Suggestions for Improvements in Conducting Periodic Safety Review (PSR) of Radioactive Wastes Management Facilities Compared to Nuclear Power Reactors

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1. Introduction

Regarding Article 63 of the Nuclear Safety Act, the provision including the timing and contents etc. of the periodic safety reviews (PSR) of radioactive wastes management facilities (RWMFs) was enacted on December 22, 2020. According to the relevant legislations, PSR of RWMFs must be performed, but since RWMFs have different characteristics from nuclear power reactors, PSR cannot be performed using the same standards and methods as they are applied. This study examines the laws and regulations related to the PSR of RWMFs and nuclear power reactors, and proposes considerations for conducting the PSR of RWMFs.

2. Legislations related to PSR

2.1. RWMFs

The law related to the PSR of RWMFs was first enacted on December 22, 2020, and Article 65-2 of the Nuclear Safety Act describes the details. A constructor and operator of RWMFs, etc. shall periodically review the safety of RWMFs, etc., as prescribed by Presidential Decree, and submit the results thereof to the Commission.[1] Presidential Decree prescribes the timing, details, methods, criteria, and periods for examining PSR.

The operator of RWMFs shall comprehensively review the safety of the facilities and prepare a report every 10 years from the date the facility has been operated. Every 10th anniversary of the operating date is granted shall be the base date for review, and the review report shall be submitted within one year and six months from such base date for review.[2] With respect to details of the contents of the PSR under Presidential Decree Article 104-3(1), it is covered by Article 93-2 of the Enforcement Rule.[3]

2.2. Nuclear Power Reactors

Every operator of a nuclear power reactor shall periodically review the safety thereof and relevant facilities, as prescribed by Presidential Decree, and submit the results thereof to the Commission.[1] Presidential Decree prescribes the timing, details, methods and criteria, and periods for examining PSR.[2] The details of the contents of the PSR under Article 37(1) of the Presidential Decree and the technical standards under Article 38(1)(4) of the Presidential Decree are set out in Articles 20 and 21 of the Enforcement Rules, respectively.[3] Table 1. shows legislations related to the PSR.

Table 1. Summary for legislations related to PSR

Content	RWMF		Nuclear Power Reactor	
	Article	Remark	Article	Remark
PSR	· Nuclear Safety ACT 65-2	· Enacted on Dec. 22. 2020	· Nuclear Safety ACT 23	· Amended on Jan. 20, 2015
Timing	· Enforcement Decree 104-2	· Amended on Mar. 7, 2023	· Enforcement Decree 36	· Amended on Dec. 30, 2022
Details	· Enforcement Decree 104-3 · Enforcement Rule 93-2	· Enacted on Jun, 22, 2021 · Enacted on Jun. 23, 2021	· Enforcement Decree 37 · Enforcement Rule 20 · Enforcement Rule 21	· Amended on Dec. 30, 2022 · Amended on Jun. 30, 2016 · Amended on Nov. 24, 2014
Methods and Criteria	· Enforcement Decree 104-4	· Enacted on Jun, 22, 2021	· Enforcement Decree 38	· Amended on Dec. 30, 2022
Periods for Examining	· Enforcement Decree 104-5	· Enacted on Jun, 22, 2021	· Enforcement Decree 39	· Amended on Dec. 30, 2022

3. Considerations in PSR for RWMFs

According to the Enforcement Rules of the Nuclear Safety Act [3], which stipulate the details of the contents of PSR, the reviews should be conducted for the items listed in Table 2. However, unlike nuclear power reactors, some RWMFs do not have major safety-related structures, systems, and components. The potential risks to the environment is relatively low compared to nuclear power reactors. That is, if the structures, systems, and components in facility are classified as general industrial grade, which is not related to safety, then they will not affect the safety caused by age-related deterioration. Therefore, it is difficult to perform a quantitative analysis of the age-related deterioration of systems and equipment or the verification for safety-related facilities.

In the case of the category of safety performance for nuclear power reactors, there are safety performance indicators specified by regulatory agencies, and the operator utilizes these indicators. However, for RWMFs, there are no safety performance indicators for conducting safety reviews related to safety performance. In order to conduct PSR for RWMFs in a more systematic manner, it is necessary to develop technical standards and examining guidelines that cover the details to be reviewed.

Table 2. Comparison of subjects for Nuclear power reactors and RWMFs in conducting PSR

No.	Nuclear Power Reactor	RWMF
1	Design of facility	
2	Physical state of SSCs* critical to safety	
3	Deterministic SA**	SA
4	Probabilistic SA	
5	Risk analysis	
6	Verification for equipment	
7	Age-related deterioration	
8	Safety performance	Safety performance, Use of operational experience and research
9	Use of operational experience and research	
10	Procedures of operation, maintenance, etc.	
11	Organization, governance and safety culture	
12	Human factors	-
13	Emergency plan	
14	Radiological impact on the environment	
15	-	Decommission

*SSCs : Structures, systems, and components
**SA : Safety analysis

4. Conclusion

This study compares the regulations that stipulate the timing, method and details of PSR for nuclear power reactors and RWMFs. Some RWMFs do not have major safety-related structures, systems, and components, so the potential risks to the environment is relatively low compared to nuclear power reactors. Since RWMFs have different characteristics from nuclear power reactors in terms of scale and risks, it is necessary to establish specific criteria for RWMFs. If safety performance indicators and examining guidelines that take into account the characteristics of RWMFs are developed, they can be used to conduct PSR of RWMFs. Also, it is necessary to establish detailed technical standards specialized to PSR of RWMFs. Thus, we suggest revision of PSR relevant regulation fitting for characteristics of RWMFs.

REFERENCES

[1] Nuclear Safety Act, No. 18972, June 10, 2022.
[2] Enforcement Decree of the Nuclear Safety Act, No. 33322, March 11, 2023.
[3] Enforcement Rule of the Nuclear Safety Act, No. 1870, March 11, 2023.