

REGULATORY REQUIREMENTS FOR CONTRACTOR MANAGEMENT AT NUCLEAR WASTE FACILITIES

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Abstract

The use of contractors to perform life cycle related activities (design, supply chain, construction, commissioning, operation and decommissioning) at nuclear waste facilities is frequently practiced, often for the complete life cycle. The primary role of the Canadian Nuclear Safety Commission (CNSC) licensee in these cases is to ensure that all requirements, including regulatory requirements, are being met by the contractors. This is achieved through the development and effective implementation of the oversight processes integrated into the management system by the licensee which retains the overall responsibility for regulatory compliance. The regulator, the CNSC, also has the responsibility to ensure this is done effectively through focused oversight activities. CSA Group *N286-12 Management System Requirements for Nuclear facilities*, published in June 2012, provides requirements for the procurement of services and items for nuclear waste facilities. This standard also applies to contractors that perform life cycle activities; however, the top management of the organization remains accountable to ensure the requirements of the Standard are met and the activities completed safely. The CSA N286-12 standard consists of 12 key principles and associated generic requirements followed by specific sections for five different facility groups, including for radioactive waste management facilities. CNSC activities related to contractor management include conducting technical reviews of the customer or licensee management system documentation, observing the licensee's activities related to oversight of contractors and indirectly assessing contractor's processes and practices. Early CNSC engagement with contracting organizations embarking on life cycle activities for licensees or licence applications has proven effective from a regulatory perspective. This paper will further elaborate on CNSC expectations with respect to contractor management best practices within Canadian Nuclear Industry.

Keywords: contractor management, oversight, management system, life cycle activities, waste management, CSA N286-12

1. Introduction

The Canadian Nuclear Safety Commission's (CNSC) Regulatory Framework consists of laws passed by Parliament that govern the regulation of Canada's nuclear industry, and regulations, licences and documents that the CNSC uses to regulate the industry. CNSC requires that persons or organizations subject to the *Nuclear Safety and Control Act* (NSCA) and the associated regulations are directly responsible for managing the radioactive waste and implementing the measures to protect the health and safety of persons and the environment. Prior to any nuclear activity occurring, a licence must be issued by the CNSC. The licensee needs to demonstrate that it has fulfilled the requirements under the NSCA and the associated regulations.

For major nuclear facilities, such as waste management facilities for the storage of used nuclear fuel, in accordance with Class I Nuclear Facilities Regulations, an application for a licence shall contain a quality assurance program for the activity to be licensed. If a licence is issued, the licence will require that "The licensee shall implement and maintain a management system". In addition, for Class IB Waste Management Facilities (WMFs) the licence also states that the licensee shall ensure that every contractor working at the facility complies with the licence requirements. The Licence Condition Handbook (LCH) associated to the licence provides the details and specifies the reference standards as the compliance verification criteria.

CNSC amended its regulatory framework in 2009 to evolve from having quality assurance requirements for the activity licensed to a broader set of management system requirements. In the licence and LCH (if applicable), the CNSC requirement for management system refers to a Canadian Standard Association (CSA) Group, N286 *Management system requirements for nuclear facilities*, which was developed and accepted by industry with input from CNSC staff.

Management systems reflect and build on the principles and elements of 'quality control', 'quality assurance' and 'quality management' as applied more broadly across an organization's management processes and practices for all activities. The accountability for the effectiveness of the management system has evolved over time from the quality organization to top management.

Contractors are utilised on a regular basis to perform multiple specialized activities in nuclear waste facilities. Safe and reliable waste management activities require a commitment and adherence to a set of management system principles and requirements and, consistent with those, the establishment and implementation of processes that achieve the expected results. An adequately established and implemented management system by a licensee provides CNSC staff confidence and evidence that the legal bases under which the Commission made its decisions and issued a licence, remain valid.

CNSC staff look for objective evidence demonstrating that the licensee has established and implemented an adequate management system compliant with all regulatory requirements. CNSC staff perform compliance activities to verify how the requirements stated in the licence and LCH regarding contractor management are met.

