond.

Surety bonds should name the CNSC as a beneficiary and the insurance or bonding agents should be Canadian companies subject to Canadian regulatory oversight.

4.5 Insurance

Insurance policies may be acceptable financial guarantee instruments provided the insurance policy is developed and accepted by the CNSC. Insurance policies should name the CNSC as a beneficiary, and the insurance agents should be Canadian companies subject to Canadian regulatory oversight.
4.6 Expressed commitments from Canadian government entities

An expressed commitment from a Canadian federal, provincial or territorial government, may be an acceptable financial guarantee instrument to cover all aspects of decommissioning a facility or site for which the government has assumed liability.

Expressed commitments from a Canadian provincial or territorial government are restricted to guarantees that the federal government has the right to offset through transfer payments as a method of enforcing the guarantee, if necessary. Universities and hospitals may also use expressed commitments as a financial guarantee instrument. In such a case, universities and hospitals must maintain a letter of commitment acknowledging the responsibility and liability for the decommissioning of the site. The letter of commitment must be signed by a person of authority at the institution.

Institutions that operate research reactors, such as SLOWPOKE reactors, should maintain sufficient financial guarantees in a form other than expressed commitments to bring the facility to a safe state, including removal of fuel and radioactive and hazardous materials from the site. The remaining cost for completing the decommissioning of the facility may be covered by a letter of commitment acknowledging the responsibility and liability of decommissioning. The letter of commitment must be signed by a person of authority at the institution.

4.7 Other types of instruments

Other types of financial guarantee instruments may be considered by the Commission as part of the licensing or renewal process. In all cases, the financial guarantee instrument must satisfy the general acceptance criteria listed in section 3. Since parent company guarantees and pledges of assets do not satisfy the acceptance criteria listed in section 3, they are not considered acceptable financial guarantee instruments.

5. Administration of Financial Guarantees

Financial guarantees are administered by clearly defined and legally enforceable arrangements acceptable to the CNSC. These arrangements must be structured to ensure that the financial guarantee provided by the applicant or the licensee includes the terms outlined in the following subsections:

5.1 Access to funds upon demand

The CNSC must be assured that it can, upon demand, access or direct adequate funds if a licensee is not available to fulfill its obligations for decommissioning. The funds must be structured such that the instrument can be drawn upon only with the prior acceptance of the CNSC and that such pay-out is not prevented, delayed or compromised, and must be structured such that the instrument can provide full assurance of value.

Where the province has a legislative framework in place, as the province of Saskatchewan does for uranium mines, the financial guarantee may be payable to a provincial entity qualified to decommission the mine, if this arrangement is approved by the Commission.

1 Examples of a person of authority include the president or chief financial officer of the organization.
The provincial entity is also responsible for the following institutional control program, as legislated by the province.

5.2 Separation of financial guarantee from licensee’s other assets

The financial guarantee arrangements must be structured to ensure that the funds provided by the applicant or licensee to guarantee funding for an approved decommissioning plan are separated from its other assets. This might require the inclusion of terms restricting access to, or use of, monies realized from the funds.

Withdrawals from a fund, or access to monies realized from other security vehicles must only be permitted for approved purposes; in particular, to pay for approved decommissioning activities, or to refund excess monies to the licensee.

5.3 Maintenance on a continuous basis

Financial guarantee instruments must be automatically renewed and must include provisions for advance notice to the CNSC of termination or the intent to not renew.

Financial guarantee instruments should be open-ended, or if written for a specified term, must be renewed automatically unless 30 days or more prior to the renewal date the issuer notifies the CNSC (as the beneficiary) and the licensee of any intention not to renew.

5.4 Replacement of financial guarantee

If the licensee fails to provide a replacement acceptable to the CNSC within 10 days after receipt of notification of cancellation, the terms of arrangement should further provide that the full face value of the instrument may automatically be paid into an account which is controlled by the federal government (either the CNSC or the Receiver General for Canada) or by a Canadian chartered bank listed in Schedule I or II of the Bank Act prior to expiration, without proof of forfeiture required. The value of the instrument must be payable, for purposes of funding decommissioning or termination of activities.

5.5 Signing officers

Applicants or licensees must provide, and continually update as required, a list of signing officers who have the requisite corporate or governmental authority to bind the corporation or the government as applicable.

6. Reporting requirements

Licensees are required to report annually on the status and the validity of their financial guarantee. Licensees must indicate if their financial guarantee remains valid, in effect and sufficient to meet decommissioning needs according to the current decommissioning plan associated with the cost estimate used to establish the amount of the financial guarantee.

Part I: Financial Guarantees for the Decommissioning of Nuclear Facilities and Activities

7. Introduction

7.1 Scope

Part I of this document provides information to applicants and licensees with regard to the CNSC’s requirements and guidance for establishing financial guarantees for decommissioning of licensed facilities and activities for Class IA and IB licences issued in accordance with the Class I Nuclear Facilities Regulations, uranium mine and mill licences, and waste nuclear substances licences.

7.2 Background

The Nuclear Safety and Control Act (NSCA) and associated regulations require applicants and licensees to make adequate provision for the safe operation and decommissioning of existing or proposed operations.

In addition, a licence may contain conditions requiring licensees to have acceptable decommissioning plans in place, and an acceptable financial guarantee that must remain valid, in effect and sufficient to meet decommissioning needs according to the most up-to-date decommissioning plan.

8. Planning for Decommissioning

Planning for the decommissioning of a facility or activity is an integral part of the lifecycle planning. The lifecycle stages of a facility include siting, construction (including design), operation and decommissioning. Planning for decommissioning is an ongoing process and should be considered at each lifecycle stage of the facility.

