REGULATORY CONSIDERATIONS ON SITE RELEASE OF NUCLEAR FACILITIES AFTER THE COMPLETION OF DECOMMISSIONING

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ABSTRACT

According to the Nuclear Safety Legislations revised on July 2015, licensee should submit Decommissioning Completion Report (DCR) and Final Site Status Report (FSSR) to regulatory body. Then, regulatory body shall review these 2 reports and shall carry out the inspection of decommissioning completion whether all the decommissioning activity and procedure has been conducted with based on Final Decommissioning Plan submitted by licensee for decommissioning approval, and they announce the license termination to licensee when their inspection is finished.

There are 2 research reactors, TRIGA Mark II & III, under decommissioning in Seoul, Korea. Licensee, the operator of research reactors, is preparing the 2 reports for decommissioning completion, and it will be submitted within further several years. There is no commercial reactors under decommissioning in Korea. Kori Unit 1 will be permanently shutdown on June 2017 and the licensee will apply the decommissioning approval within 5 years after permanent shutdown.

It is necessary to develop the safety regulation guideline on decommissioning completion stage such as review guideline of decommissioning completion report and inspection guideline of decommissioning completion. Therefore, regulatory considerations on decommissioning completion stage of nuclear facilities were obtained in this study, especially in decommissioning inspection stage for decommissioning activity and procedure, and in decommissioning completion inspection stage for reviewing DCR & FSSR referring to MARSSIM.

1. Introduction

There are 25 units of nuclear power reactors in operation and 5 units of nuclear power reactors under construction in Korea as of Nov. 2016 (Table 1). However, there is no permanently shutdown nuclear power reactor and decommissioned or under decommissioning nuclear power reactor. There are only 2 research reactors (TRIGA Mark II & III) being decommissioned since 1997. It is realized that improvement of the regulatory framework for decommissioning of nuclear facilities has been emphasized constantly from the point of view of IAEA's safety standards. IAEA published the safety requirement on decommissioning of facilities on July 2014; its title is the Safe Decommissioning of Facilities, General Safety Requirement Part 6.

As of November 2016, design lives of 12 units (Kori unit 1~4, Wolsong unit 1~4, Hanbit unit 1~2 and Hanul unit 1~2) among 25 units of nuclear power plants which are in operation in Korea will be expired by 2030. Kori Unit 1 which is the first commercial nuclear power plant in Korea acquired an approval for continued operation in 2007. Kori Unit 1 will be the first permanent shutdown NPP in Korea, according to the decision of no-application of 2nd continued operation, which is anticipated on 2017, in the 12th Energy Committee organized by MOTIE (Ministry of Trade, Industry and Energy) on June 2015. Wolsong Unit 1 got the authorization of continued operation in March 2015, and it will be expired in 2023 [2].

Table 1. Status of nuclear facilities in Korea

Facility	Status	Name
NPP	Under the review of construction permit	• 2 units; Shin-Hanul unit 3&4
	Under construction	• 5 units; Shin-Kori unit 4~6 and Shin-Hanul unit 1&2
	In operation	• 25 units; Kori unit 1~4, Wolsong unit 1~4, Hanbit unit 1~6, Hanul unit 1~6, Shin-Kori unit 1~3 and Shin-Wolsong unit 1&2
Research or Educational Reactor	Under the review of construction permit	• KJRR (RR)
	In operation	• HANARO (RR) • AGN (ER)
	Under decommissioning	• KRR 1 & 2
Nuclear Fuel Cycle Facility	Under the review of license	• Fuel Fabrication Plant No. 3
	In operation	• Fuel Fabrication Plant No. 1 & 2 • Fuel Fabrication Facility for RR • Post-Irradiation Examination Facility (PIEF)
	Decommissioned (released)	• Uranium Conversion Facility

Introductions on recently revised nuclear safety legislations for decommissioning of nuclear facilities are mainly dealt with in this study. Regulatory safety issues on decommissioning of nuclear facilities, especially transportation, temporary storage, intermediate storage and permanent disposal of spent nuclear fuel, and transportation, treatment, storage and final disposal of radioactive waste being generated from decommissioning are also discussed to obtain further development items of safety regulation for decommissioning.
It is also necessary to develop the safety regulation guideline on decommissioning completion stage such as review guideline of decommissioning completion report and inspection guideline of decommissioning completion. Therefore, regulatory considerations on decommissioning completion stage of nuclear facilities were obtained in this study, especially in decommissioning inspection stage for decommissioning activity and procedure, and in decommissioning completion inspection stage for reviewing decommissioning completion report and final site survey report referring to MARSSIM.

