Review of Non-Radiological Risk Assessment Methodology in Nuclear Facilities Decommissioning

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Introduction

❖ Safety assessment in decommissioning

- In order to certify the safety of decommissioning plan, safety assessment should be performed.
- Korea Nuclear Safety Act's guidelines for safety assessment in the decommissioning plan specify that safety assessment must also consider.

❖ Necessity of non-radiological risk in safety assessment

- As the decommissioning of nuclear facilities progresses, the radioactive material in the facility gradually decreases, and non-radiological hazards become the major risk to workers.
- The IAEA has noted that non-radiological hazards can actually have a greater impact than radiological hazards during decommissioning.
- However, no systematic guidelines or methodologies for safety assessment have been established.
- Therefore, it is necessary to analyze non-radiological risk assessment methodologies conducted at Korea and abroad to establish future NPP decommissioning safety assessment methodologies.

Objectives

❖ Review of non-radiological risk assessment methodology in nuclear facilities decommissioning

- **Review of nuclear facilities methodologies.**
- **Review of general architecture methodologies.**

Nuclear Facilities Non-radiological Risk Assessment Methodology

❖ Atomic Energy of Canada Ltd(AECL)

- AECL's risk assessment is a process of 1) risk identification, 2) risk analysis, 3) risk evaluation.
- The risk identification step identifies all hazards that may affect the decommissioning activities.
- Risk analysis step analyzes the probability of occurrence and impact of the hazards identified.
- In the risk evaluation stage, risk response measures and strategies are determined based on the results of risk analysis.

❖ Sellafield Ltd

- Sellafield Ltd utilizes a risk matrix to derive severity as the product of the probability of occurrence and impact of identified hazards, and then develop a proportional risk treatment strategy.
- opportunity means a positive, threat means a negative impact.

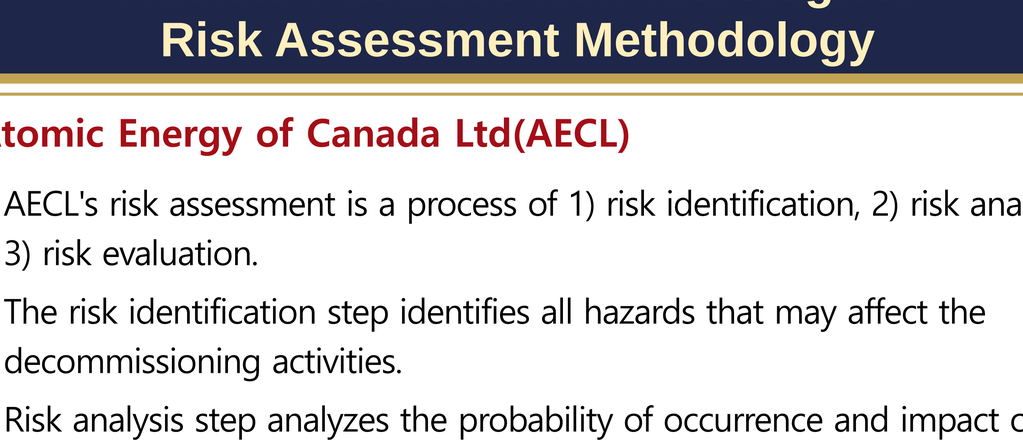

Figure 1. Risk matrix to determine severity

❖ Korea Atomic Energy Research Institute (KAERI)

- KAERI also utilizes a risk matrix to determine severity.
- However, since radiological and non-radiological hazards coexist during decommissioning, the institution determines the level of safety measures by weighing the priority of radiological and non-radiological risks.

Table 1. Risk priority of the hazards

Risk Type	Level	Priority
Radiological	>10 mSv	1
Non-Radiological	16-25 [a]	2
Radiological	1 – 10 mSv	3
Non-Radiological	13-15 [a]	4
Radiological	0.1 – 1 mSv	5
Non-Radiological	6-10 [a]	6
Radiological	< 0.1 mSv	7
Non-Radiological	1-5 [a]	8

a: severity derived from risk matrix

General Architecture Risk Assesment Methodology

❖ Shropshire Council

- Similar to the nuclear facilities methodologies, Shropshire council utilizes a risk matrix to derive severity levels.
- Based on the severity level, risks are categorized as very low risk, low risk, moderate risk, or high risk to determine the level of safety measures.

❖ Shangoni Management Services Ltd

- Shangoni Management Services Ltd provides a methodology for deriving probability of impact and magnitude of impact.
- Performed the risk matrix as the product of the finalized risk grade.

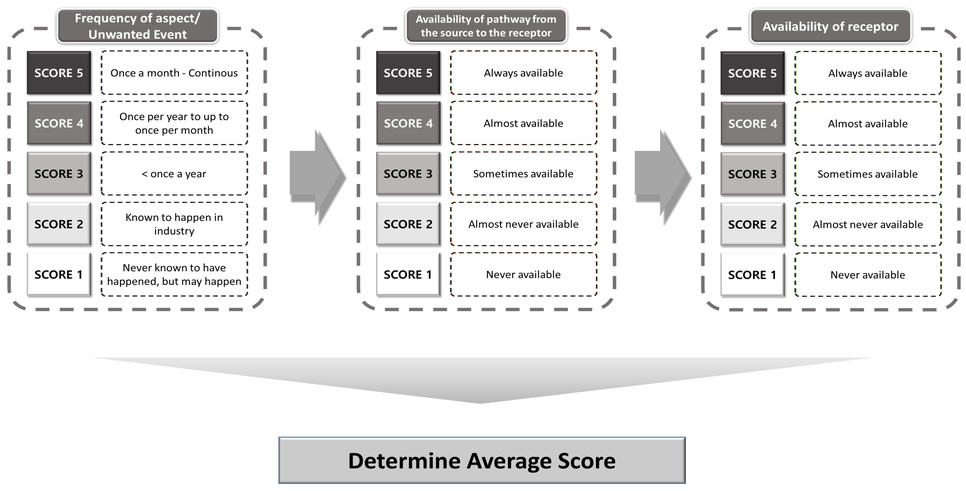

Figure 2. Determination of probability of impact

Conclusion

❖ In this study, the non-radiological risk assessment methodologies of Korea and foreign nuclear facilities and general architecture were investigated during decommissioning.

❖ All methodologies have in common the identification of risks and then analyzing the risks according to the probability of occurrence and impact level of the hazard.

❖ However, there were differences in the methodologies used to determine the probability of occurrence and impact level.

❖ The results of this study can be used as a basis for developing a non-radiological risk assessment methodology for future safety assessments.

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