Requirements and guidance for decommissioning planning for CNSC-regulated activities and facilities are provided in REGDOC-2.11.2, Decommissioning [1], and CSA standard N294-19, Decommissioning of facilities containing nuclear substances [2]. Decommissioning plans can vary in complexity and detail in accordance with specific circumstances but must be sufficiently detailed to enable credible estimates of the amount of financial guarantees.

9. Cost Estimates for Decommissioning

The cost estimate for decommissioning should be based on the most up-to-date decommissioning plan and should reflect the assumed decommissioning strategy and end state of the facility or activity.

The decommissioning cost estimates may vary depending on the stage in the lifecycle. In the case of estimates undertaken at the conceptual design stage of a project, the purpose is to:

- enable designers and client organizations to establish overall project costs
- inform the long-term financing process to provide for future funds when a facility will be decommissioned
Later, when the decommissioning project planning has advanced as a facility or activity nears the end of its period of operation, the cost estimate forms part of the basis for the detailed decommissioning planning.

Various approaches to determine the level of cost estimate accuracy exist. Organizations such as the Association for Advancement of Cost Engineering (AACE International) have guidelines for estimating cost for different industries [5]. Guidance establishing the cost estimate level of accuracy is provided in Appendix B.

10. Requirements for Costs to Be Included

Cost estimates must include all decommissioning activities from operations, during shutdown to the final release from regulatory control. The cost estimate for decommissioning must address the cost of the following principal activities, if applicable:

- preparation for final shutdown
- facility shutdown activities
- additional activities for safe enclosure (if applicable)
- decontamination and dismantling activities
- waste processing and storage, including used fuel
- project management, engineering and site support
- site clean-up, landscaping and restoration (if required)
- long-term management, including disposal of radioactive waste and used fuel (if applicable)
- long-term monitoring and maintenance of the site and institutional control (if applicable)
- miscellaneous expenditures

The applicant or licensee must estimate the cost for all activities included in their decommissioning plan.

11. Cost Categories

Four cost categories should be defined for each principal activity:

- labour cost: payments to employees including social and health benefits
- investment cost: capital/equipment/material cost
- expenses: consumables, taxes, insurance, etc.
- contingencies: a specific provision for unforeseeable elements of cost within the defined project scope

The applicant or the licensee should reflect local construction rates for labour, and provide conservative estimates for materials, equipment and administrative expenses.

An example of standardized definitions for cost categories for all major activities is presented in Appendix C.

12. Presentation of Cost Estimate

When developing a decommissioning cost estimate, consideration should be given to the presentation of cost estimate. The method most widely used as a platform for presenting the cost
estimation for establishing the funding for decommissioning is the work breakdown structure (WBS).

The WBS elements are arranged in a hierarchal format. The first level identifies the principal activities of the decommissioning project as listed in section 10 of this document. The second level presents the cost of activity groupings under which project costs would be gathered. The first and second levels are usually aggregations of the typical activities identified in the third level. The cost associated with each activity could be subdivided according to the four cost categories shown in figure 1.

An example of the hierarchal cost structure used by the International Structure for Decommissioning Costing (ISDC) is presented in figure 1 [6].

**Figure 1: Hierarchal cost structure as per International Structure for Decommissioning Costing**

![Hierarchal cost structure diagram]

Subsequent levels to the cost structure could be added in order to distinguish costs related to specific parts of the facility or specific periods of decommissioning project. The ISDC summary of cost item hierarchy is presented in Appendix D. The detailed itemization presented in the appendix provides general guidance on cost to be included in the estimate. The applicants and licensees should ensure that costs for all activities described in the decommissioning plan are reflected.

The approaches to cost estimation vary depending on the primary objective of the cost estimate, the facility lifecycle stage and the advancement of decommissioning planning. A brief description and comparison of those estimating methods is provided in table 1 in Appendix E.

### 13. Elements of Cost Estimates

When developing a decommissioning cost estimate, the four basic elements to a cost estimate should be considered: basis of estimate, structure of estimate (work breakdown structure [WBS]), schedule and uncertainty analysis. These four elements are described in detail in the following sections.
13.1 Basis of estimate

The basis of estimate (BOE) is the foundation upon which the cost estimate is developed. A BOE should fully reflect the current decommissioning plan prepared in accordance with REGDOC-2.11.2, *Decommissioning* [1]. The BOE should be based on the following:

- assumptions and exclusions
- boundary conditions and limitations – legal and technical (e.g., regulatory framework)
- decommissioning strategy description
- end state of the facility
- stakeholder, public and indigenous input/concerns
- facility description and site characterization (radiological/hazardous material inventory)
- waste management (packaging, storage, transportation, and disposal)
- used fuel management (activities included in a decommissioning project)
- sources of data used (actual field data vs. estimating judgment)
- cost estimating methodology used (e.g., bottom-up)
- basis for determining contingency, estimating uncertainty and risk
- discussion of techniques and technology to be used
- schedule analysis
- uncertainty analysis

The cost estimate for decommissioning should provide that, if impacts of proposed operations are difficult or impossible to estimate with precision, a credible worst-case scenario must be used. The cost estimate should not assume drawdown of nuclear substances or hazardous waste during operations. A “decommissioning tomorrow approach” must be applied, assuming that the facility is shutting down overnight, and the cost estimate must be based on the state of the facility and inventories at the time of shutdown. A credit for salvage of materials or equipment is not allowed. For the purpose of the cost estimate, they must be considered as waste.

The cost estimate for decommissioning must cover the entire decommissioning project, including, as applicable, the need for post-closure licensing, monitoring, surveillance and maintenance, and institutional control.

13.2 Structure of estimate

The WBS is used to categorize cost elements and work activities into logical groupings that have a direct or indirect relationship to each other and to determine how they affect the overall cost of the project. To that end, the work scope cost elements are broken down into activity-dependent, period-dependent, and collateral costs as defined in the following paragraphs.

