2.3.1QUALITY MANAGEMENT SYSTEM; DOMAIN INSIGHT

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OVERVIEW

A quality management system (QMS) is based on the process approach. This implies that all activities are considered to be part of one or more processes.

A process always starts with inputs and ends with outputs, and the process describes the transition from input to output. The process itself needs to be supported by:

- People and competences (who does it)
- Equipment and materials (what do we need to do it)
- Methods and documentation (how do we do it)
- Objectives and target (what should we achieve + metrics)

Within predisposal, it is crucial to identify and describe all relevant processes. Typically, predisposal processes describe what happens from the point where the waste is generated to the transfer to the final repository.

Organisations are required to define and document their processes, measure and monitor their performance, and continuously improve them. Specifically, for Radioactive Waste Management (RWM), QMS are crucial frameworks designed to ensure that the processes, procedures, and responsibilities for achieving quality objectives are defined, implemented, and maintained. The role of QMS in RWM is to safeguard the environment and public health by ensuring that radioactive waste is managed in a manner, by ensuring compliance (meets international standards and practices), optimizing and continuously improving the process and acquiring confidence of stakeholders

This can be further detailed into following aspects:

- Ensuring Compliance: A QMS ensures that RWM processes comply with local and international regulations and standards. This includes adherence to the guidelines set forth by organizations such as the International Atomic Energy Agency (IAEA) and the International Organization for

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Standardization (ISO), particularly ISO 9001 standards related to quality management.

- Process Optimization: By establishing clear procedures and standards, a QMS helps in optimizing waste management processes. This includes waste characterization, segregation, transport, treatment, storage, and disposal. Process optimization leads to increased efficiency, reduced costs, and minimized risks associated with radioactive waste management.
- Continuous Improvement: QMS frameworks incorporate the principle of continuous improvement, applying the Plan-Do-Check-Act (PDCA) cycle to all processes. This iterative process ensures that RWM practices are constantly evaluated and improved upon, leading to safer, more efficient, and more sustainable waste management practices.
- Stakeholder Confidence: Implementing a QMS in RWM builds confidence among stakeholders, including regulatory bodies, the public, and international partners. It demonstrates a commitment to quality and safety, thereby enhancing the credibility and reputation of the organizations involved in managing radioactive waste.

Each process requires proper documentation. Therefore, a predisposal QMS must describe used methodologies, protocols, techniques etc. in procedures/instructions/… . As an example, one must describe the process which waste packages must follow to guarantee their application with the WAC. Another relevant aspect of “documentation” is record keeping. QMS must provide tools like inspections, surveys, tests, record keeping, etc., to cover all the involved aspects indicated in the procedures with the aim at maintaining the system as established.

Another important aspect is establishing reliable measures and controls to verify the performance of the processes. Related to WAC, Quality Assurance must design the controls that assure the proper way of proceeding and the fulfillment of WAC.

A third relevant aspect describes the requirements related to people and competences. Nuclear industry needs skilled staff, which must be found at the job market or properly trained. Within a process, it is crucial to describe unambiguously roles and responsibilities of staff.

Finally, sufficient resources must be available in the process. Within the nuclear sector, special attention must be given to safety and security.

When a QMS is set up correctly, it helps to coordinate and direct an organization’s activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis.

A definition of QMS could be as follows, *the needed structure of actions, methods and procedures that guarantee the maintenance and optimization of one approved process, in this case in relation to the Manufacturing and Acceptance of radioactive Items (Packages, Casks, Disposal Units, Large Components) in a Disposal – Storage.*

KEYWORDS

Criteria, disposal, storage, wasteform, inventory, characterization, package, cask, non-conformity, treatment, conditioning, inspection, test, audit, predisposal, radiation protection, safety, Quality, Management System, process

KEY ACRONYMS

RW – Radioactive Waste.

RWM – Radioactive Waste Management.

WMO – Waste Management Organization.

VLLW – Very Low Level Waste.

LLW – Low Level Waste.

ILW – Intermediate Level Waste.

HLW – High Level Waste.

WAC – Waste Acceptance Criteria.

WAP – Waste Acceptance Process.

WFQ – Waste Form Qualification.

DGD – Deep Geological Disposal.

IAEA – International Atomic Energy Agency.

EC – European Commission.