2. Revision of Nuclear Safety Legislations Related to Decommissioning

Revision history of nuclear safety legislation related to decommissioning is shown in Table 2. Due to the implementation of revised nuclear safety act, enforcement decree and enforcement regulation, 32 units of power reactors including in operation, under construction and under the review of construction permit, 2 research reactors in operation and under the review of construction permit, 1 educational reactor, and 4 nuclear fuel cycle facilities in operation and under the review of license as shown in Table 1, will be become getting the impact by the revised legislations.

Table 2. Revision history of nuclear safety legislations related to decommissioning

Legislation	Date	Revision History
Nuclear Safety Act		
	20th Jan. 2015	• Partial amendment & proclamation (the provision on gathering public opinion was implemented from the date of proclamation)
	21st Jul. 2015	• Implementation (from 6 months later after proclamation)
Nuclear Safety Enforcement Decree & Nuclear Safety Enforcement Regulation		
	19th Mar. 2015	• The 36th Nuclear Safety Committee passed a vote of the draft revision on Nuclear Safety Enforcement Decree and Enforcement Regulation.
	25th Mar. 2015	• Pre-announcement of partial amendment draft on Nuclear Safety Enforcement Decree and Enforcement Regulation (Mar. 25 ~ May 4)
	20th Jul. 2015	• Partial amendment of Nuclear Safety Enforcement Decree
	21st Jul. 2015	• Partial amendment of Nuclear Safety Enforcement Regulation & implementation of Nuclear Safety Enforcement Decree and Enforcement Regulation
Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. & Notice of the Nuclear Safety and Security Commission (NSSC) No.2015-08 (reactor.41)		
	23rd Apr. 2015	• The 39th Nuclear Safety Committee passed a vote of the draft revision on Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. and passed a vote of the enacted draft on Notice of NSSC No.2015-08.
	13th May 2015	• Pre-announcement of partial amendment draft on Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. (May 13 ~ Jun. 3) • Pre-announcement of the enacted draft on Notice of NSSC No.2015-08 (reactor.41) (May 13 ~ Jun. 3)
	23rd Jul. 2015	• Partial amendment & implementation of Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. • Enactment & implementation of Notice of NSSC No.2015-08 (reactor.41)

• Notice of NSSC No.2015-08 (reactor.41) “Standard Format and Content of Decommissioning Plan for Nuclear Facilities”

3. Changes in revised legislations

Revised Nuclear Safety Act defines “decommissioning” as “decommissioning is the whole activities taken for the release from regulatory control by dismantling and decontamination of the authorized site and facilities, after the licensee who is responsible for power reactor, research or educational reactor and fuel cycle facilities permanently shutdown the facilities.” This definition is referring to the definition of IAEA, OECD/NEA and USA [5, 7 and 8].

There are several significant changes according to the implementation of revised legislations (Figure 1). It is also shown about regulatory provisions related to decommissioning during the lifecycle of nuclear facilities in Figure 2.

(1) The entire licensee who has issued the license for power reactors, research or educational reactors and fuel cycle facilities should submit preliminary decommissioning plan within 3 years from the implementation date (21st Jul. 2015) as a grace period.

