

Review of Radiological Criteria for License Termination in Korea

Jung Hwan Jang¹⁾, Ki Hoon Kim¹⁾, Sang Jin Kim¹⁾, Cheol Kyu Choi²⁾, and Kwang Pyo Kim^{1)*}

¹⁾ Kyunghee University, 1732, Deokyoung-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

²⁾ Korea Institute of Nuclear Safety, 62, Gwahak-ro, Yuseong-gu, Daejeon, Republic of Korea

*kpkim@khu.ac.kr

1. Introduction

Korean government decided permanent shutdown of Kori #1, the first commercial nuclear power plant (NPP) in Korea. The Nuclear Safety Act defines ‘decommissioning’ as all activities for the purpose of excluding from the application of the Nuclear Safety Act by permanently shutdown of a facility that has been licensed or designated, dismantling the facility and site, or removing radioactive contamination [1]. In order to release the site, it is necessary to establish radiological criteria for license termination after decontamination and dismantling.

In 2016, radiological criteria for license termination was enacted from Nuclear Safety and Security Commission Notice 2016-33. This is to organize the safety regulation system in preparation for the decommissioning of nuclear facilities, such as permanent shutdown of Kori #1. However, there is a lack of technical review about radiological criteria for license termination.

The objective of this study was to review the radiological criteria for license termination in Korea. Radiological criteria and rationales in foreign country and international organization were reviewed.

2. Radiological criteria for license termination

Table 1 shows domestic and overseas radiological criteria for license termination. Radiological criteria are generally classified as unrestricted use and restricted use of a site.

Table 1. Summary of domestic and overseas radiological criteria for license termination

Nation	Type	Dose constraint
Korea [2]	Unrestricted use of a site	The effective dose for a member of a critical group that considering all relevant exposure pathways due to residual radioactivity should not exceed 0.1 mSv/y

	Dose is expected to exceed 0.1 mSv in a year	Restricted use is allowed if the dose for a member of a critical group does not exceed 0.1 mSv/y
	Restricted condition is to fail when reuse in the second criteria	Demonstrate that the dose for a member of a critical group does not exceed 1 mSv/y
US [3]	Radiological criteria for unrestricted use	Background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem/y(0.25 mSv/y)
	If the institutional controls were no longer in effect	100 mrem /y(1 mSv/y) 500 mrem/y (5 mSv/y)
IAEA [4]	Unrestricted use of a site	Optimization of protection that the effective dose to a member of a critical group is kept below the dose constraint of 0.01 mSv/y ~ 0.3 mSv/y.
	Restricted use of a site	0.3 mSv/y (if the restrictions were to fail in the future the effective dose should not exceed 1 mSv/y)
ICRP [5]	Dose constraint for public exposure and for prolonged exposure	No more than about 0.3 mSv/y and should be less than 1 mSv/y

2.1 Korea

Radiological criteria for license termination in Korea are specified in Nuclear Safety and Security Commission Notice 2016-33. Domestic criteria were established by reviewing criteria for international organization and countries with decommissioning experiences such as the United States.

2.2 US

U.S. Nuclear Regulatory Commission analyzed the

impacts and costs associated with obtaining various dose levels for release considerations of the sites. As a result, the following trends can be seen. (1) For unrestricted use, no definitive conclusion can be made on a basis which would distinguish between acceptable alternative residual radioactivity levels in the range of 15-25 mrem/y. (2) For soil, level less than 25 mrem/y generally result in a cost-benefit ratio not considered reasonably justifiable under NRC's regulatory framework. NCRP No.116 also recommended that no single source or set of sources under one's control should result in an individual being exposed to more than 25 mrem/y.

2.3 IAEA

Figure 1 shows dose constraint for the release of sites from IAEA. According to IAEA WS-G-5.1, it is reasonable and appropriate to have different dose constraints for the release of sites than for the clearance of material from regulatory control. The clearance of material may take place frequently over the lifetime of a practice, as well as at the termination stage. The cleared material may enter into trade with a broad range of potential uses and should comply with clearance criteria, which are of the order of 0.01 mSv in a year. The dose criteria for the release of site from regulatory control can be higher than those for the clearance of material, because site remains in place and hence the degree of certainty about the potential uses of the site is higher than the degree of certainty associated with the uses of material after its release from regulatory control. Therefore it is reasonable to allow a larger fraction of the individual dose limit for the release of sites.

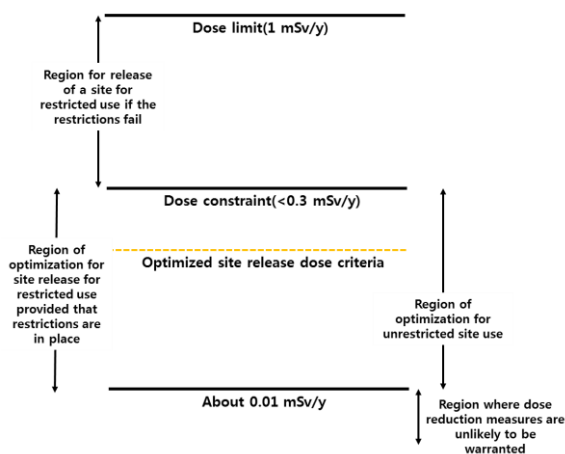


Fig. 1. Constrained optimization and regions of effective dose for members in the release of sites.

2.4 ICRP

ICRP 77 was the first publication proposing a numerical value for the public dose constraint. It is described that the dose constraint should be less than 1 mSv and that a value of no more than about 0.3 mSv would be appropriate. Dose constraint level should be established on a case-by-case basis, 'with consideration of the maximum annual dose that would be acceptable from a new source at a single location, taking into account exposures from other sources subject to control and equity considerations'. The value of 0.3 mSv/y implicitly means to allow for exposures to multiple sources.

3. Conclusion

In this study, we reviewed the radiological criteria and rationales in US, IAEA and ICRP. Domestic criteria were established by reviewing international organization and criteria for countries with decommissioning experiences such as the United States. Based on this information, it will contribute to improve the regulatory system in accordance with the site restoration.

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