GBS - EURAD Roadmap goals breakdown structure

QMS – Quality management system

ISO – International Standard Organisation

PS - Package Specification

1 TYPICAL OVERALL GOALS AND ACTIVITIES IN THE DOMAIN OF QMS

This section provides the overall goal for this domain, extracted from the EURAD Roadmap goals breakdown structure (GBS). This is supplemented by typical activities, according to phases of implementation, needed to achieve the domain goal. Activities are generic and are common to most regional and geological disposal programmes.

Domain Goal	
Domain Activities	
Phase 1: Planning and Programme Initiation	Defining processes. Grading nuclear activities in relation to safety. Processing/Storage/Disposal QMS
Phase 2: Program Implementation	Defining additional processes, methodologies, procedures, controls to guaranty safety. Applying the QMS as an integral part of the management system.
Phases 3–4: Program Operation/Optimisation and Closure	Strictly adhering to the QMS and continuous improvement. Emphasis on knowledge preservation (record keeping,...), knowledge transfer in the overall RWM, Resolution of Non-Conformities arising from operations. Feedback to improve processes.

The main domain of QMS is the operational domain once both WAC and WAP have been defined and implemented.

2 INTERNATIONAL LEGISLATION

International regulations on radioactive QMS aims at maintaining the involved process inside the established requirements or criteria. The following are the main international legislation:

- ANSI N45.2 Quality assurance program requirements for nuclear facilities
- ISO 9000 family
- ISO 19443:2022 Quality management systems - Specific requirements for the application of ISO 9001:2015 by organizations in the supply chain of the nuclear energy sector supplying products and services important to nuclear safety (ITNS).
- IAEA GS-R-3 Safety Requirements Series the Management System for Facilities and Activities.
- IAEA GSR Part 1: "General Safety Requirements: Safety Fundamentals,"
- 10CFR21 Reporting of defects and Noncompliance.
- Appendix B 10 CFR 50 Quality Assurance for Nuclear Power Plants.
- IAEA GSG-16 Leadership, Management and Culture for Safety in Radioactive Waste Management,
- IAEA-TECDOC-1335: "Guidance for the Application of an Assessment Methodology for Innovative Nuclear Energy Systems"

3 GENERIC SAFETY ISSUES FOR QUALITY MANAGEMENT SYSTEM

The integration of safety considerations into the QMS helps to ensure the protection of personnel, the public, and the environment. Generic safety issues that are relevant to QMS in RWM are indicated:

- Radiation Exposure: Minimizing radiation exposure is a fundamental safety concern in RWM. This involves implementing controls to limit exposure levels for workers, ensuring proper shielding, and monitoring radiation levels in relevant areas.
- Waste Handling and Packaging Safety: Ensuring the safe handling, transportation, and packaging of radioactive waste is essential. Proper procedures for waste characterization, packaging, and labeling help prevent accidents and ensure regulatory compliance.
- Criticality Safety: Avoiding criticality events (uncontrolled nuclear chain reactions) is a key concern in RWM. Implementing measures to prevent criticality, such as proper waste configuration and storage, is essential for safety.
- Worker Training and Competence: Ensuring that personnel are adequately trained and competent in safety procedures is vital. This includes training on radiation protection, emergency response, and the proper use of safety equipment.
- Security of Radioactive Materials: Safeguarding radioactive materials from unauthorized access or malicious use is a safety and security concern. Implementing security measures and monitoring systems helps prevent unauthorized access and potential security threats.
- Environmental Safety: Protecting the environment from the impact of radioactive materials is a key safety consideration. This involves monitoring and controlling emissions, preventing groundwater contamination, and addressing potential ecological impacts.
- Management of Hazardous Chemicals: In addition to radioactive materials, the handling and management of hazardous chemicals may be necessary in RWM. Proper safety measures, including labeling, storage, and handling protocols, are essential.
- Transportation Safety: Safety considerations extend to the transportation of radioactive waste. Ensuring the safe transport of materials, compliance with transportation regulations, and emergency response planning for transportation incidents are critical.
- Long-Term Safety: Planning for the long-term safety of waste disposal facilities involves considering potential future human activities, geological stability, and the integrity of engineered barriers over extended periods.
- Taking into account next steps in the whole RWM cradle to grave life cycle.

The basic safety requirements for the characterization and acceptance of radioactive waste are applicable to all nuclear or radiological installations throughout their life cycle, esp.:

- Any nuclear power plant or reactor, nuclear fuel enrichment facility, nuclear fuel element manufacturing facility, spent nuclear fuel reprocessing facility, temporary storage facility for spent nuclear fuel or high-level radioactive waste,
- Temporary storage facilities for radioactive waste that are located on the same site and are directly related to the indicated facilities.
- Processing and disposal facilities. In the way they are directly linked with final product to dispose.