2. Use of contractors in nuclear waste facilities

There are many examples of the use of contractors to complete work in waste management facilities. For the Adapted Phase Management (APM) initiative regarding final disposal of used nuclear fuel for Nuclear Power Plants, the Nuclear Waste Management Organization (NWMO) is managing the contractors for the initial field studies and detailed geological mapping. Although no licence application has been submitted for this initiative, CNSC staff are conducting pre-licensing reviews, including the management system activities applicable for contractor management. It is important to note that these pre-licensing reviews do not fetter the Commission's decision making authority. In relation to Ontario Power Generation's (OPG) Deep Geological Repository (DGR) Project for disposal of low and intermediate level nuclear waste, the licence application for site preparation and construction identified the NWMO as the Engineering, Procurement and Construction Management (EPCM) contractor. OPG, as the licence applicant, has committed to an oversight process of the project based on ongoing monitoring, observation of activities, assessment and audits. Both OPG's and NWMO's established documented management system addresses the need for change management, review and verification processes for the DGR design and construction. The construction of Storage Building #2 at the OPG Darlington Waste Management (WMF) facility was contracted out, and the construction of the Retube Waste Storage Building (RWSB) at the Darlington WMF will also be contracted out.

Contractors are chosen based on their ability to provide an adequate service. Different administrative processes are in place to select those contractors. The technical requirements and management system requirements are part of the bidding and evaluation process. In the end, the licensee will put in place oversight processes to ensure the safety of the nuclear facility. All of these activities have associated licencing requirements.

In the management of radioactive waste there are different models for the management of contractors depending on the complexity of activities and the contractual requirements. These models and associated processes are described in the licensee's governing documentation. The following are a few examples.

Individual Contractors

Managing individual contractors (i.e. trades) will involve the hiring of contractor employees, on-boarding, especially providing them the generic licensee safety training, supervising them in the field and evaluating and closing the work arrangements. Different processes will interface with the contractor management process: supply chain, training processes, work management.

General Contracting

Contractors perform a specific activity (produce an item or provide a service). The contractors are evaluated based on their ability to meet requirements. Contractors have to be qualified in order to satisfy the procurement process. A Qualified Supplier List (or Approved Vendors List) is the general practice used in industry to list the contractors/suppliers that meet the qualification criteria including the quality management system requirements. Goods and services shall be verified and receiving inspection processes are developed. The contract completion for goods and items is monitored and supplier's performance is evaluated.

Projects

Contractors will develop and implement a project set by the licensee. The contractor's organization needs to be evaluated, including their management system. The project should be managed by the contractor through a suite of project management processes. Various processes and tools should be developed. Oversight and verification processes need to be put in place by the organization that manages the project and by the licensee. The project needs to be controlled by both organizations. Schedule management, cost management, risk management, financial management processes should be developed. At the close out of the project, the licensee needs to ensure that all the tests and verifications were performed as per requirements and turnover activities are in place. Various aspects and key processes of the projects, such as Regulatory interface with CNSC, resource management, project quality assurance, engineering, health and safety, environment, procurement and communications should be documented and implemented by the licensee and their contractors.

Engineering, Procurement and Construction Contracting

Engineering, Procurement and Construction (EPC) or EPCM is a particular form of contracting arrangement where the EPC contractor is made responsible for all the activities from design, procurement, construction, to commissioning and handover of the project to the Owner (licensee). The EPC contractor will develop processes to meet the licence requirements. All processes are reviewed by the licence holder. The licensee remains accountable for all regulatory submissions and approvals, project funding and oversight of EPC contractor. Usually, an oversight model is developed by the licensee. The turnover activities should be controlled. In general, for turnover activities the following activities are performed:

- Turnover of the documentation/records
- Walk down of the facility prior to acceptance
- Inspect/ test/ commission the system, structures and components that are being turned over to ensure they are in the state defined in the turnover documentation and as per applicable codes, standards and specifications
- Identification of boundaries in the field and transfer documents
- Identification of incomplete items and exceptions assuring regulatory requirements has been satisfied.

After turnover from EPC, the licensee shall be accountable for ensuring that the waste facility is operating properly and meets all the requirements.

3. Oversight of contractors performed by licensees

As required by the licence, the overall responsibility for managing the licensed activities is with the licensee. Based on the licence application and during compliance activities, CNSC staff have verified that the licensee's oversight of their contractors is documented in order to comply with contractual requirements, regulatory and statutory requirements, programs and technical specifications.