13.2.1 Activity-dependent costs

Activity-dependent costs are costs associated directly with performing decommissioning activities. Examples of such activities include decontamination; removal of equipment; demolition of buildings; and waste packaging, shipping and disposal. These activities lend themselves to the use of unit cost and work productivity factors (or work difficulty factors) applied against the facility, activity and structure’s inventories to develop the decommissioning cost and schedule.
13.2.2 Period-dependent costs
Period-dependent costs include those activities associated primarily with the project duration: engineering, project management, dismantling management, licensing, health and safety, security, energy and quality assurance. These are primarily management staffing level costs, developed by estimating the manpower loading and associated overhead costs based on the scope of work to be accomplished during individual phases within each period of the project.

13.3 Collateral and special item costs
In addition to activity and period-dependent costs, there are costs for special items, such as for procurement of construction or dismantling equipment, site preparation, insurance, property taxes, health physics supplies, liquid radioactive waste processing and independent verification surveys. Such items do not fall in either of the other categories.

13.3.1 Contingency
Contingency is a work scope element of cost and it should be applied to the base cost to account for unforeseen elements of cost that are likely to occur. Because of the unique nature of this element of cost, the application of contingency is further described in section 13.5 of this document.

13.4 Schedule
The project schedule is an integral part of a cost estimate.

The preparation of a schedule is a well-developed process for which proven software programs are available.

The breakdown by project phase ties together all related activities in a chronological sequence to better define the work scope and schedule. The schedule’s work breakdown structure should be the same as the cost estimate work breakdown structure.

Activity sequencing requires the determination and documentation of the relationship between activities. Work process flow charts should be used to structure the relationship between activities.

At the early stages of decommissioning planning and cost estimation, a less detailed schedule summarizing the principal activities may be provided, and a more detailed schedule should be provided later based on the detailed decommissioning planning.

13.5 Uncertainty analysis
The BOE should fully define the boundaries of the decommissioning project scope and set out the basis for estimating the base cost and the associated uncertainties.

Contingencies are defined as unforeseeable elements of cost within the defined project scope.

The base cost is first calculated on the basis of standard conditions where activities are performed within the defined project scope, without delays, interruptions, inclement weather, tool or equipment breakdown, labour strikes, waste shipment problems, disposal facility waste acceptance criteria changes, or changes in the anticipated shutdown conditions.
The following three approaches for applying contingency could be used:

- for the entire decommissioning project
- for groups of decommissioning activities
- for individual decommissioning activities

Applicants or licensees should add contingencies to the base cost as a specific provision for any unforeseeable elements of cost within the defined project scope that may occur. Applicants or licensees must provide a justification of the contingencies applied to the cost estimates and link them to the cost estimate category. Contingencies are an integral part of the cost estimate.


Cost estimates are first prepared in current dollars assuming that the decommissioning will be executed at the time the cost is estimated. However, the time required to fully decommission can vary widely and has a significant impact on the calculation of the cost of decommissioning. Various factors must therefore be outlined in the estimate of the financial guarantee requirement:

- Inflation rate: The forecasted percentage increase in the price of goods and services annually. The rate of inflation used should be from a reasonable and credible source, such as from the Bank of Canada. Applicants or licensees must factor in inflation to ensure that there are sufficient funds reserved even when price increases are factored in.

- Discount rate (or expected rate of return on investment): In cases where the funds are invested, the expected rate of return that will be earned by the funds over time must be estimated. This expected rate of return should be supported by assumptions such as historical performance of the fund over time, the risk of the portfolio etc.

Another element that is important when performing this calculation is an estimate of when various elements of the work will be performed. Disbursements or planned spending must be factored in.

Starting with current value of the money, then applying the inflation rate and the discount rate, results in the net present value of funds required to be invested today, to ensure there are sufficient funds available for decommissioning in the future.

14.1 Constant dollars

Liabilities for decommissioning activities are reported in the present value of the underlying obligation, thereby expressing estimates in constant dollars to reflect changes in underlying funding obligations over time.

14.2 Cash flow and planned disbursements

A schedule of cash flow and planned disbursements for decommissioning must also be submitted in order to calculate the net present value of decommissioning requirements.

14.3 Net present value

The net present value presents the current dollar value of estimated future cash expenditures. It depends on the timing of decommissioning activities and expected expenditure profile.
In order to determine how much money is required today to pay for future liability, economic assumptions with respect to inflation and interest rate must be considered. Applicants and licensees must indicate the inflation rate and interest or discount rate used in calculations and justify the validity of the selected rates and assumptions.

As stated above, many decommissioning activities take place over a number of years, so it is important to ensure there are sufficient funds available today to cover costs that will be incurred years into the future.

15. **Review of Financial Guarantees**

Applicants or licensees must ensure that the financial guarantee remains valid, in effect and sufficient to meet decommissioning needs according to the most up-to-date decommissioning plan. Therefore, licensees must revise their financial guarantee at a minimum every five years or earlier when requested by the Commission. Applicants or licensees may request a review of their financial guarantees by the CNSC at any time.

Applicants or licensees must submit the updated financial guarantee for review by CNSC staff and acceptance by the Commission.
Part II: Financial Guarantees for Termination of Licensed Activities

16. Introduction

16.1 Scope

Part II of this document applies to holders of nuclear substances and radiation devices, prescribed equipment, and Class II facilities licensees. These licensees must ensure that they are financially responsible for the termination of the activities authorized by their licence. The CNSC has developed an insurance-based financial guarantee program to ensure that the Crown is not held financially responsible in the situation where a licensee has failed to properly terminate licensed activities.

