Introduction on Recently Revised Regulatory Framework Related to Decommissioning of Nuclear Facilities in Korea – 16488

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ABSTRACT

There are 24 units of nuclear power reactors in operation and 4 units of nuclear power reactors under construction in Korea as of November 2015. However, there is no permanently shutdown nuclear power reactor and decommissioned or under decommissioning nuclear power reactor. There are only 2 research reactors 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.

According to follow up action on the result of IAEA's Integrated Regulatory Review Service (IRRS) mission to Korea in 2011, regulatory framework for decommissioning of nuclear facilities in Korea was revised through comparing to IAEA safety standards. It was identified that items should be revised to improve the regulatory framework for decommissioning. Those are as follows: absence of legal definition of decommissioning, incomplete procedure for safety regulation after permanent shutdown, undetailed acceptance criteria for decommissioning plan, incomplete requirements for early preparing and periodic update of decommissioning plan, undetailed requirements on standard format and contents for decommissioning plan, and incomplete radiological criteria on site and building reuse after completion of decommissioning.

Nuclear Safety Act related to decommissioning of nuclear facilities was revised and promulgated on 21st July 2015. As the lower statute of Nuclear Safety Act, Enforcement Decree of the Nuclear Safety Act and Enforcement Regulation of the Nuclear Safety Act were also revised and promulgated on 21st July 2015.

In this paper, related to decommissioning of nuclear facilities such as nuclear power reactor, research or training reactor, and nuclear fuel cycle facility, it was introduced the main changes of the amended and promulgated Nuclear Safety Act on July 2015. It was also mentioned about the current issue in accordance with its implementation. Main contents of revised Nuclear Safety Act are that decommissioning plan should be submitted for nuclear installations to be constructed and operated, and this plan should be updated periodically. In addition, 3 years of grace period was set to submit preliminary decommissioning plan for the facility which has already been approved prior to July 2018. Preliminary decommissioning plan should be updated every 10 years, and regulatory body

should review this document.

According to the revised Nuclear Safety Act, in the case of a nuclear power reactor after the approval of the change on operating license for permanent shutdown, should submit final decommissioning plan within 5 years, and be approved by the regulatory body. On July 2015, Kori Unit 1 was determined not to apply its 2nd continued operation, and will expire in 2017. Kori Unit 1 will be the first case for the submission of final decommissioning plan.

INTRODUCTION

There are 24 units of nuclear power reactors in operation and 4 units of nuclear power reactors under construction in Korea as of November 2015. However, there is no permanently shutdown nuclear power reactor and decommissioned or under decommissioning nuclear power reactor. There are only 2 research reactors 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 2015, design lives of 12 units (Kori unit 1~4, Wolsong unit 1~4, Hanbit unit 1~2 and Hanul unit 1~2) among 24 units of nuclear power plants which are in operation in Korea will be expired by 2030 (see Table-I). 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 [1].

However, permanent shutdown and decommissioning issue of Kori Unit 1 and Wolsong Unit 1 has become larger since the station blackout of Kori Unit 1 occurred in Feb. 2012 and the life extension of Wolsong Unit 1 in 2015.

BACKGROUND

Since the 1990s, it has been emphasized that the regulation on decommissioning of nuclear facility should be improved. In addition, preparedness for early decommissioning became necessary after Fukushima Daiichi nuclear disaster. In July of 2011, IAEA's Integrated Regulatory Review Service (IRRS) was inspected in Korea and it was recommended that the regulatory framework for decommissioning should require decommissioning plans for nuclear installations to be constructed/operated and these plans should be updated periodically[2].

Therefore, imperfection of the regulatory framework has been analyzed and the revision of nuclear safety legislations was performed in order to improve the regulatory framework for decommissioning of nuclear facilities in Korea.

Table-I. The construction and operation status of NPPs as of 3rd Nov. 2015

No.	Unit Name	Reactor	Capacity (MWe)	Construction Starting -Date	Synchronization -Date	Design Life (yr)	Status
1	Kori-1	PWR	603	1972-04-27	1977-06-26	30+10	On operation
2	Wolsong-1	PHWR	622	1977-10-30	1982-12-31	30+10	
3	Kori-2	PWR	675	1977-12-04	1983-04-22	40	
4	Kori-3	PWR	1,042	1979-10-01	1985-01-22	40	
5	Kori-4	PWR	1,042	1980-04-01	1985-11-15	40	
6	Hanbit-1	PWR	995	1981-06-04	1986-03-05	40	
7	Hanbit-2	PWR	995	1981-12-10	1986-11-11	40	
8	Hanul-1	PWR	995	1983-01-26	1988-04-07	40	
9	Hanul-2	PWR	1,006	1983-07-05	1989-04-14	40	
10	Hanbit-3	PWR	1,039	1989-12-23	1994-10-30	40	
11	Hanbit-4	PWR	1,039	1990-05-26	1995-07-18	40	
12	Wolsong-2	PHWR	730	1992-06-22	1997-04-01	30	
13	Hanul-3	PWR	1,047	1993-07-21	1998-01-06	40	
14	Wolsong-3	PHWR	729	1994-03-17	1998-03-25	30	
15	Hanul-4	PWR	1,045	1993-11-01	1998-12-28	40	
16	Wolsong-4	PHWR	730	1994-07-22	1999-05-21	30	
17	Hanbit-5	PWR	1,046	1997-06-29	2001-12-19	40	
18	Hanbit-6	PWR	1,050	1997-11-20	2002-09-16	40	
19	Hanul-5	PWR	1,048	1999-10-01	2003-12-18	40	
20	Hanul-6	PWR	1,048	2000-09-29	2005-01-07	40	
21	Shin-Kori-1	PWR	1,038	2006-06-16	2010-08-04	40	
22	Shin-Wolsong-1	PWR	1,000	2007-11-20	2012-01-27	40	
23	Shin-Kori-2	PWR	1,000	2007-06-05	2012-01-28	40	
24	Shin-Wolsong-2	PWR	1,000	2008-09-23	2015-02-26	40	
25	Shin-Kori-3	PWR	1,400	2008-10-16		Under construction	
26	Shin-Kori-4	PWR	1,400	2009-08-19	-		
27	Shin-Ulchin-1	PWR	1,400	2008-09-25	-		
28	Shin-Ulchin-2	PWR	1,400	2008-09-25	-		
29	Shin-Kori-5	PWR	1,400	-	-	Under the review of construction permit	
30	Shin-Kori-6	PWR	1,400	-	-		

