

Comparison and Analysis of Overseas Regulatory Requirements for Decommissioning QA Program

Chan-Gyu HAN¹, Sang-Jin KIM²

^{1,2}KINS(Korea Institute of Nuclear Safety),

Dept. of Quality Assurance, 62 Gwhak-ro, Yuseong-gu, Daejeon, KOREA 34142

E-Mail : k732hcg@kins.re.kr¹, k974ksj@kins.re.kr²

*Corresponding author: Kyung-Woo Choi(kwchoi@kins.re.kr)

1. Introduction

In accordance with the decision to close Kori 1, the first nuclear power plant in the country, preparations are underway for the current permanent suspension, and it is scheduled to go into full-scale decommissioning after the permanent suspension. However, in Korea, Kori Unit 1 is the first decommissioning nuclear power plant, and it has no experience related to disassembly. Therefore, the disassembly related technology is also a rudimentary level.

The decommissioning of nuclear power plants will be applied to many technologies as much as the construction. Among them, QA Program, which is the basic element of all safety activities, is a subject to be studied at the decommissioning stage.

The purpose of this study is to examine the methodology for evaluating the composition and application of the QA program at the disassembly stage from the regulatory point of view. We will analyze the regulatory requirements of foreign countries with experience of decommissioning at the beginning, and compare the QA programs related to decommissioning in the US and Europe to suggest the appropriate model that Korea should apply.

2. Analysis of overseas regulatory requirements

2.1 Consolidated Decommissioning Guidance (NUREG-1757 Vol.1, Rev.2)

This document is a combination of the US Nuclear Regulatory Commission (Nuclear Regulatory Commission) and Nuclear Material Safety and Safeguards (NMSS) in the United States, which incorporates numerous decommissioning-related regulatory documents into three volumes, one of which is the Consolidated Decommissioning Guidance

- ✓ Part I : Decommissioning Process and Decommissioning Groups
- ✓ Part II : Decommissioning Plans

And Quality Assurance is described in 17.6. The composition of the quality assurance program for decommissioning presented in this document provides seven requirements out of the 18 requirements of

10CFR50 Appendix B [1], the composition of which is as follows.

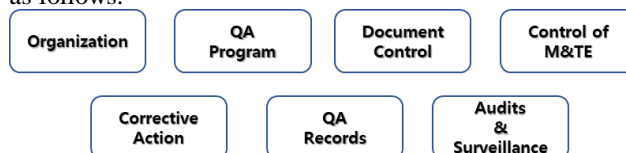


Fig.1. 7 QA Requirements for decommissioning in Nureg-1757

Before looking at the seven component requirements outlined in this document, we need to look at why they have made the seven requirements out of the 18 requirements into the disposal QA program. In general, the 18 requirements that apply to the nuclear QA program are listed in order of work progress, and the nature of work for each step can be expressed as the following figure.

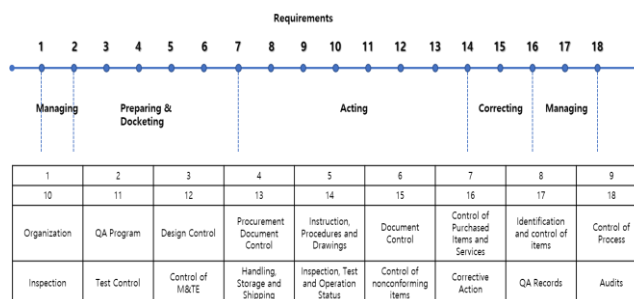


Fig.2 Work Process and division by QA Requirements

The above figure shows that the requirements of QA for decommissioning in NUREG-1757 apply most of the requirements of "MANAGING" part rather than "ACTING" part of operation of power plant. Considering that there are some requirements that are equivalent to ACTING, such as document management and management of measurement and test equipment, but there are some requirements that are deemed necessary for decommissioning, further studies should consider the operational characteristics of nuclear power in Korea, As well as expanding the requirements in the field.