3.1 Planning and Program Initiation

From the early start of planning and programme orientation, the process approach must be followed. Organisations should define the basis process first, after which these processes can be developed in more detail an new processes can be added. The QMS should grow with the development of the disposal programme. See IAEA GSG16 for more information.

3.2 Program Implementation

For program implementation, the same approach as described in 3.1 must be followed. Organisations must start with a simple description of the process and gradually increase complexity.

Example 1: QMS to ensure waste package compliance to WAC

Every final produced package must fulfill all the applicable WAC regarding the involved wasteform inside the defined WAS. How to control whether the provided data are valid is a question of Quality Assurance. Therefore, a quality system should be developed to guaranty the compliance of the established requirements. Basically, there are two ways to accomplish that:

- Hard way, QMS by measuring packages (casks, large items, etc.).
- Smart way, QMS by controlling Processes.
- A mixture of both, some data are verified package by package and other data are verified Process by Process. This is the common approach.

That Quality Management System is mainly focused to validate the following WAC aspects:

- Generic: Identification, Tracking, Codification, Package Dimensions, Weight, Activity Classification, Historical (Legacy)/ Non-Historical.
- Radiological: Isotopic Composition, Dose Rate, Surface contamination, Difficult to Measure Isotopes/Scaling Factors. Fissile material content. Heterogeneity.
- Chemical: Pyrophoric and explosive material, Chemical Toxicity, Leaching accelerators, Complexing agents, Free liquids, Organic liquids, Corrosion.
- Containment Capability/Release Rate: Leaching, Diffusion.
- Physical: Heat Release, Package Volume Optimisation, Gas Release.
- Biological: Waste degradation, Gas production.
- Mechanical: Compression, traction, Compression after water immersion, Mechanical resistance after thermal cycles.

Quality control on packages means every of the showed aspects/properties must be verified/measured.

This strategy could be good for small nuclear market/producers where the number of packages to control is small enough. On the other hand, for intermediate or large nuclear market, it is not a feasible way to proceed. Take for example into consideration that there are around 200.000 Packages disposed at El Cabril Disposal Centre.

When thousands of waste packages need quality control, it is important to check each of them. An alternative strategy is to control the process of package production that considers all the WAC. Normally there is a Package Specification, PS, where the producer describes all the aspect/properties to check for a WasteForm, describing the waste stream, treatment, condition, characterization, etc. Subsequent approval process is established that assures compliance with the required criteria.

All the subjects in WAC are checked in the PS approval, supported by surveys and additional tests performed in external laboratories. Once the PS is approved, a Control must be applied to assure the process maintenance during time in the way described and approved.

Example 2: Quality Control in compliance to WAC (how to organise)

Two kinds of Quality Controls could be implemented:

- On-Site, Off-Site Controls, (O&OC).
- Laboratory Controls, (LC).

O&OC have the finality of checking all the involved aspects of the producer package streams by means of surveys that partially cover some of the criteria, trying to perform several of these surveys to cover the whole process. Examples of these Controls:

- Off-Site Documentation Survey: inspection of all the procedures/documentation associated to all PS the producer has, just to notice of new revisions and the scope of that revisions in relation to the approved process.
- On Site Means Control: Inspection performed before the PS approval, verifying that there are the proper means to produce the package nature involved in PS.
- On site Process Survey: inspection of some part or the whole process of the package manufacturing to check the means, condition materials, etc., indicated in the PS.
- Off Site Waste survey: inspection focused on one PS and several manufactured packages, checking all data and linked forms, analyzing their agreement to the approved PS and WAC.
- On site Activity Survey: Inspection with measuring devices to compare the producer assigned activity with the measured one.
- Off Site Activity survey: Inspection of packages activity data sheet.

LC have the finality of measuring WAC properties to data validation. Some examples of LC:

- Non-Destructive Laboratory Control: Measurements of basic data like mass, dose rate, package integrity, Gamma spectrometry, etc. to verify the WAC.
- Destructive Laboratory Control: Measurements of difficult to measure radionuclides, core sampling for mechanical tests, leaching, etc.

it would be desirable to optimize and combine these controls to cover all the waste streams of every producer in an established period.

Normally data provided/measured by the producer, when under periodic control, are considered valid and therefore no further systematic supervision is required. Other difficult data to obtain is better to track the process instead of the systematic measurement of every package, and periodic controls derive.