IMPERFECTIONS OF CURRENT REGULATORY FRAMEWORK

Comparing this to IAEA's safety standards [3, 4, 5] and regulatory frameworks of major nuclear countries, inadequate items of the former regulatory framework in Korea were mentioned as follows:

- Absence of legal definition of "Decommissioning"
- Incomplete procedure for safety regulation after permanent shutdown
- Incomplete acceptance criteria for Decommissioning Plan
- Incomplete requirements for early establishment and periodic revision of Decommissioning Plan
- Incomplete details on entered items of Decommissioning Plan
- Incomplete radiological standard for site reutilization after decommissioning

REVISION OF NUCLEAR SAFETY LEGISLLATIONS

Revision history of nuclear safety legislation related to decommissioning is shown in Table-II. Due to the implementation of revised nuclear safety act, enforcement decree and enforcement regulation, 27 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, will be become getting the impact.

The recently revised Nuclear Safety Legislations were considered about the imperfection mentioned above[6]. Table-III shows the recently revised contents of legislations, especially what legislation is dealing with the each content.

Table-II. Revision history of nuclear safety legislation 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

Table-III. Revision of regulatory framework in the decommissioning stage of nuclear facilities

Decommissioning Stage		Description	Nuclear Safety Legislation		
			Act	Enforcement Decree	Enforcement Regulation
Pre-decommissioning	Construction and operation	Definition of "Decommissioning"	O	-	-
		Obligation of DP (Decommissioning Plan) submission	O	-	-
		Periodic update of DP	O	-	O
	Permanent shutdown, transition period	Detailed regulation on the application of license amendment for permanent shutdown	O	O	-
Decommissioning		Detailed regulation on the submission and approval of DP	O	-	O
Post-decommissioning		Regulation on the completion of decommissioning or license termination	O	-	O
Etc.		Design requirements to facilitate decommissioning	(dealt with in the technical standards)		
		Disclosure of information and public involvement	O	O	O

MAIN CHANGES IN REVISED LEGISLATIONS

Definition of "Decommissioning"

Lifecycle of nuclear facilities will be classified into three stages in order to consider decommissioning-related issues through the whole lifecycle. Three stages consist of pre-decommissioning, decommissioning and post-decommissioning stage (Table-III). 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 is the definition referring to the following references.

(1) IAEA GSR Part No. 6

The term 'decommissioning' refers to the administrative and technical actions taken to allow the removal of some or all of the regulatory controls

from a facility.

(2) OECD/NEA (Improving Nuclear Regulation, 2009)
The term "decommissioning" covers all of the administrative and technical actions associated with early planning for cessation of operations through termination of all licenses and release of the site from nuclear regulatory control.

(3) 10CFR50 (Domestic Licensing of Production and Utilization Facilities)
Decommission means to remove a facility or site safely from service and reduce radioactivity to a level that permits -
1) Release of the property for unrestricted use and termination of the license; or
2) Release of the property under restricted conditions and termination of the license

Effect of revised legislations

There are several significant changes according to the implementation of revised legislations.

(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.

(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 will be developed and applied such as "Inspection standards during decommissioning" and "Radiological standard for site release after the completion of decommissioning".

CONCLUSIONS

Detailed improvements for the regulatory framework will be established. Therefore, fundamental data for developing the technical standards and revising the corresponding legislation will be organized. By improving the regulatory framework for decommissioning, decommissioning-related system in Korea will meet the international standards and safety on decommissioning will be enhanced.

Related to decommissioning of nuclear facilities such as nuclear power reactor, research or training reactor, and nuclear fuel cycle facility, it was introduced the main changes of the amended and promulgated Nuclear Safety Act on July 2015. It was also mentioned about the current issue in accordance with its implementation. Main contents of revised Nuclear Safety Act are that decommissioning plan should be submitted for nuclear installations to be constructed and operated, and this plan should be updated periodically. In addition, 3 years of grace period was set to submit preliminary decommissioning plan for the facility which has already been approved prior to July 2018. Preliminary decommissioning plan should be updated every 10 years, and regulatory body should review this document.

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

REFERENCES

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