2.1.1 Application by Requirements

In Nureg-1757, seven requirements for disassembly QA program were presented. Acceptance Criteria and

Evaluation Finding were composed by requirements, and Acceptance Criteria consisted of Information to be Submitted and Regulatory Requirement, In the Evaluation Finding, the applicant listed the items to be checked by the regulator according to the Acceptance Criteria in reviewing the relevant requirements. Most of the contents are the same as the requirements corresponding to the ASME NQA-1 [2], which is the technical standard for applying the QA requirements of nuclear power, or are described in more detail. However, some requirements are presented in NQA-1 It also includes content that is not included, as shown in the table below.

Table I: Additional Description in Nureg-1757

| | Description |
|--------------|---|
| Organization | The staff should verify that the licensee and its contractors will evaluate the performance of work delegated to other organizations, including audits/surveillances of the contractor's QA programs and audits/surveillances of subcontractors, consultants, and vendors furnishing equipment or services to the applicant or its contractors. The frequency and method of this evaluation should be specified |
| QA Program | A description of how NRC will be notified of changes (a) for review and acceptance in the accepted description and (b) in organizational elements within 30days after the announcement of the changes(note that editorial changes or personnel reassignments of a nonsubstantive nature do not require NRC notification) |

2.2 Organization and Management for Decommissioning of Large Nuclear Facilities (IAEA Technical Reports Series No.399)

The International Atomic Energy Agency (IAEA), in 2000, presented the contents of the operation and management of a large nuclear power plant decommissioning through Technical Reports Series No.399. It includes Quality Assurance. The IAEA standard, which is applied mainly in Europe, does not apply only QA differently from the US, and operates the QA factor under the concept of managing the entire power plant as in GSR Part2 [3]. This view is different from the one in which the United States enacted the ASME NQA-1, which is a technical standard for enacting the Nuclear QA requirements through the 10

CFR 50 Appendix B, and applying the same, so it is difficult to compare them on the same line. However, By comparing the possible requirements, we will look at what they have in common and what is different, and what they can apply in our country.

2.2.1 Requirements Application Status

Unlike in the United States, this document states that the QA requirements applicable to the decommissioning phase of a nuclear power plant should be different. Although the requirements to be applied at each stage are not specifically shown, it is suggested that the risk identified at each stage is different and the QA to be applied varies depending on the level of management.

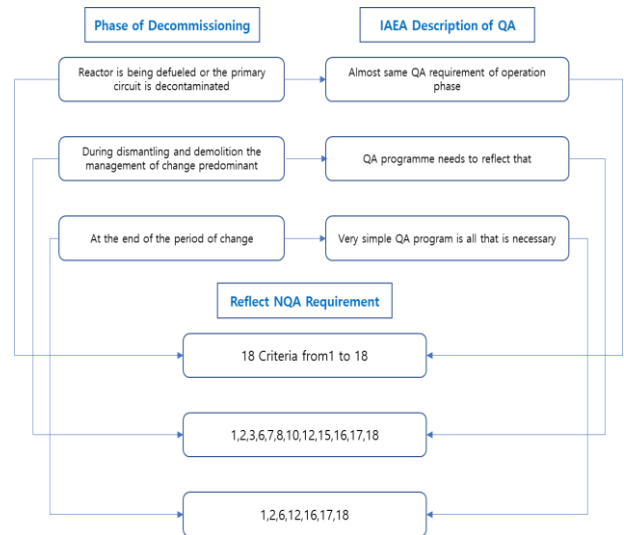


Fig.3 Example of applying QA requirements according to decommissioning phase

This seems reasonable at first glance, but on the other hand, it can be a way to make the QA program more complex. In any case, based on the above approach, there are seven application requirements in the document, which are as follows.