3.3 Program Operation and Closure

Processes at play during program operation and closure must be documented, as explained in 3.1 and 3.2, and process development should grow together with the disposal programme.

Example on record keeping and management

All required data linked to the indicated package properties/aspects must be recorded in a System that officially allows their tracking. Additionally for all packages, their final place in disposal or temporal place in storage is typically requested

also tracked. This Management System must be under control applying the current quality tools to guarantee the correctness of data during handling in adding, consulting, saving, modification, etc.

This System should be in communication with the Producers systems just to update the generated packages and to verify the inventory. This determines the future packages to be transported to the disposal/storage.

Before sending any transport of packages to the disposal, an acceptance process has also to be implemented in the System to control that only accepted packages can be sent to disposal, preventing the sending of non-accepted/evaluated packages.

Quality Controls on packages should be also implemented in the System to demonstrate that in addition to the correctness of System Data, a quality control of packages is also carried out and included in the System as additional records.

Below are summarized some basics in a record keeping data base:

- **Package Maintenance**: data of every package: ID, Activity Level (L&ILLW or VLLW), Producer, Acceptance Level, Waste classification, Waste nature, Package Type, Activity level, Placement, Weight, Dose Rate, Total alpha activity, Total beta-gamma activity, Production Date, Isotopes, Nuclear Material, Expedition number.
- **Producer Management**: all the information related with the waste nature produced in its installation and all the Waste form that are acceptable.
- **Waste form Acceptation**: acceptability of each waste package according with the Package Specification.
- **Waste classification & Activity Level Update**: consider decaying process.
- **Scaling Factors and Easy to Measure Isotopes**: for each producer and each waste stream the applicable scaling factors according to the production date and the origin of each producer.
- **Batch maintenance**: information related to every batch that is accepted: Batch Identification, Acceptance Document, Reference date, number of

packages included in the batch, volume of the batch, Waste classification of the batch, Vault identification.

- **Expedition management**: information related to the expeditions of waste packages to send to Processing/Storage/Disposal, such as date of expedition, dose rate at the date of expedition, activity of the package at date of expeditions.
- **Disposal Units maintenance**: ID, Container Type, Activity level, Placement, Weight, Dose Rate, Total alpha activity, Total beta-gamma activity, Production Date, Isotopes, Nuclear material
- **Vaults management**: Disposed Volume, disposed activity, starting exploitation date, ending exploitation date, Total alpha activity, Total beta-gamma activity.
- **Samples maintenance**: information about sample is Identification of the sample, producer, waste nature, activity.
- **Producer's documents and Acceptance documents**: Package Specifications from producer. Forms that certify the WAC fulfillment for every Package Specification.

Example 2: non-conformity management

Non-conformity management should be also deployed in the System to track any non-conformities derived from data audits, on site or off site inspections, laboratory controls, audits, etc. and to control/track the solution to the non-conformity. Issues can be identified because of external audits, independent internal evaluations, self-evaluations, suggestions and.

The types of issues are:

- Non-Conformity (non-compliance with a mandatory requirement): it involves the definition of corrective actions to correct the non compliance. In addition, depending on the significance for safety of the issue, it involves the definition of correction actions to eliminate the causes that originated the Non-Conformity and avoid its recurrence.
- Potential Non-Conformity: it involves the definition of preventive actions to eliminated the cause that could lead to a real non conformity.
- Improvement: it involves the definition of improvements actions for making a process or activity more efficient.
- Commitment: it involves the management and monitoring of the engagements made with the regulatory body.

4 CRITICAL ISSUES, INFORMATION, DATA OR KNOWLEDGE IN THE DOMAIN OF QMS

Most critical issues for a QMS are bad or poorly defined processes as the QMS is based on these processes. Missing steps in a process can, for instance, lead to missing controls

Other critical aspects:

- Lack of resources
- Lack of controls
- Insufficient knowledge of legislation
- Need for competent staff with correct know-how, both from regulatory point of view and implementing QMS
- Long-term durability of requirement of comparability (is your measurement of 20 years agon still correct now)
- Lack of good record keeping/management system

Some examples of key aspects in RWM which need to be controlled by processes:

- Regulatory Compliance: Adhering to regulatory requirements is crucial. Regulations are in place to protect human health and the environment, and compliance is necessary to avoid legal issues and ensure the safe management of radioactive waste.
- Waste Characterization: Accurate characterization of radioactive waste is essential for proper handling, packaging, and disposal. Understanding the types, quantities, and characteristics of radioactive materials is critical for selecting appropriate treatment and disposal methods.
- Safety and Security: Ensuring the safety and security of personnel, the public, and the environment is paramount. This involves implementing robust safety measures, emergency preparedness, and security protocols to prevent accidents, leaks, or unauthorized access to radioactive waste.
- Technology and Innovation: Keeping abreast of advancements in technology and innovative solutions is important for improving the efficiency and effectiveness of radioactive waste management. This includes developments in waste treatment, packaging, and disposal methods.
- Data Management: Managing vast amounts of data related to radioactive waste, including waste characterization, disposal records, and monitoring data, is crucial. Effective data management systems help in tracking and analyzing information for continuous improvement and compliance reporting.
- Long-Term Safety: Radioactive waste often remains hazardous for thousands of years. Planning for the long-term safety of disposal facilities, including considerations for geological stability and future human activities, is a critical issue.
- Public and Stakeholder Engagement: Involving the public and relevant stakeholders in decision-making processes is essential for gaining trust and addressing concerns. Open communication and transparency contribute to the success of radioactive waste management programs.
- International Cooperation: Radioactive waste management is often a global concern, especially when dealing with transboundary movements of waste. International collaboration and information exchange are vital for addressing challenges collectively and promoting best practices.

- Training and Education: Ensuring that personnel involved in radioactive waste management are well-trained and educated is crucial. This includes training in safety protocols, waste characterization techniques, and the latest technologies.
- Life Cycle Assessment: Conducting comprehensive life cycle assessments of radioactive waste management processes helps in understanding the environmental impact and identifying opportunities for improvement in different stages of the waste management life cycle.

Addressing these critical issues requires a multidisciplinary approach, involving experts in nuclear engineering, environmental science, regulatory affairs, and other relevant fields to develop and implement effective quality management systems in radioactive waste management.

5 MATURITY OF KNOWLEDGE AND TECHNOLOGY

QMS are widely used over the world, by different sectors and since many years. We consider QMS to be a mature topic.

Knowledge and guidelines are available in the ISO9000-norms, IAEA guidelines, and EC directives.

Similar to all other topics, QMS evolve, and organisations need to follow these evolutions and adapt their QMS accordingly. Note that continuous improvement is one of the cornerstones of many directives and norms.

An important difference with other industries is the time scales: disposal of nuclear waste considers time spans of a few hundred to hundreds of thousands of years.

6 PAST RD&D PROJECTS ON QMS

QMS are application oriented and must keep track of evolutions. On QMS itself, no additional R&D is required. When looking at the application of a QMS, record keeping and data management are fields where additional R&D is required. In the past, projects such as MODERN-2020 and EURAD-MODATS were focused on these topics and more R&D can de expected in the future.

7 UNCERTAINTIES

QMS are well established, ISO 9000 family exists for a long time and is widely accepted. Besides following changes in standards and guidelines, organisations must follow regulatory changes. When looking at the broader scope of QMS in RWM, the largest uncertainties can be found in knowledge and data preservation on very long time scales.

When setting up and implementing the QMS, sufficient resources are required. Organisations must foresee sufficient budget and staff to set up the QMS, maintain and improve it and all this over a long period of time.

In many countries, QMS have been set up after the first waste was produced. This leads to the presence of historical/legacy waste for which limited information is available and which might not meet the current waste acceptance criteria. Therefore, when new nuclear installations are designed, materials streams have to be considered from cradle to grave and final decommissioning, dismantling and waste management must be considered from the design phase.

Nuclear industry is strongly influenced by the public opinion as the latter influences decision makers. Reaching public acceptance is crucial for the nuclear industry. By installing a QMS which makes all processes transparent, ensures good quality and puts safety in the first place can enhance the public acceptance.

Uncertainties can exist in applying QMS in the context of RWM. Here are some common areas where uncertainties might arise in the application of QMS:

- Interpretation of Standards: The interpretation of QMS standards and guidelines can vary, leading to uncertainties in how organizations apply them. Different interpretations may result in inconsistencies in QMS implementation.
- Organizational Culture: The organizational culture plays a crucial role in the effective application of QMS. Uncertainties may arise in how well the principles and practices of the QMS are embraced by employees and integrated into daily operations.
- Training and Competence: The level of training and competence of personnel involved in implementing the QMS can affect its effectiveness. Uncertainties may arise if there are gaps in understanding or skills among employees.
- Documentation Practices: While proper documentation is a fundamental aspect of QMS, uncertainties can arise in how organizations document processes, procedures, and quality records. Consistency and clarity in documentation are essential for effective QMS application.
- Risk Assessment and Management: Identifying and managing risks is a key component of QMS. Uncertainties may arise in the identification of potential risks, the assessment of their impacts, and the effectiveness of risk mitigation strategies.
- Continuous Improvement: The concept of continuous improvement is inherent in QMS. Uncertainties may arise in how organizations identify opportunities for improvement, track performance metrics, and implement changes to enhance the system over time.
- Auditing Processes: Internal and external audits are crucial for evaluating the effectiveness of the QMS. Uncertainties can arise in the auditing process, including variations in the interpretation of audit findings and the consistency of audit practices.
- Adaptation to Change: Organizations undergo changes over time, such as structural changes, technological advancements, or shifts in regulatory requirements. Uncertainties may arise in how well the QMS adapts to these changes and maintains its effectiveness.
- Communication: Effective communication is essential for successful QMS implementation. Uncertainties may arise in how well information about the QMS is communicated across different levels of the organization, potentially leading to misunderstandings or misinterpretations.

- Integration with Business Processes: QMS should be integrated seamlessly into the overall business processes of an organization. Uncertainties may arise in how well the QMS aligns with and supports broader organizational goals and objectives.

To address these uncertainties, organizations need to foster a culture of openness, continuous learning, and adaptability. Regular training, communication, and feedback mechanisms can help mitigate uncertainties in the application of QMS, ensuring its effectiveness and alignment with organizational objectives.

8 GUIDANCE, TRAINING AND COMMUNITIES OF PRACTICE

This section provides links to resources, organisations and networks that can help connect people with people, focused on the domain of transport.

Guidance
- European Standard EN 15288 Series: The EN 15288 series of standards provides guidance on the management of facilities involved in the treatment and storage of radioactive waste. While primarily applicable in the European context, these standards can be informative for global practices. - ANSI/ANS-3.11-2019 - American National Standard for Management System for Nuclear Facilities: This American National Standard provides guidance on the development and implementation of a management system for nuclear facilities, including those engaged in radioactive waste management. • NEA-OECD Documents: The Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD) publishes reports and documents related to nuclear energy, including quality management aspects. Relevant documents can be found in the "Radioactive Waste Management Committee" section. • ISO9000 family • IAEA • LABONET/DISPONET ...
Training
Training **Communities** - ISO: INTERNATIONAL ORGANIZATION FOR STANDARDIZATION - CEN: COMITÉ EUROPEO DE NORMALIZACION - ANSI: AMERICAN STANDARDS INSTITUTE - ASTM: American Society for Testing and Materials - IAF: INTERNATIONAL ACREDITATION GROUP
Active communities of practice and networks
IAEA,: IPN, Labonet, Disponet.

OECD-NEA: Radioactive Waste Management Committee (RWMC)

9 ADDITIONAL REFERENCES AND FUTURE READING

- ISO 9001:2015 - Quality Management Systems: While not specific to radioactive waste management, ISO 9001 is a widely recognized international standard for QMS. Organizations involved in radioactive waste management can use ISO 9001 as a foundation for developing their QMS.
- ISO 14001:2015 - Environmental Management Systems: This standard focuses on environmental management systems and can be integrated with QMS for organizations seeking to address environmental aspects of radioactive waste management.
- ISO 19443:2018 - Quality Management Systems for Organizations Performing in the Field of Nuclear Energy Sector: This standard is specific to the nuclear energy sector and provides additional requirements to ISO 9001. It is relevant for organizations involved in activities related to nuclear energy, including radioactive waste management.
- IAEA General Safety Requirements No. GSR Part 2 Leadership and Management for safety
- IAEA General Safety Requirements No. GSR Part 5 Predisposal Management of Radioactive Waste
- IAEA General Safety Guide -16 Leadership, management and culture for safety in radioactive waste management
- European Standard EN 15288 Series: The EN 15288 series of standards provides guidance on the management of facilities involved in the treatment and storage of radioactive waste. While primarily applicable in the European context, these standards can be informative for global practices.
- ANSI/ANS-3.11-2019 - American National Standard for Management System for Nuclear Facilities: This American National Standard provides guidance on the development and implementation of a management system for nuclear facilities, including those engaged in radioactive waste management.
- NEA-OECD Documents: The Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD) publishes reports and documents related to nuclear energy, including quality management aspects. Relevant documents can be found in the "Radioactive Waste Management Committee" section.