

IAEA Concept for Exemption and Clearance

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1. Introduction

Exemption and Clearance are very important concepts for reduction of very low-level radioactive materials, thereby ultimately reduce the cost during decommissioning and remediation and determine when decommissioning is finished (decommissioning endpoint). Korea also accepted these concept, recommendations, and guides [1-4], and has established laws and regulations and controlled now.

In this article, IAEA concepts for clearance and exemption, which are needed to integrate with waste classification by IAEA recommendation, have been reviewed.

2. Basic Safety Standards

IAEA's basic safety standards (BSS) for radiation protection system are in accordance with three exposure groups (workers, patients, and general public), three exposure situations (planned situation, emergency situation, and existing situation) and three radiation protection principles (justification, limitation and optimization) [1]. Those safety standards are described as exemption and clearance for controlling radioactive materials. The detail levels for both of exemption and clearance were derived on the basis of trivial dose (de-minimis), e.g. 10 μ Sv in a year.

3. Exemption

The general criteria for exemption are 1) that

radiation risks are sufficiently low as not to warrant regulatory control, or 2) that regulatory control of radioactive materials would be yield no net benefit. Therefore, IAEA suggested that the radioactive materials such as moderate amount (at the most of the order of a ton) of materials below level given in Table I-1 of Schedule I in Ref. [1], bulk amount of materials below level given in Table I-2 of Schedule I in Ref. [1], and radiation generator, which does not cause a directional dose equivalent rate exceeding 1mSv/h at a distance of 0.1 m from surface or with the maximum energy not greater than 5keV, are automatically exempted without further consideration [1].

4. Clearance

'Clearance' is defined, by IAEA, as the removal of regulatory control by the regulatory body from radioactive materials within notified or authorized practices. Therefore, if the materials have been cleared once, they do not again become subject to requirements for notification, registration and licensing, unless otherwise specified by the regulatory body. Usually this clearance is applied with exemption. IAEA describes that clearance level can be applied to all material types, management options and volumes. Namely, the clearance level given in Table I-2 of Schedule I in Ref. [1] is 'general clearance levels', which was derived without any assumptions on material type and management option.

IAEA is now preparing a new safety report series with a title of derivation of ‘specific clearance levels’ in material being suitable recycling, reuse, or for disposal in landfills, which can be applied to a particular material type and/or management option but independent of material volumes and specific conditions. And moreover, IAEA will have a plan to develop a ‘case specific clearance levels, which could be applied to a specific clearance level derived for a particular situation taking into account assumptions on material type, management option, material volume, and specific conditions of material management. Those clearance levels are obviously higher than the general clearance levels.

The activity concentration of an artificial nuclide in solid form does not exceed the level in Table I-2 of Schedule I in Ref. [1], whereas, for natural nuclide, its activity concentration does not exceed the level in Table I-3 of Schedule I in Ref. [1]. For mixture of more than one nuclides, the clearance level is that the sum of the individual nuclide activity concentrations is less than the sum of fraction for each derived level [1].

The IAEA exemption and clearance levels for typical nuclide are shown in Table 1, compared with Korean clearance levels.

Table 1. IAEA exemption and clearance levels for typical nuclides [1]

Radionuclide	Activity concentration (Bq/g)	
	Exemption level of moderate amounts	Exemption level of bulk amounts / Clearance level
H-3	1×10^6	100
C-14	1×10^4	1
Co-60	1×10^1	0.1
Ni-59	1×10^4	100
Ni-63	1×10^5	100
Sr-90	1×10^2	1
Nb-94	1×10^1	0.1
Tc-99	1×10^4	1
I-129	1×10^2	0.01
Cs-137	1×10^1	0.1

5. Conclusion

IAEA suggested exemption and clearance concepts to reduce the amount of material disposed as waste, thereby reducing cost. This policy impacts hugely on operator at the waste management point of view. Specific or case specific clearance levels with much higher values are needed to be derived and applied to reduce the amount of very low-level radioactive waste.

REFERENCES

- [1] IAEA Safety Standards No. GSR Part 3, “Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards,” International Atomic Energy Agency, Vienna, 2014.
- [2] IAEA Safety Standards Series No. RS-G-1.7, “Application of the Concepts of Exclusion, Exemption and Clearance,” International Atomic Energy Agency, Vienna, 2004.
- [3] IAEA Safety Report Series No. 44, “Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance,” International Atomic Energy Agency, Vienna, 2005.
- [4] IAEA General Safety Guide No. GSG-1, “Classification of Radioactive Waste,” International Atomic Energy Agency, Vienna, 2009.