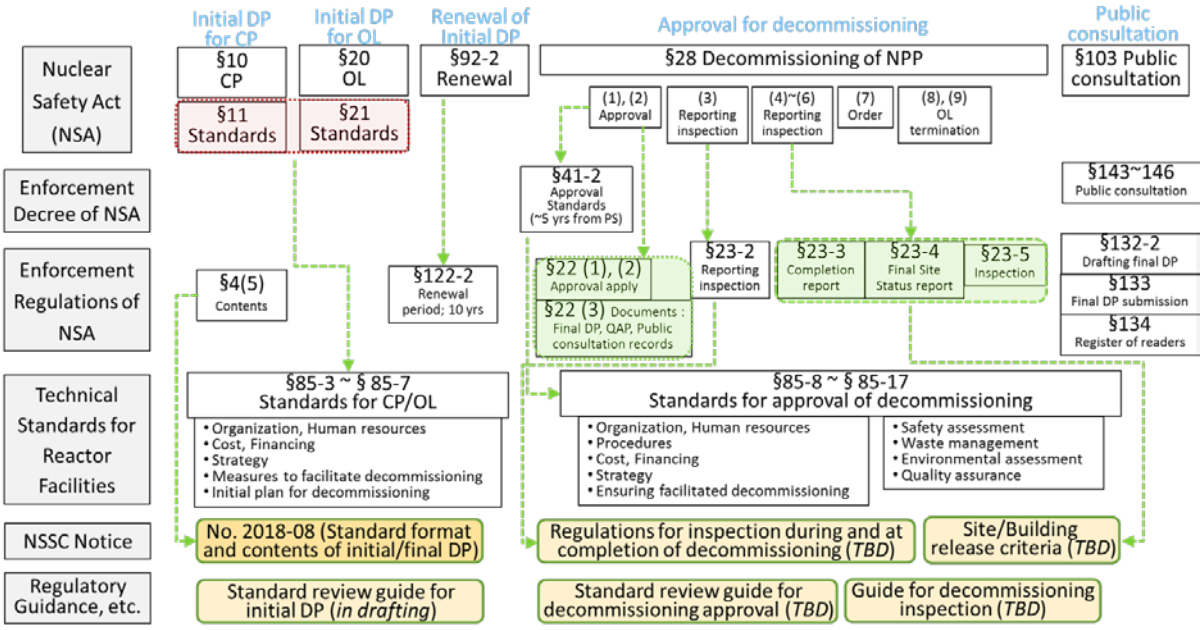

Figure 1. Established provisions for decommissioning regulations

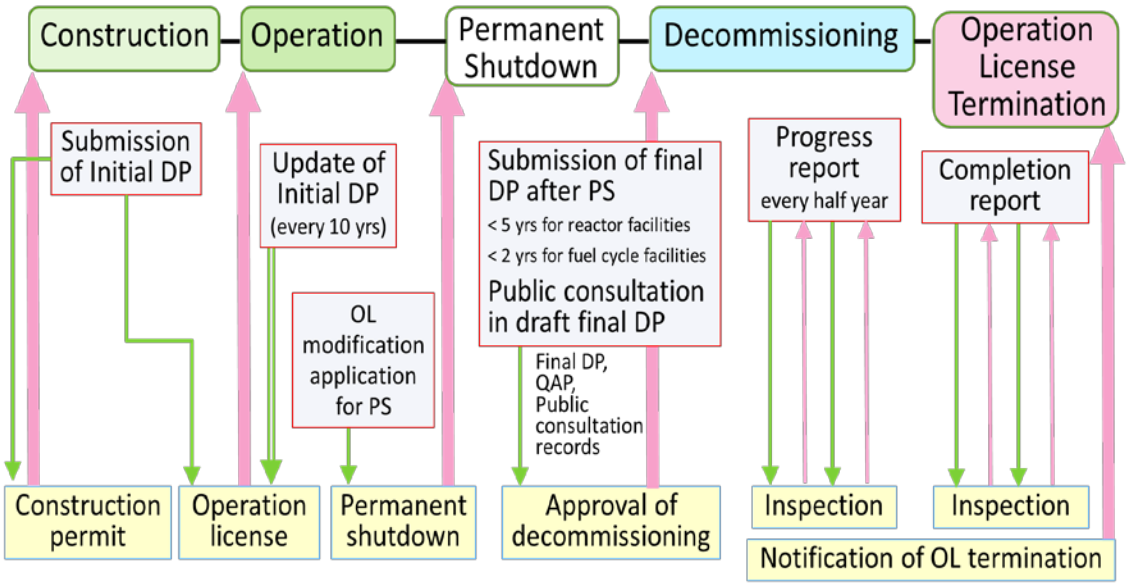

Figure 2. Regulatory provisions related to decommissioning during the lifecycle of nuclear facilities

