

# Investigation of the basis of management standards for raw materials, byproducts and processed products

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## 1. Introduction

Act on Protective Action Guidelines Against Radiation in The Natural Environment (Act on Radiation in NORM) stipulates matters concerning the safety management of radiation that may be encountered around. To manage radiation in natural environment, law suggests total activity and radioactivity concentration. The standards presented in the law assumed that established based on the recommendations of the International Atomic Energy Agency (IAEA).

However, although the regulatory standards presented in law are frequently used, the basis of regulatory standards is not clear. Thus, investigation of law is necessary for appropriate safety management of radiation in natural environment. Therefore, it is necessary to analyze the rationale for standards presented in the law and to confirm the adequacy by comparing it with foreign standards.

To achieve this purpose, the current status and basis for management standards for raw materials, byproducts and processed products were analyzed. Therefore, in this study, the basis of international organizations and foreign standards was analyzed.

## 2. Analysis of basis of law

### 2.1. Korea

The criteria of registration is defined in Article 9 of Act on Radiation in NORM and Article 9 of Enforcement Decree Of same Act.

Table 1 shows domestic criteria for registration. There are radioactive concentration and total activity are suggested in the law. In radioactive concentration, 10 Bq/g for K-40, and 1 Bq/g for NORM except K-40. And 10,000 kBq for K-40, and 1,000 kBq for NORM except K-40.

Table 1. Regulatory standards presented in Korean law

Country	Nuclides	Criteria	
		Total Activity (kBq)	Radioactive concentration (Bq/g)
Korea	K-40	10,000	10
	NORM (Except K-40)	1,000	1

### 2.2. Foreign country, International Organization

The IAEA presented 10 Bq/g for K-40 and 1 Bq/g for U/Th series as criteria for applying the regulatory requirements for planned exposure situations by NORM. Table 2 shows radioactive concentration of IAEA criteria.

Table 2. Regulatory standards presented in IAEA

Institute	Nuclides	Criteria
		Radioactive concentration (Bq/g)
IAEA	K-40	10
	U/Th	1

In the UK, the substance was set differently 1) over 1 ton, 2) under 1 ton, and total of 9 nuclides was set. Table 3 shows Radioactive concentration of UK criteria.

**Table 3.** Regulatory standards presented in UK law

Country	Nuclide	Radioactive concentration (Bq/g)	
		Over 1 ton	Under 1 ton
UK	K-40	10	10 <sup>2</sup>
	Rb-87	1	10 <sup>4</sup>
	Pb-210+	1	10
	Po-210	1	10
	Ra-226	1	10
	Ra-228+	1	10
	Th-228+	1	1
	Th-232 sec	1	1
	U-238 sec	1	1

Sec: secular equilibrium with daughter nuclides  
+ : including daughter nuclides

### 2.3 The Basis of Law

Management standards presented by overseas and international organizations are given as radioactive concentrations. However, in the case of Korea, both the total activity and radioactive concentration are suggested. The radioactive concentration in Korean law is same value as suggested by the IAEA and the UK. However, the standard for total activity is not presented by international organizations.

Typically, the general criteria for exemption and clearance are 10  $\mu$ Sv/yr for effective dose. However, the IAEA suggests that for bulk material containing NORMs, the 10  $\mu$ Sv/yr standard is not appropriate. Typically, fluctuation of background is about level of 1 mSv/yr. Therefore, for these substances, the exemption criteria are approximately 1 mSv or less as effective doses for one year, and the clearance criteria are 1 Bq/g or less for each radionuclide in the U-238 and Th-232 decay series, and 10 Bq/g or less for K-40. The RS-G-1.7 report of IAEA suggests that substances with a weight of more than 1 ton were considered bulk quantities.

Therefore, it is judged that domestic criteria are derived based on 1) Radioactive concentration, 2) Bulk material weight. The domestic criteria of 10,000 kBq (10<sup>7</sup> Bq) for K-40, and 1,000 kBq (10<sup>6</sup> Bq) for U/Th is

judged that derived base on 10 Bq/g, 1 Bq/g with 1 ton each.

### 3 Conclusion

The criteria for registration of Raw materials, Byproducts, and processed products are presented in the "Act on Radiation in NORM" as radioactive concentration.

However, the regulatory criteria presented in "Action Radiation in NORM" are frequently used, but the basis for setting the regulatory criteria is not clear, making it difficult to understand. Accordingly, in this study, the registration criteria of "Raw material" presented in "Act on Radioactivity in NORM" of domestic and foreign country, International Organization were analyzed.

The IAEA presented 10 Bq/g for K-40 and 1 Bq/g for U/Th. And the UK, the substance was set differently 1) over 1 ton, 2) under 1 ton, and total of 9 nuclides was set.

Based on UK and IAEA, it is judged that domestic criteria are derived based on 1) Radioactive concentration, 2) Bulk material weight. The domestic criteria of 10,000 kBq (10<sup>7</sup> Bq) for K-40, and 1,000 kBq (10<sup>6</sup> Bq) for U/Th is judged that derived base on 10 Bq/g, 1 Bq/g with 1 ton each.

Based on the analysis results of the "Action Radiation in NORM" criterion, it is believed that result of this study can be used for future law revisions.

The result of this study can be used as a basis for determining suitability for domestic criteria through comparison of domestic and international radiation protection standards.

### REFERENCES

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