Based on the information provided by the licensees the oversight follows the following general principles:

- The overall responsibility is with the licensee
- The organization performing the work shall execute the activities in accordance with contractual requirements and the contracting organization (licensee) shall ensure that these requirements are fulfilled by the performing organization. The contractual requirements shall stipulate provisions for access to contractors and sub-contractors by the contracting organization
- The contractors are responsible for ensuring that their sub-contractors, suppliers etc. are in compliance with contract requirements
- The licensee shall enforce the CNSC requirements.

Specific documentation is developed by the licensee to describe oversight activities. The documentation for the oversight activities of the licensee includes:

- Review and acceptance of contractors/sub-contractors documentation and deliverables
- Review of findings and observations
- Field walkdowns
- Direct observations of work activities/witnessing of activities
- Interviews with personnel performing the work and top management
- Review of records
- Event reviews and trending of events
- Independent verification
- Assessment of activities through review of self-assessment results, management review of commitments, review of corrective actions
- Review of changes for different activities
- Management system audits
- Surveillance.

The oversight activities performed by the licensee should be planned and controlled as with any other work activity. The same management system requirements regarding work planning and scheduling, and work control apply to the oversight activities.

The licensee's oversight documentation has the following steps:

1. Establishing the oversight plan. This takes into account the activities and their risk significance, the project stage, feedback from management and personnel and the status of previous oversight activities.
2. Issuing the oversight schedule. The schedule should be updated and revised when a new contract is awarded, a new sub-contractor is added or major change in the scheduling is necessary.
3. Oversight preparation. During this step the personnel will identify the applicable documentation and records to be reviewed, the check list(s) should be prepared, organization to be overseen should be notified and safety precautions should be taken if necessary.
4. Oversight execution. During this step, the observations made during oversight should be brought to the attention of the organization subject to oversight. If the work is unsafe the "stop work" procedure shall be initiated immediately.

5. Oversight reporting. All observations are recorded and corrective actions are initiated as necessary by the contractors. The corrective actions should be reviewed by the organization performing the oversight. A target date for completion and evidence for completion of the issue should be communicated to the licensee.
6. Oversight follow up and closing. Follow up should be conducted until the organization performing the oversight is satisfied with the results. The follow up activities should be tracked.

All the oversight activities performed are documented whether there were observations/findings or not.

4. Regulatory requirements for Contractor Management

The CNSC licence for Class IB WMFs states “licensee shall implement and maintain a management system”. The LCH, if applicable, provides the details and specifies the reference standards as the compliance verification criteria. The LCH contains compliance verification criteria, references to licensee’s documentation, references to standards and CNSC regulatory documents and commitments made by the licensee to ensure compliance with regulatory requirements.

Recognizing the importance of contractors’ activities in the waste management activities, the following general licence condition is also part of the waste management licence: “The licensee shall ensure that every contractor working at the facility complies with this licence”. Thus, the licensee must make the necessary technical and administrative arrangements to meet this licence condition

In June of 2012, the CSA Group published the update standard *N286-12 Management system requirements for nuclear facilities* [1]. The Standard also applies to all the life cycle activities as in the previous versions but is now applicable beyond the power reactors to other licensed facilities. It integrates the requirements from other management system standards such as for quality, health & safety, environment, economics and security. CSA N286 standard represents the industry’s current best practice for the principles fundamental to management processes and features important to the overall objective of safety. CSA N286-12 is becoming the standard of reference for the licence condition on management system for class I B Waste Management Facilities.

The CSA Group published in July 2014 the *Commentary document on N286-12, Management system requirements for nuclear facilities, N286.0.1-14* [2]. The commentary document covers some of the Generic requirements and provides background information helpful for the implementation of a management system in line with the intent of the standard.

5. CSA N286-12 requirements regarding Contractor Management for class I Waste Management Facilities

N286-12 refers to the management system as: “The management system brings together in a planned and integrated manner the processes necessary to satisfy the requirements that must be met to achieve business success and sustainability”.

The N286-12 standard consists of 12 key principles and associated generic requirements (clause 4) followed by specific sections for five different facility groups. Clause 9 “Specific Requirements for

radioactive waste management facilities” presents the specific requirements related to design, supply chain, commissioning, operation and decommissioning for radioactive waste management facilities.