17. Financial Guarantee Program

Under the insurance-based program, the CNSC is the insured party and the beneficiary. Licensees that participate in this program contribute to the cost of the insurance policy, in proportion to their liability. Liability is calculated on the basis of a formula that prescribes an estimated liability for each unit of prescribed equipment and sealed source as well as a room or laboratory where open source material is used.

Additional information on financial guarantees for nuclear substances and radiation devices and prescribed equipment and Class II facilities can be found on the CNSC website.

18. Alternatives to Financial Guarantee Program

The financial guarantee program is flexible in situations where a licensee’s activities do not meet the prescribed formula. In these situations a licensee has the option to propose its own financial guarantee for review and acceptance by the Commission following the established principles of section 3 and 4 of this document.


Financial guarantees for licences are assessed annually by the CNSC staff or when required by the Commission, to ensure that coverage is sufficient for the licensed activities.
Appendix A: Example of Letter of Credit

The following provides an example of letter of credit\(^2\). This template may be used by licence applicants or licensees when submitting a letter of credit to the CNSC.

1. The undersigned, hereinafter called the Guarantor, irrevocably guarantees to pay to the Beneficiary an amount not exceeding xxx Canadian dollars, including interest, costs and accessories, upon receipt of a written demand by the Beneficiary certifying that the Applicant has failed to fulfill its obligations with respect to decommissioning resulting from, or under the Nuclear Safety and Control Act, its regulations or licence no. xxx.

2. This Guarantee is effective from its issuance and must terminate and automatically expire on the expiry date.

3. Upon expiry of this Guarantee, by payment in favour of the Beneficiary or by lapse of time, the Beneficiary must return to the Guarantor the original of the Guarantee, bearing clear mention of its cancellation.

4. This Guarantee must be deemed to be automatically extended without amendment for a further one (1) year period from the present or any future expiration date hereof, unless at least thirty (30) days prior to the present or any future expiration date, the bank notifies you, the Beneficiary, in writing by courier or registered mail, that the bank elect not to consider this Guarantee to be renewable for any additional period. If the Applicant fails to provide a replacement financial guarantee acceptable to the Beneficiary within ten (10) days after receipt of this notification, the full face value of this Guarantee, less any partial drawings made hereunder, must be paid to the Beneficiary, or to a trustee acceptable to the Beneficiary, prior to the expiration date, with no proof of forfeiture required.

5. Partial draws by the Beneficiary are permitted hereunder. The amount of the partial draw shall be paid by the Guarantor to the Beneficiary, and the full face value of this Guarantee (i.e., the Guarantor’s maximum liability under this Guarantee) shall be automatically reduced by the amount of any partial drawings made hereunder.

6. Any demand for payment must be signed by a person authorized to act on the behalf of the Beneficiary

7. The Guarantor will honour the demand of the Beneficiary without enquiring whether the Beneficiary has the right as between itself and the Applicant to make such demand and without acknowledging any claim of the Applicant.

8. The Guarantor’s liability under this Guarantee must in no event exceed the sum mentioned in paragraph 1 herein, and such liability must terminate if a demand for payment made strictly in accordance with the requirements of these presents has not been received at the above branch no later than on the expiry date.

9. This Guarantee is not assignable.

\(^2\) Note: This is an example only and not the form of any specific financial institution. In any specific case additional or varied clauses may be used or required.
10. This Guarantee is governed by the laws of xxx, and the Courts of that province must have exclusive jurisdiction on all matters relating to this Guarantee and all recourses resulting therefrom.

11. This Guarantee sets forth in its entirety all of the obligations of the Guarantor and these obligations cannot be modified, interpreted or increased by any document or agreement mentioned herein, and any reference to any such document or agreement must not be construed as incorporating same to this Guarantee.
Appendix B: Cost Estimate Grades and Classification

A universally accepted standard for developing decommissioning cost estimates has not been established. However, organizations such as the Association for the Advancement of Cost Engineering (AACE International) have developed guidelines for estimation cost for different industries [5].

General

AACE International and the Construction Industry Institute have established guidelines and procedures for estimating costs [5]. These guidelines rank cost estimates as Grades A, B, or C, depending on their level of accuracy.

Grade C (accuracy of ±25% to 30%)

Grade C cost estimates are known as order-of-magnitude cost estimates. They are performed quickly by using shortcut techniques such as

a) escalating and/or scaling up from previous estimates
b) cost curves
  c) preliminary process design and equipment sizing without plot plans or major equipment quotations

It is likely that the overall scope of the project has not been defined.

Grade B (accuracy of ±15% to 20%)

Grade B cost estimates are known as budgetary cost estimates. They can be developed when the scope of the project has been defined but the detailed planning has not been performed. For large projects, they can be developed as soon as the preliminary process flow diagrams, preliminary plot plans, and equipment sizing have been completed. On smaller projects, estimates are developed when approximately 10% of the engineering is completed.

Grade A (accuracy of ±10%)

Grade A cost estimates are known as definitive cost estimates. They can be developed when the scope of the project is well defined and the detailed planning is prepared. For large projects, a Grade A estimate are prepared when the engineering flow diagrams, facility plans, and equipment lists are completed, and design has progressed to the stage required for the bidding process. For small projects, more engineering detail is necessary, and 30% to 50% of the engineering might be required to be completed.

