Strengthening Control of Small Quantity of Nuclear Material in the ROK

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1. Introduction

Small Quantity of Nuclear Material (hereinafter referred to as "SQNM") is generally prescribed to be less than specified minimum quantities of nuclear material, and normally, it is used in medical, industrial, research areas. SQNM is not subject to licensing under the Nuclear Safety Act (NSA) in general. And SQNM users/holders for non-nuclear activities do not need to report them to the State System of Accounting for and Control of nuclear material (SSAC) under specified quantities. However, all nuclear materials are subject to national accounting management and reporting under the ROK and IAEA safeguards agreement [1]. Therefore, SQNM should be managed at the national level.

This paper reviews how SQNM is managed and discusses way to strengthen SQNM management.

2. Current Situation of SQNM control

2.1 International regime for SQNM control

The IAEA's definition of nuclear material is any source or any special fissionable material as defined in Article XX (twenty) of the IAEA Statute. And there is no definition of SQNM. However, it generally refers to the nuclear material used in the Location Outside Facilities (LOF), which is not a facility, where nuclear material is customarily used in amounts of one effective kilogram or less.

According to article 36 and 37 of the INFCIRC/153 (CSA), nuclear material can be exempted from safeguards application at the request of the state. At the same time, information regarding the quantities and uses at each location of the exempted nuclear material should be declared to the IAEA based on article 2.a.(vii) of the INFCIRC/540 (AP) as well. Therefore, nuclear materials should be under the control of the state at all times, and there is no lower limit to its amount.

2.2 Domestic regime for SQNM control

The NSA defines the nuclear materials and enforces permission to use them. In detail, the nuclear materials are classified into nuclear fuel materials and nuclear raw materials, and any person intending to use or possess nuclear fuel materials should obtain a license from the Nuclear Safety and Security Commission (NSSC).

It also mentions about nuclear fuel materials not subject to licenses for use. It is referred to in detail in the sub-ordinance, the main contents are as follows; Enforcement Decree of Nuclear Safety Act, article 71 (Nuclear Fuel Materials Not Subject to Licenses for Use) mentions the exemption of licenses to use nuclear fuel materials, specifically less than 300 grams of uranium 235, less than 900 grams of thorium, etc. And NSSC Public Notice 2017-43 (Types and Quantities of Nuclear Fuel Material not Subject to License for Use) mentions about exempted natural or depleted uranium used in a counter weight for airplane and shielding for radioisotope camera, and exempted thorium used in some industrial applications.

At the NSA, nuclear materials subject to safeguards measure are described as a special nuclear materials which is a part of internationally controlled materials. The special nuclear materials has no lower limit, and its exemption needs approval of the NSSC. It means that the procedure for its exemption follows the IAEA procedure. There is no clear definition of SQNM at the domestic regime, but it is generally borrowed from the international regime. According to the NSSC Public Notice 2017-84 (Regulation for Report of Internationally Controlled Materials, etc.), SQNM for non-nuclear activities under specified quantities is not needed to report some of its information to the SSAC. However, all nuclear materials should be reported to the IAEA based on the CSA and AP. Therefore, reporting of the SQNM for non-nuclear activities under specified quantities tends to rely heavily on voluntary reporting.

The domestic regime exempts licenses for nuclear materials below a certain amount based on NSA, while at the same time enforcing reports on safeguards measure. In this situation, the status of the management of SQNM in the ROK is as follows. There are 207 facilities in one LOF in the ROK. And the facilities consist of 77 industries and 130 universities and research institutes. The use status of SQNM is shown in the following table.

Table 1. Use status of SQNM in the ROK

Element	Number of SQNM	Amount of SQNM
Depleted Uranium	2,224	52,184.771 Kg
Enriched Uranium	31	18,251.440 g
Natural Uranium	75	3.470 Kg
Plutonium	39	1.506 g
Thorium	57	0.683 Kg
Uranium, unified	6	0.006 Kg

2.3 Examples of SQNM control in other countries

The Atomic Energy Basic Act is at the top of the legislative framework for Japanese nuclear activities. On the basis of the provisions of the Atomic Energy Basic Act, the Act for the Regulation of Nuclear Source Material, Nuclear Fuel Material, and Reactors was enacted as the main law for implementation of safeguards in Japan. This law restricts the use of nuclear material to the authorized licensees and obliges them to fulfill obligations from the international agreements. There are about 1800 licensees which use a small amount of nuclear material for non-nuclear purpose in 195 LOFs in Japan. And the nuclear material for LOFs is depleted uranium or natural uranium up to 300 grams or thorium up to 900 grams. While such nuclear material is exempted from safeguards according to the provisions of the safeguards agreement, the amount of exempted nuclear material in each location is voluntarily reported to the IAEA on an annual basis [2].

In United Arab Emirates (UAE), the Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Use of Nuclear Energy is basic legislative framework for nuclear activities of UAE. And Federal Authority for Nuclear Regulation (FANR) established regulation regarding safeguards implementation, named of Regulation for the System of Accounting for and Control of Nuclear Material and Application of Additional Protocol (FANR-REG-10). The regulation mirrors international framework such as CSA and AP, and it means that definitions of nuclear materials, criteria for exemptions from safeguards, contents of reporting and declaration, etc. are almost same with the IAEA document. FANR regulates all nuclear materials including SQNM from importing to exporting or dilution or disposal or consumption of the nuclear materials. All person who may receive, produce, use, possess, transport, import or export of nuclear materials should apply for and receive a license from the FANR. And even though the nuclear materials are exempted from safeguards, the materials should under control of the FANR and be declared annually [3].

3. Strengthening of SQNM control

Several measures could be proposed to strengthen control of SQNM in ROK.

Fundamentally to manage the SQNM, it is necessary to revise the relevant legislation. Especially, definition of nuclear materials subject to safeguards, which is defined as special nuclear materials, should be descripted clearly and precisely. And safeguards contents should be specifically stated in line with international norms. KINAC develops NSSC Public Notice remediation plans to enhance management of SQNM, and has application and evaluation plans on site.

Outreach activities could enable people using SQNM to voluntarily report their use. Currently managing virtually all SQNM is limited. Voluntary reporting through ongoing outreach is one of the best ways to reduce these problems.

KINAC is using National LOF Management System, which is web based national SQNM management system, and it helps SQNM users to declare their information of nuclear materials. KINAC collects information and data from the system, and report the accountancy to the IAEA. However, the system is old and lacks user convenience and needs improvement.

4. Conclusions

SQNM use in medical, industrial, and research is essential and continues to increase. However, the definitions and legal basis of SQNM is not clear. In this paper, we reviewed various problems of SQNM management regime and proposed measures for improving them. First of all, it is necessary to revise legal framework in line with international norms. And outreach activities could help SQNM users to adhere to appropriate regulations. Web based national SQNM management system of KINAC helps SQNM users to declare their information as well.

KINAC will continue to improve the regime for SQNM management with above mentioned measures. And this will ensure efficient national SQNM management.

REFERENCES

[1] Agreement Between The Government Of The Republic Of Korea And The International Atomic Energy Agency For The Application Of Safeguards In Connection With The Treat On The Non-proliferation Of Nuclear Weapons (INFCIRC/236), 1975.

[2] Comprehensive Summary of Safeguards in Japan, Japan Safeguards Office (JSGO), Nuclear Regulation Authority (NRA), Japan, March 2019.

[3] Regulation for the System of Accounting for and Control of Nuclear Material and Application of Additional Protocol (FANR-REG-10), FANR Regulation, UAE.