The primary inputs considered for N286-12 include quality management, health and safety, environment and security standards. N286-12 has the following main features:

- Safety is the primary deliverable of the management system
- Applicable beyond the power reactors to other licensed facilities
- Aligned with the principles of IAEA guidance regarding management systems
- Integrates the requirements from other management system standards such as for quality, health & safety, environment, economics and security
- Represents best practices and the most recent benchmark in the ongoing evolution of management system standards
- Top management is accountable
- Management system serves to understand and promote a safety culture
- Applies to suppliers contracted to perform the life cycle activities
- The management system promotes and supports excellence in human performance
- A graded approach may be applied.

All 12 Principles stated in clause 4.1.2 “Management system principles” apply to all of the requirements in the standard. The Generic requirements stated in clause 4 “Generic requirements for management system” (e.g. Records, Documents, Work management, Change, Assessment) apply to all the specific life cycle phases (i.e. supply chain, design, construction, commissioning, operations, decommissioning).

In accordance to clause 1.4, N286-12 also applies to contractors that perform life cycle activities such as design, supply chain, construction, commissioning, operation and decommissioning; however, the top management of the licensee organization remains accountable to ensure the requirements of the Standard are met. However, N286-12 requirements do not necessarily apply to all suppliers of items and services. They do, for example, if the supplier provides complete life cycle phase activities, such as Engineering and Procurement Construction (EPC) activities.

The Management system requirements include the need to develop and implement the arrangements and documentation to manage the supply chain, including contractors. Clause 9.5 of CSA N286-12 contains these requirements, as per the following:

- Services and items shall be controlled through the contractual arrangements

- Acceptability of contractors shall be based on selection criteria, suppliers proposals are reviewed and the contract is awarded to the most qualified contractor
- The contractor's management system shall be reviewed and accepted in advance
- The oversight of sub-contractors shall be put in place.

Clause 9.5 "Supply chain" presents the supply chain processes that need to be established and controlled. Clause 9.5 is intended to ensure that the specified items and services get to the right location at the right time, in support of safety requirements. This clause identifies the typical phases in the supply chain. It presents the requirements for the following supply chain processes:

1. Purchasing requirements
2. Supplier acceptability
3. Provisions of the purchasing requirements to suppliers
4. Supplier selection and award
5. Supplier-customer relationship
6. Verification of services
7. Receipt and inspection of items
8. Segregation and disposition of problem items
9. Storage and handling.

All the requirements are normative (mandatory). However, a few clauses, as related to the subject of this article, should be mentioned:

- Define the management system standard and applicable requirements (clause 9.5.2 (e))
- The purchasing requirements shall identify the provisions for extending applicable requirements to sub-suppliers (clause 9.5.2 (k))
- Suppliers will be assessed on their management system (clause 9.5.3.1 (c))
- Suppliers shall be assessed on oversight of supplier's supply chain (clause 9.5.3.1 (e))
- Audits shall be planned and performed to confirm the initial and ongoing acceptability of the supplier's management system (clause 9.5.3.2)
- When there is a requirement to buy local and the supplier does not meet all requirements, the responsible organization shall apply controls to fulfill requirements (clause 9.5.3.5)

- The selected supplier's technical documents that are required to be submitted shall be reviewed and accepted (clause 9.5.5)
- The performance of the supplier-customer relationship shall be monitored to ensure purchasing requirements will be met (clause 9.5.6)
- Purchased services shall be verified in accordance with the planned verification (clause 9.5.7).

The commentary document *Commentary document on N286-12, Management system requirements for nuclear facilities* describes in section 5 the intent of the specific requirements applicable at different phases of the supply chain process for a nuclear waste facility. The document recognizes the importance of supply chain activities in the life cycle phases of nuclear facility. Section 5 clarifies the context of clause 9.5 of N286-12. The document should be viewed as “an informative annotation” regarding the clause 9.5 requirements.

6. CNSC compliance activities

To meet the licence requirements, CNSC staff expect that licensee arrangements are effective in the use of contractors, whether as an on-site contractor or as a vendor of goods and services, while retaining responsibility and control for safety through:

- Maintaining a core of in-house staff to ensure contractor's management for nuclear safety
- Retaining overall responsibility for the nuclear and radiological safety and security of all its business, including work carried out on its behalf by contractors
- Choosing between sourcing work in-house or from contractors as it is informed by a company policy that takes into account the nuclear safety implications of those choices
- Ensuring that contracts are only allowed for work with nuclear safety significance to contractors with suitable competence, safety standards, management systems, culture and resources
- Ensuring that all contractor staff are familiar with the nuclear safety implications of their work
- Ensuring that contractors' work is carried out to the required level of safety and quality.