Cost estimate classes

AACE International describes a classification system for cost estimates in the process industry (see table 1). In general, the accuracy of the cost estimate increases as the level of project definition increases. Decommissioning cost estimates prepared for the PDP are typically prepared as Class 4 study-type cost estimates. For additional information refer to the AACE International’s Required Skills and Knowledge of Cost Engineering [5].
Table 1: AACE International cost estimate classification for process industries

<table>
<thead>
<tr>
<th>Estimate class</th>
<th>Level of definition, % of complete definition</th>
<th>End usage (typical purpose of estimate)</th>
<th>Methodology (typical estimating method)</th>
<th>Expected accuracy (typical variation in low and high ranges), %</th>
<th>Preparation effort (typical degree of effort relative to lowest cost index of 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 5</td>
<td>0% to 2%</td>
<td>Concept screening</td>
<td>Capacity factored, parametric models, judgment, or analogy</td>
<td>Low: -20% to -50% High: +30% to +100%</td>
<td>1</td>
</tr>
<tr>
<td>Class 4</td>
<td>1% to 15%</td>
<td>Study of feasibility</td>
<td>Equipment factored or parametric models</td>
<td>Low: -15% to -30% High: +20% to +50%</td>
<td>2-4</td>
</tr>
<tr>
<td>Class 3</td>
<td>10% to 40%</td>
<td>Budget, authorization of control</td>
<td>Semi-detailed unit costs with assembly level line items</td>
<td>Low: -10% to -20% High: +10% to +30%</td>
<td>3-10</td>
</tr>
<tr>
<td>Class 2</td>
<td>30% to 70%</td>
<td>Control or bid/tender</td>
<td>Detailed unit cost with forced detailed take-off</td>
<td>Low: -5% to -15% High: +5% to +20%</td>
<td>4-20</td>
</tr>
<tr>
<td>Class 1</td>
<td>50% to 100%</td>
<td>Check estimate or bid/tender</td>
<td>Detailed unit cost with detailed take-off</td>
<td>Low: -3% to -10% High: +3% to +15%</td>
<td>5-100</td>
</tr>
</tbody>
</table>
Appendix C: Standardized Definitions for Cost Categories

This appendix provides information on standardised definitions for cost categories for all major activities. These definitions have been developed by the International Structure for Decommissioning Costing (ISDC) [6].

For each cost item, four cost categories have been defined:

1. Labour costs
2. Investment costs (capital, equipment and material costs)
3. Expenses
4. Contingency

1. Labour costs

Labour costs are defined as costs calculated on the basis of the workload for a particular cost item and the labour cost unit rate, including:

- salaries
- contributions to social security and health insurance
- company contributions to pension scheme and fringe benefits
- overheads

2. Investment costs (capital, equipment and material costs)

Investment costs are defined as costs for:

- equipment
- machinery

3. Expenses

Expenses are defined as costs for consumer items or expendable items, or as costs for other expenditures related to decommissioning cost items where applicable, such as:

- consumables
- spare parts
- protective clothing
- travel expenses
- legal expenses
- taxes
- value added tax
- insurance
- consultants costs
- quality assurance costs
- rents
- office material
- heating costs
- water costs
• electricity costs
• computer costs
• telephone/fax costs
• cleaning
• interest
• public relation
• licences/patents
• decommissioning authorisation
• income from asset recovery (“negative expenses”)

4. **Contingency**

Contingency, added to individual cost items of the standardised listing, is a specific provision for unforeseeable elements of costs within the defined project scope. Any impacts on cost outside of the scope of the decommissioning project are not considered.
Appendix D: International Structure for Decommissioning Costing Cost Item Hierarchy

This appendix provides information from the International Structure for Decommissioning Costing (ISDC) [6]. The ISDC was developed as a presentation platform for standardized listing of costs within the scope of decommissioning planning. Note that cost estimation for decommissioning of nuclear facilities can vary widely in format, content and practice.

ISDC Summary of cost item hierarchy

**Principle activity 01: Pre-decommissioning actions**

01.0100 Decommissioning planning
   - 01.0101 Strategic planning
   - 01.0102 Preliminary planning
   - 01.0103 Final planning

01.0200 Facility characterisation
   - 01.0201 Detailed facility characterisation
   - 01.0202 Hazardous-material surveys and analyses
   - 01.0203 Establishing a facility inventory database

01.0300 Safety, security and environmental studies
   - 01.0301 Decommissioning safety analysis
   - 01.0302 Environmental impact assessment
   - 01.0303 Safety, security and emergency planning for site operations

01.0400 Waste management planning
   - 01.0401 Establish waste management criteria
   - 01.0402 Develop a waste management plan

01.0500 Authorisation
   - 01.0501 License applications and license approvals
   - 01.0502 Stakeholder involvement

01.0600 Preparing management group and contracting
   - 01.0601 Management team activities
   - 01.0602 Contracting activities

**Principle activity 02: Facility shutdown activities**

02.0100 Plant shutdown and inspection
   - 02.0101 Termination of operation, plant stabilisation, isolation and inspection
   - 02.0102 Defueling and transfer of fuel to spent-fuel storage
   - 02.0103 Cooling down of spent fuel
   - 02.0104 Management of fuel, fissile and other nuclear materials
   - 02.0105 Isolation of power equipment
   - 02.0106 Facility reuse

02.0200 Drainage and drying of systems
   - 02.0201 Drainage and drying of closed systems not in operation
   - 02.0202 Drainage of spent-fuel pool and other open systems not in operation
   - 02.0203 Removal of sludge and products from open systems
   - 02.0204 Drainage of special process fluids

02.0300 Decontamination of closed systems for dose reduction
   - 02.0301 Decontamination of process installations using operational procedures
   - 02.0302 Decontamination of process installations using additional procedures
02.0400 Radiological inventory characterisation to support detailed planning
   02.0401 Radiological inventory characterisation
   02.0402 Underground water monitoring
02.0500 Removal of system fluids, operational waste and redundant material
   02.0501 Removal of combustible material
   02.0502 Removal of system fluids (water, oils, etc.)
   02.0503 Removal of special system fluids
   02.0504 Removal of waste from decontamination
   02.0505 Removal of spent resins
   02.0506 Removal of specific operational waste from fuel cycle facilities
   02.0507 Removal of other waste from facility operations
   02.0508 Removal of redundant equipment and materials