(2) The entire licensee who wants to apply the license for power reactors, research or educational reactors and fuel cycle facilities should also submit preliminary decommissioning plan when they submit the documents for the license approval. Regulatory body should also review the preliminary decommissioning plan submitted by licensee.
(3) Once submitted preliminary decommissioning plan should be updated every 10 years and be approved by regulatory body.
(4) When the licensee is going to start decommissioning, they should submit final decommissioning plan with the document such as QA, public opinion for final decommissioning plan and the result of public hearing. Regulatory body should also review the final decommissioning plan and the related documents submitted by licensee. Licensee should submit the final decommissioning plan within 5 years for power reactor and

research/educational reactor and within 2 years for fuel cycle facility after their permanent shutdown.
(5) Licensee who is responsible for decommissioning of power reactor should report the status of decommissioning every 6 months, and then regulatory body should perform the confirmation and inspection against decommissioning status of facility.
(6) When Licensee who is responsible for decommissioning complete decommissioning, they should report and submit documents related. Regulatory body should conduct the confirmatory inspection.
(7) When the confirmatory inspection is completed, regulatory body announces the license termination to the licensee.

Further requirements and technical standards such as “Inspection standards during decommissioning” and “Radiological standard for site release after the completion of decommissioning” have been developed and applied on Sep. 2016.

4. Regulatory considerations on transportation, storage and disposal of SNF and radioactive waste generated from decommissioning

Considering revised nuclear safety legislations related decommissioning of nuclear facilities, potential regulatory safety issues could obtain as Table 3.

Table 3. Potential issues for decommissioning safety regulation

Contents	Safety issues
SNF	Transshipment between neighbouring units*
	Installation of high-density storage racks (re-racking)*
	Installation of additional racks*
	Temporary storage facilities (Canister and MACSTOR for CANDU SNF)*
	Additional installation of temporary storage facilities (MACSTOR for CANDU SNF)*
	Installation of intermediate storage facility
	Installation of permanent repository facility
Radioactive waste	Characterization, treatment, transportation, storage and disposal of radioactive waste generated from decommissioning
	Storage, transportation, treatment and disposal of large-scale radioactive waste such as reactor vessel head and steam generator
	Material release of large-scale radioactive waste such as concrete blocks and metallic components

* : already adapted or being adapted

5. Regulatory considerations on decommissioning completion stage

There are several regulatory considerations before starting not only the review of decommissioning completion report and final site survey report but also the inspection of decommissioning completion, because characterization survey on building and site would be already finished by licensee at the submission stage of these kinds of reports. It could be strongly recommended to regulatory body by communicating with licensee as follows;

(1) Document review for historical site assessment,
(2) Scope of building and site for decommissioning including non-impacted area,
(3) Selection of radionuclides on building and site for survey,
(4) Preliminary review and determination of DCGL (Derived concentration guideline level) and survey unit on building & site before characterization survey, and
(5) Involvement during the scoping survey [9].

6. Conclusions

This paper introduced recently revised nuclear safety legislations related to decommissioning of nuclear facilities. From the aspects of regulatory framework for decommissioning of nuclear power plant, the revisions of NSA and relevant regulations for decommissioning have been done successfully based on the IAEA safety standards. We have thought that this was the first step for the improvement of regulatory framework on the safe decommissioning.

Several regulatory considerations are also obtained. The next step would be the development of detailed technical standards and regulatory guides on decommissioning completion. Those would be necessary for preparation for decommissioning and developed in a timely manner.

ACKNOWLEGEMENT

This work was supported by the Nuclear Safety Research Program through the Korea Foundation of Nuclear Safety (KOFONS), granted financial resource from the Nuclear Safety and Security Commission (NSSC), Republic of Korea.

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