CNSC staff verify the licence condition pertinent to the management system through a review of information as described in LCH “Compliance Verification Framework”. In addition to describing the Licence Conditions and their compliance verification criteria, recommendation and guidance, the LCH is organized according to the Safety and Control Area (SCA) framework. A SCA is a technical topic used by the CNSC to assess, review, verify and report on regulatory requirements and performance across all regulated facilities and activities. A SCA contains Specific Areas (SA).

For example, the Management System SCA covers the framework that establishes the processes and programs required to ensure an organization achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture. Contractor management is one of the SA of the Management System SCA that will require CNSC staff compliance activities and reporting.

During the compliance activities, CNSC staff verify that the requirements of the licence are met and the licensee controls the work performed by a contractor. The following compliance activities are performed by the CNSC staff for the specific area of contractor management:

1. Desktop Reviews (Technical assessments) of Program and Process documents, including the documents that ensure that the every contractor working at the facility complies with the licence requirements
2. Compliance Inspections
3. Reviews of events and trending activities
4. Witnessing of inspections/audits organized by the licensee for their contractors.

CNSC staff have prepared specific inspection guides for contractor management verifications of the licensee. The guide is focused on the following major topics:

- Selection of contractors
- Establishing of contracting requirements
- Training and qualification of contractor's staff including the licensee's staff
- Verification of contractors' processes
- Acceptance of work performed by contractors
- Management of non-conformances
- Review of contractor's performance.

The oversight of licensee's contractors is observed during the CNSC staff compliance activities. The licensee's oversight activities and documents as described in section 3 of this article are reviewed and inspected during the CNSC staff compliance activities.

During the compliance activities, CNSC staff indirectly assess contractors' processes and practices. CNSC staff pay special attention to the work performed by the EPC contractor. Should a licence to prepare a site and construct the OPG DGR be issued, CNSC staff would verify OPG's compliance by observation of OPG and EPCM activities. CNSC engaged both the applicant (OPG) and their contracting organization in discussions early on in the licensing process. This ensured that CNSC regulatory requirements throughout the life cycle of the project were understood. CNSC's early involvement proved to be effective from a regulatory perspective and improved efficiency from the licence application perspective.

7. Conclusion

Different models to manage the work of contractors are used in nuclear industry for the management of radioactive waste. The licensees use the contractual arrangements to verify and oversee the contractor's work and to ensure that their requirements are met. The oversight activities are documented, planned and controlled.

The licences issued by CNSC for class I B Waste Management Facilities require that the licensees implement and maintain a management system. Contractor management is a requirement of these licences and it is a specific licence condition. CNSC staff expect that licensee arrangements are effective for the use of contractors whether as an on-site contractor or as a vendor of goods and services, and the licensee is retaining responsibility for safety.

The current licence condition for management systems for class I B Waste Management Facilities includes CSA N286 standard. In June of 2012, the CSA Group published the standard *N286-12 Management system requirements for nuclear facilities*. This Standard applies to all the life cycle activities as in the previous versions but is now applicable beyond the power reactors to other licensed facilities. N286-12 is becoming the licence condition standard for class I B Waste Management Facilities.

Clauses 1.4 and 9.5 of *N286-12 Management system requirements for nuclear facilities* contain specific requirements regarding the requirements for contractors. Clause 1.4 applies to contractors (EPC) that perform life cycle activities such as design, supply chain, construction, commissioning, operation and decommissioning; however, the top management of the licensee remains accountable to ensure the requirements of the Standard are met.

CNSC staff is using a variety of compliance activities to verify how the licensee controls the work performed by a contractor. During those compliance activities CNSC staff indirectly assess contractors' processes and practices. The oversight performed by the licensee of their contractors is observed during the CNSC staff compliance activities. Early engagement and review by CNSC staff of the licence applicant and EPC or EPCM contractor's governance would help ensuring the quality of the licensee application documentation.

8. References

[1] CSA N286-12 Management system requirements for nuclear facilities, June 2012

[2] CSA Commentary document on N286-12, Management system requirements for nuclear facilities, N286.0.1-14, June 2014