

The Guideline for Low and Intermediate Level of Radioactive Waste Management Life Cycle – A Reference for Waste Tracking System (WTS) and Waste Certification Program (WCP)

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1. Introduction

Recently each organization is preparing the decommissioning of nuclear power reactor. Thus government and Korea Hydro & Nuclear Power (KHNP) has recognized the need of support to manage all the data generated in the decommissioning and decontamination process. With the support of Korean Energy Technology Evaluation and Planning (KETEP), the project called radioactive WTS [4] was organized to develop the database system with friendly User Interface (UI), managing all the internal and external data generated from waste generation up to disposal process. Now detail software design specification is being refined step by step.

Most of requirements for WTS are based on the IAEA TECDOC [1][2][3], decommissioning plan, and examples of foreign experiences and a sort of specific needs from utility. In addition to those resources, MIRAE-EN Co., Ltd. is suggesting the ISO TC85 SC5 WG5 standard describing the requirements of radioactive waste management life cycle, which could be also obviously requirements for WTS development and would be good aids and basis for waste certification for disposal. This paper addresses the story of this standard proposal, which is virtually design concept of WTS.

2. Main content of the guideline

When implementing the radioactive waste management process, there are many important technologies such as identification of radionuclides by scaling factor, collection and segregation, waste treatment and conditioning like solidification, incineration, vitrification and etc., container, and transport. All these detail technologies could be the scope of a general standards under this umbrella description, meaning that this proposal just figures out the general requirements of overall process of radioactive waste management life cycle.

The structure of this proposal is to provide the 1) guidance or requirements, 2) activities, and 3) outcome of each radioactive waste management process.

It is expected that this proposal could be a strategical guideline for radioactive waste management process. The standard proposed to ISO TC85 SC5 WG5 “Characteristics and waste management” has the following contents;

2.1 Conceptual structure

This proposal is organized in accordance with strategy in Figure 1, and this process structure could be flexible and used in selective manner in each waste stream and characteristics. Things interesting is that this includes the process for the radioactivity hazard and impact analysis for safe and transparent waste management before commencing the radioactive waste management process.

2.2 Contents in proposal

Table 1. The content of proposal

4	General principles
4.1	Waste management life cycle process requirements
4.1.1	Waste management planning process
4.1.2	Radioactive waste generation process
4.1.3	Radioactive waste treatment process
4.1.4	Waste characterization process
4.1.5	Radioactive waste classification process
4.1.6	Radioactive waste conditioning process
4.1.7	Radioactive waste packaging process
4.1.8	Radioactive waste transport process
4.1.9	waste delivery and maintenance process
5.	Documentation
5.1	Required data
5.2	Record plan/procedure
5.3	Data traceability

Also since the generation of radioactive waste of low and intermediate level, a couple of organization is trying to minimize the waste volume increase during the treatment process mainly due to the disposal cost and safety in disposal infrastructure. Thus various treatment and conditioning technologies could be used to achieve this goal, which implicates the use of possible technologies is dependent on the position of national regulation or practices.

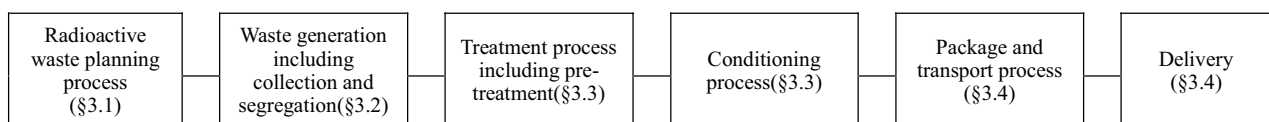


Fig. 1. Umbrella process for waste management.

A solidification by Portland and Calcium Aluminate cement, Paraffin and Polymer, vitrification, and incineration could be one of the samples for those technologies.

2.3 Quality management Issues

First of all, the main objective of this proposal is to maintain the traceability of radioactive waste from waste generator to disposal, which ultimately to achieve the safety of radioactive waste management. In order to achieve this final objectives, the quality system should be established to support the integrity of radioactive waste management with respect to staffs, organization and other stakeholder with integral documentation of process history.

3. Technical management for processes

3.1 Radioactive waste management planning

According to the proposal, the conceptual planning for management shall be established for systematic and transparent guideline as a basis for managing radioactive waste life cycle. It needs to provide the comprehensive waste management and certification that should be adhered to throughout the waste management process. Also all the risks and its emergency, mitigation or recovery plan shall be considered and prepared to cope with the unexpected events during radioactive waste management life cycle.

3.2 Waste segregation and collection

This could be an actual step occurring just after waste generation process, which also could be divided into sub-process such as pre-treatment and treatment process depending on the specific waste stream. It may involve collection, segregation, decontamination and chemical adjustment for waste collection. However this section describes the requirements of those processes as one single topic.

The characteristics of raw radioactive waste treatment process need to be well defined with care in a sense that the various type of characteristics of raw waste stream is able to determine a series of treatment process such as burning as incineration, pyrolysis and solidification by eliminating a liquid, gaseous and pyrophoric compound etc., and of characteristic performance testing for conformity. All the data gathered in this process need to be recorded and reviewed for approval.

3.3 Waste treatment and condition

According to the waste stream and characteristics, the numerous waste treatments such as cutting, chemical adjustment and decontamination which includes decontamination by sand, smear, chemical compound, ultrasonic, electrolytic and sand polishing etc. and centrifugal separator, decompressive evaporator, enrichment etc. could be selected and applied for treatment. All the information gathered during this process need to be recorded and reviewed for approval.

3.4 Radioactive waste packaging and delivery

According to the international comments, these two (2) processes has been already mentioned in another working group under TC5 so that these topics are left out in this proposal.

4. Supporting tool and environment

All of information produced through these activities shall be managed and maintained through integrated WTS systematically and electronically.

5. Conclusion

It is expected that there're lots of requirements for specific technologies for waste management that could be one of the technologies under this whole umbrella process requirements. Hopefully this could be utilized for process establishment and implementation for WTS in selective manner that is compliant to each waste stream and application.

All the topics mentioned so far is an attempt to achieve the traceability and safety of radioactive wastes management regardless of the waste stream and level of activity. Thus Section 5 in Table 1 emphasizes on any kind of documentation, which plays a great role of requirements ensuring the integrity of waste acceptance criteria (WAC), and then the appropriateness of waste certification or accreditation system of radioactive waste management system. Also there is plan to expand this proposal into WTS and WCP if consented by ISO TC85 SC5 WG5 Member States in the future (See Figure 2).

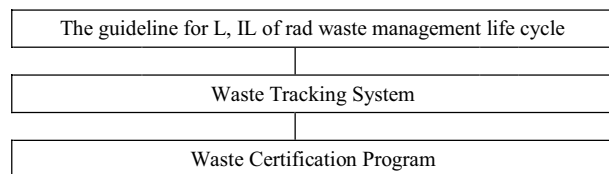


Fig. 2. ISO standardization plan.

REFERENCES

- [1] No. SSG-40, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors.
- [2] No. SSG-41, Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities.
- [3] GS-G-3.3, the management system for the Processing, Handling, and Storage of Radioactive waste.
- [4] Radioactive Waste Tracking System for Nuclear Power Plants Decommissioning and Non-Reactor Nuclear Facilities (NRNF), PN: 20171510300710, the project proposal by MIRAE-EN Co., Ltd., KETEP.