Principle activity 03: Additional activities for safe enclosure

03.0100 Preparation for safe enclosure
   03.0101 Decontamination of selected components and areas to facilitate safe enclosure
   03.0102 Zoning for long-term storage
   03.0103 Removal of inventory not suitable for safe enclosure
   03.0104 Dismantling and transfer of contaminated equipment and material to containment structure for long-term storage
   03.0105 Radiological inventory characterisation for safe enclosure
03.0200 Site boundary reconfiguration, isolating and securing structures
   03.0201 Modification of auxiliary systems
   03.0202 Site boundary reconfiguration
   03.0203 Construction of temporary enclosures, stores, structural enhancements, etc.
   03.0204 Stabilisation of radioactive and hazardous waste pending remediation
   03.0205 Facility controlled area hardening, isolation for safe enclosure
03.0300 Facility entombment
   03.0301 Facility entombment as end state of decommissioning strategy
   03.0302 Institutional control and monitoring of the entombment end state

Principle activity 04: Dismantling activities within the controlled area

04.0100 Procurement of equipment for decontamination and dismantling
   04.0101 Procurement of general site-dismantling equipment
   04.0102 Procurement of equipment for decontamination of personnel and tools
   04.0103 Procurement of special tools for dismantling the reactor systems
   04.0104 Procurement of special tools for dismantling in fuel cycle facilities
   04.0105 Procurement of special tools for dismantling other components or structures
04.0200 Preparations and support for dismantling
   04.0201 Reconfiguration of existing services, facilities and site to support dismantling
   04.0202 Preparation of infrastructure and logistics for dismantling
   04.0203 Ongoing radiological characterisation during dismantling
04.0300 Pre-dismantling decontamination
   04.0301 Drainage of remaining systems
   04.0302 Removal of sludge and products from remaining systems
   04.0303 Decontamination of remaining systems
   04.0304 Decontamination of areas in buildings
04.0400 Removal of materials requiring specific procedures
   04.0401 Removal of thermal insulation
   04.0402 Removal of asbestos
   04.0403 Removal of other hazardous materials
04.0500 Dismantling of main process systems, structures and components
   04.0501 Dismantling of reactor internals
   04.0502 Dismantling of reactor vessel and core components
   04.0503 Dismantling of other primary loop components
   04.0504 Dismantling of main process systems in fuel cycle facilities
   04.0505 Dismantling of main process systems in other nuclear facilities
   04.0506 Dismantling of external thermal/biological shields

04.0600 Dismantling of other systems and components
   04.0601 Dismantling of auxiliary systems
   04.0602 Dismantling of remaining components

04.0700 Removal of contamination from building structures
   04.0701 Removal of embedded elements in buildings
   04.0702 Removal of contaminated structures
   04.0703 Decontamination of buildings

04.0800 Removal of contamination from areas outside buildings
   04.0801 Removal of underground contaminated pipes and structures
   04.0802 Removal of contaminated soil and other contaminated items

04.0900 Final radioactivity survey for release of buildings
   04.0901 Final radioactivity survey of buildings
   04.0902 Declassification of buildings

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**Principle activity 05: Waste processing, storage and disposal**

05.0100 Waste management system
   05.0101 Establishing the waste management system
   05.0102 Reconstruction of existing facilities for decommissioning waste management system
   05.0103 Procurement of additional equipment for management of historical/legacy waste
   05.0104 Maintenance, surveillance and operational support for waste management system
   05.0105 Demobilisation/decommissioning of waste management system

05.0200 Management of historical/legacy high-level waste
   05.0201 Characterisation
   05.0202 Retrieval and processing
   05.0203 Final conditioning
   05.0204 Storage
   05.0205 Transport
   05.0206 Disposal
   05.0207 Containers

05.0300 Management of historical/legacy intermediate-level waste
   05.0301 Characterisation
   05.0302 Retrieval and processing
   05.0303 Final conditioning
   05.0304 Storage
   05.0305 Transport
   05.0306 Disposal
   05.0307 Containers
05.0400 Management of historical/legacy low-level waste
   05.0401 Characterisation
   05.0402 Retrieval and treatment
   05.0403 Final conditioning
   05.0404 Storage
   05.0405 Transport
   05.0406 Disposal
   05.0407 Containers

05.0500 Management of historical/legacy very low-level waste
   05.0501 Characterisation
   05.0502 Retrieval, treatment and packaging
   05.0503 Transport
   05.0504 Disposal

05.0600 Management of historical/legacy exempt waste and materials
   05.0601 Retrieval, treatment and packaging
   05.0602 Clearance measurement of exempt waste and materials
   05.0603 Transport of hazardous waste
   05.0604 Disposal of hazardous waste at dedicated waste dumps
   05.0605 Transport of conventional waste and materials
   05.0606 Disposal of conventional waste at conventional waste dumps

05.0700 Management of decommissioning high-level waste
   05.0701 Characterisation
   05.0702 Processing
   05.0703 Final conditioning
   05.0704 Storage
   05.0705 Transport
   05.0706 Disposal
   05.0707 Containers

05.0800 Management of decommissioning intermediate-level waste
   05.0801 Characterisation
   05.0802 Processing
   05.0803 Final conditioning
   05.0804 Storage
   05.0805 Transport
   05.0806 Disposal
   05.0807 Containers

05.0900 Management of decommissioning low-level waste
   05.0901 Characterisation
   05.0902 Processing
   05.0903 Final conditioning
   05.0904 Storage
   05.0905 Transport
   05.0906 Disposal
   05.0907 Containers