Table II: Decommissioning QA Requirements from IAEA

| | Requirements |
|-----|--|
| 5.2 | Control of modification to the Plant |
| 5.3 | Radiation Protection and Environmental Safety Control |
| 5.4 | Control of Outside Contracted Services |
| 5.5 | Surveillance and Inspections |
| 5.6 | Management of Information |
| 5.7 | Audits |
| 5.8 | Management, Assessment and Reporting of Incidents and Events |

3. Comparison Analysis

We reviewed the US regulatory requirements for the QA Program at the decommissioning phase and the requirements of the IAEA, which are mainly applied in Europe. In this chapter, we will look at commonalities and differences between two different regulatory systems. However, considering Korea adopts the US regulatory system so far, we will take the standard of comparison as the requirement of 18 nuclear QA that US is applying.

Based on the requirements described in each document, the requirements of the United States and the IAEA are matched, as shown in the figure below.

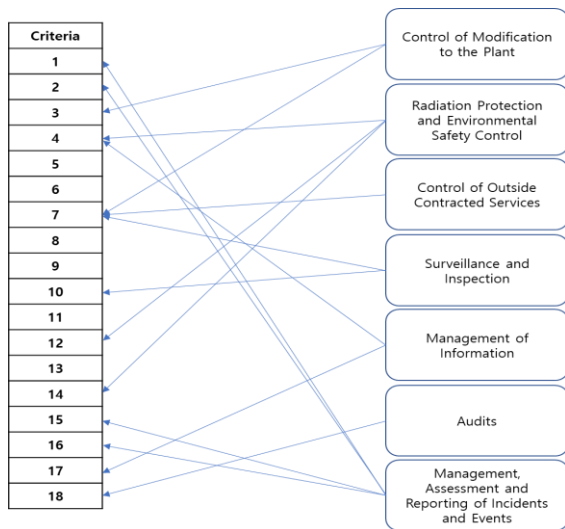


Fig.4 Matching matrix between IAEA and NQA-1 Requirements

Based on this matching, the IAEA may apply approximately 13 requirements in the United States. In addition to the requirements set out in Nureg-1757[4] by the United States, six additional areas of design control, control of purchased items and services, identification and control of items, inspection, control of nonconforming items, and corrective actions are further applied. Numbers only seem to apply the more relaxed requirements of decommissioning because the United States applies a smaller number of requirements than Europe. However, as mentioned earlier, in Europe, QA is included as an area of management rather than separate QA, so it can be judged to be more comprehensive than the US approach. In other words, we cannot say that any regulatory position is more advantageous by matching the requirements, but through the above analysis, it seems that there is definitely a part that we need to learn through the first decommissioning.

4. Conclusions

In this study, we looked at the requirements applied to the QA Program in the decommissioning phase proposed by the US and the IAEA, and compared the

two documents briefly. As mentioned earlier, Korea adopts the QA system of the United States, so it is easy to accommodate the requirements of the United States, but it is also not desirable to uncritically apply the requirements of the United States at the beginning of the decommissioning. In the IAEA document, the requirements for application are also considered to be applicable or necessary for each stage of decommissioning. In the case of Korea, which is the first country to dismantle, it is necessary to consider the application of the requirements more carefully and conservatively. Therefore, in this study, it is necessary to apply the requirements of about 13 IAEA standards when establishing the QA program in the disassembly stage in Korea. If the experience of decommissioning is accumulated, I think Korea can adjust the application requirements.

Of course, it is difficult to judge that this study has been done in depth because it concluded only through the comparison of two documents. In the future, further study on more documents and requirements, The development of a QA program that can be applied to the decommissioning phase and the development of the regulatory system should continue.

ACKNOWLEDGEMENT

This study is the result of the Nuclear Safety Research Project(No. 1605008-0318-SB110) conducted with the support of KOFONS(KOREA Foundation Of Nuclear Safety) as the fund of the NSSC(Nuclear Safety and Security Commission)

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