05.1000 Management of decommissioning very low-level waste
   05.1001 Characterisation
   05.1002 Treatment and packaging
   05.1003 Transport
   05.1004 Disposal
05.1100 Management of decommissioning very short-lived waste
   05.1101 Characterisation
   05.1102 Treatment, storage, handling and packaging
   05.1103 Final management of decommissioning very short-lived waste

05.1200 Management of decommissioning exempt waste and materials
   05.1201 Treatment and packaging
   05.1202 Clearance measurement of exempt waste and materials
   05.1203 Transport of hazardous waste
   05.1204 Disposal of hazardous waste at dedicated waste dumps
   05.1205 Transport of conventional waste and materials
   05.1206 Disposal of conventional waste at conventional waste dumps

05.1300 Management of decommissioning waste and materials generated outside controlled areas
   05.1301 Recycling of concrete
   05.1302 Treatment and packaging of hazardous waste
   05.1303 Treatment and recycling of other materials.
   05.1304 Transport of hazardous waste
   05.1305 Disposal of hazardous waste at dedicated waste dumps
   05.1306 Transport of conventional waste and materials
   05.1307 Disposal of conventional waste at conventional waste dumps

**Principle activity 06: Site infrastructure and operation**

06.0100 Site security and surveillance
   06.0101 Procurement of general security equipment
   06.0102 Operation and maintenance of automated access control systems, monitoring systems and alarms
   06.0103 Security fencing and protection of remaining entrances against trespassing
   06.0104 Deployment of guards/security forces

06.0200 Site operation and maintenance
   06.0201 Inspection and maintenance of buildings and systems
   06.0202 Site upkeep activities

06.0300 Operation of support systems
   06.0301 Electricity supply systems
   06.0302 Ventilation systems
   06.0303 Heating, steam and lighting systems
   06.0304 Water supply systems
   06.0305 Sewage/waste water systems
   06.0306 Compressed air/nitrogen systems
   06.0307 Other systems

06.0400 Radiation and environmental safety monitoring
   06.0401 Procurement and maintenance of equipment for radiation protection and environmental monitoring.
   06.0402 Radiation protection and monitoring.
   06.0403 Environmental protection and radiation environmental monitoring

**Principle activity 07: Conventional dismantling, demolition and site restoration**

07.0100 Procurement of equipment for conventional dismantling and demolition
   07.0101 Procurement of equipment for conventional dismantling and demolition
07.0200 Dismantling of systems and building components outside the controlled area
  07.0201 Electricity generating system
  07.0202 Cooling system components
  07.0203 Other auxiliary systems

07.0300 Demolition of buildings and structures
  07.0301 Demolition of buildings and structures from the formerly controlled area
  07.0302 Demolition of buildings and structures outside the controlled area
  07.0303 Dismantling of the stack

07.0400 Final cleanup, landscaping and refurbishment
  07.0401 Earthworks, landworks
  07.0402 Landscaping and other site finishing activities
  07.0403 Refurbishment of buildings

07.0500 Final radioactivity survey of site
  07.0501 Final survey
  07.0502 Independent verification of the final survey

07.0600 Perpetuity funding/surveillance for limited or restricted release of property
  07.0601 Routine maintenance
  07.0602 Surveillance and monitoring

**Principle activity 08: Project management, engineering and support**

08.0100 Mobilisation and preparatory work
  08.0101 Mobilisation of personnel
  08.0102 Establishment of general supporting infrastructure for decommissioning project

08.0200 Project management
  08.0201 Core management group
  08.0202 Project implementation planning, detailed ongoing planning
  08.0203 Scheduling and cost control
  08.0204 Safety and environmental analysis, ongoing studies
  08.0205 Quality assurance and quality surveillance
  08.0206 General administration and accounting
  08.0207 Public relations and stakeholders involvement

08.0300 Support services
  08.0301 Engineering support
  08.0302 Information system and computer support
  08.0303 Waste management support
  08.0304 Decommissioning support including chemistry, decontamination
  08.0305 Personnel management and training
  08.0306 Documentation and records control
  08.0307 Procurement, warehousing, and materials handling
  08.0308 Housing, office equipment, support services

08.0400 Health and safety
  08.0401 Health physics
  08.0402 Industrial safety

08.0500 Demobilisation
  08.0501 Demobilisation of project infrastructure for decommissioning
  08.0502 Demobilisation of personnel

08.0600 Mobilisation and preparatory work by contractors (if needed)
  08.0601 Mobilisation of personnel
  08.0602 Establishment of general supporting infrastructure for decommissioning project
08.0700 Project management by contractors (if needed)
    08.0701 Core management group
    08.0702 Project implementation planning, detailed ongoing planning
    08.0703 Scheduling and cost control
    08.0704 Safety and environmental analysis, ongoing studies
    08.0705 Quality assurance and quality surveillance
    08.0706 General administration and accounting
    08.0707 Public relations and stakeholder involvement

08.0800 Support services by contractors (if needed)
    08.0801 Engineering support
    08.0802 Information system and computer support
    08.0803 Waste management support
    08.0804 Decommissioning support including chemistry, decontamination
    08.0805 Personnel management and training
    08.0806 Documentation and records control
    08.0807 Procurement, warehousing, and materials handling
    08.0808 Housing, office equipment, support services

08.0900 Health and safety by contractors (if needed)
    08.0901 Health physics
    08.0902 Industrial safety

08.1000 Demobilisation by contractors (if needed)
    08.1001 Demobilisation of project infrastructure for decommissioning
    08.1002 Demobilisation of personnel

Principle activity 09: Research and development
    09.0100 Research and development of equipment, techniques and procedures
        09.0101 Equipment, techniques and procedures for characterisation
        09.0102 Equipment, techniques and procedures for decontamination
        09.0103 Equipment, techniques and procedures for dismantling
        09.0104 Equipment, techniques and procedures for waste management
        09.0105 Other research and development activities
    09.0200 Simulation of complicated works
        09.0201 Physical mock-ups and training
        09.0202 Test or demonstration programmes
        09.0203 Computer simulations, visualisations and 3D modelling
        09.0204 Other activities

Principle activity 10: Fuel and nuclear material
    10.0100 Removal of fuel or nuclear material from facility to be decommissioned
        10.0101 Transfer of fuel or nuclear material to external storage or to treatment facilities
        10.0102 Transfer of fuel or nuclear material to dedicated buffer storage
    10.0200 Dedicated buffer storage for fuel and/or nuclear material
        10.0201 Construction of buffer storage
        10.0202 Operation of buffer storage
        10.0203 Transfer of fuel and/or nuclear material away from the buffer storage
    10.0300 Decommissioning of buffer storage
        10.0301 Decommissioning of buffer storage
        10.0302 Management of waste
Principle activity 11: Miscellaneous expenditures

11.0100 Owner costs
   11.0101 Implementation of transition plans
   11.0102 External projects to be performed as a consequence of decommissioning
   11.0103 Payments (fees) to authorities
   11.0104 Specific external services and payments

11.0200 Taxes
   11.0201 Value added taxes
   11.0202 Local, community, federal taxes
   11.0203 Environmental taxes
   11.0204 Taxes on industrial activities
   11.0205 Other taxes

11.0300 Insurances
   11.0301 Nuclear related insurances
   11.0302 Other insurances
Appendix E: Approaches to Cost Estimation

The Nuclear Energy Agency document *The Practice of Cost Estimation for Decommissioning of Nuclear Facilities* [7] provides a comparative overview of the cost estimation methods and their advantages and disadvantages. It is summarized in the following table.

Table 1: Estimating method comparison

<table>
<thead>
<tr>
<th>Estimating Method</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom-up</td>
<td>In this building blocks technique, a work statement and set of drawings or specifications are used to extract material quantities required for executing each discrete task performed in accomplishing a given activity. From these quantities, direct labour, equipment and overhead costs can be derived.</td>
<td>Most accurate as it accounts for site-specific radiological and physical inventory. Relies on unit cost factors (UCFs).</td>
<td>Requires detailed description of inventory and site specific labour, material and equipment costs for the UCFs.</td>
</tr>
<tr>
<td>Specific analogy</td>
<td>Specific analogies depend upon the known cost of an item used in prior estimates as the basis for the cost of a similar item in a new estimate. Adjustments are made to known costs to account for differences in relative complexities of performance, design and operational characteristics.</td>
<td>Accurate if prior estimates are appropriately adjusted for size differences, inflation and regional differences in labour materials and equipment.</td>
<td>Adjustments as noted may require detailed documentation and introduce approximations that reduce accuracy.</td>
</tr>
<tr>
<td>Parametric</td>
<td>Parametric estimating requires historical databases on similar systems or subsystems. Statistical analysis is performed on the data to find correlations between cost drivers and other system parameters, such as design or performance. The analysis produces cost equations or cost estimating relationships that may be used individually or grouped into more complex models.</td>
<td>Suitable for use for large sites where detailed inventory is not readily available. Suited for Order of Magnitude estimates.</td>
<td>Approximations based on areas or volumes introduce additional inaccuracies. There is no way to track actual inventory. Not suited for project planning of work activities.</td>
</tr>
<tr>
<td>Estimating Method</td>
<td>Description</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cost review and update</td>
<td>An estimate may be constructed by examining previous estimates of the same or similar projects for internal logic, completeness of scope, assumptions and estimating methodology.</td>
<td>Suitable for large sites where detailed inventory is not available. Suited for update of previous estimates, or order of magnitude estimates.</td>
<td>There is no way to track actual inventory. Generally not suited for project planning of work activities.</td>
</tr>
<tr>
<td>Expert opinion</td>
<td>An expert opinion technique may be used when other techniques or data are not available. Several specialists may be consulted iteratively until a consensus cost estimate is established.</td>
<td>An expert opinion technique may be used when other techniques or data are not available. Several specialists may be consulted iteratively until a consensus cost estimate is established.</td>
<td>Expert opinion may not be specific to the work activities. May not reflect the radiological limitations of the decommissioning project.</td>
</tr>
</tbody>
</table>
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

The CNSC may include references to information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC Web page “How to gain free access to all nuclear-related CSA standards”.


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:

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.

CNSC regulatory documents are classified under the following categories and series:

1.0 Regulated facilities and activities
Series 1.1 Reactor facilities
1.2 Class IB facilities
1.3 Uranium mines and mills
1.4 Class II facilities
1.5 Certification of prescribed equipment
1.6 Nuclear substances and radiation devices

2.0 Safety and control areas
Series 2.1 Management system
2.2 Human performance management
2.3 Operating performance
2.4 Safety analysis
2.5 Physical design
2.6 Fitness for service
2.7 Radiation protection
2.8 Conventional health and safety
2.9 Environmental protection
2.10 Emergency management and fire protection
2.11 Waste management
2.12 Security
2.13 Safeguards and non-proliferation
2.14 Packaging and transport

3.0 Other regulatory areas
Series 3.1 Reporting requirements
3.2 Public and Indigenous engagement
3.3 Financial guarantees
3.4 Commission proceedings
3.5 CNSC processes and practices
3.6 Glossary of CNSC terminology

Note: The regulatory document series may be adjusted periodically by the CNSC. Each regulatory document series listed above may contain multiple regulatory documents. Visit the CNSC’s website for the latest list of regulatory documents.