Review Current Legislation for Completeness of Safeguards Regulation through Comparison with Safety and Physical Protection Regulation

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1. Introduction

According to the Nuclear Safety Act (hereinafter referred to as "NSA"), nuclear licensees within the ROK should obtain a permit and license from the Nuclear Safety and Security Commission (hereinafter referred to as "Commission"). Also, the NSA mentions detailed safety regulations of a whole life cycle, from siting to decommissioning, of nuclear facilities [1].

The nuclear licensees who have obtained permit and license should also obtain the approval of the Commission in respect to plans for accounting and control of special nuclear materials (hereinafter referred to as "safeguards plan") based on the NSA. It is to apply safeguards regulation. And they should obtain the approval of the Commission in respect to security plan based on the Act on Physical Protection and Radiological Emergency (hereinafter referred to as "APPRE") as well. It is to apply physical protection regulation.

The regulations of safeguards, physical protection and safety are different depending on regarding legal basis, its applicable period, and corresponding nuclear materials. The nuclear licensees often face difficulties in applying these regulations to their nuclear facility.

This paper compares the application of those regulations to nuclear reactor licensees, and discusses how to improve safeguards regulation.

2. Comparison of regulations

In this section, some of the differences among safeguards, physical protection and safety regulations are compared and reviewed.

2.1 Legal Basis

Basically, there are two (2) acts for nuclear regulations, one is the NSA and the other is the APPRE. The NSA is a legal basis for nuclear safety and safeguards regulations. And the APPRE is a legal basis for physical protection regulation. And each legislative system is composed of act, enforcement decree, enforcement regulation, and public notice. There are other acts for nuclear regulations, such as Act on Protective Action Guidelines Against Radiation in the Natural Environment, Nuclear Liability Act, Act on Indemnity for Nuclear Liability, etc. Those acts have specific purpose and objectives, and not covered in this paper.

2.2 Nuclear Materials subject to each regulation

Definition on nuclear materials for safety and safeguards regulation is stated in the NSA. And definition on nuclear material for physical protection regulation is mentioned in the APPRE.

In the NSA, nuclear materials are classified into nuclear fuel materials and nuclear raw materials. Definition on nuclear materials subject to safeguards regulation is also stipulated in NSA, and it is defined as special nuclear materials among the internationally controlled materials. The definitions of each materials are shown in Table 1.

Table 1. The definitions of Nuclear Materials in NSA

Provided Term	Definition Text of Act	Definition Text of Enforcement Decree/Regulation
Nuclear materials	Nuclear fuel materials and nuclear raw materials	-
Nuclear fuel materials	Materials capable of producing nuclear energy, such as uranium and thorium, as prescribed by Presidential Decree;	1. Uranium with same ratio of the isotope 235 to isotope 238 as the ratio occurring in nature and its compounds 2. Uranium with lower ratio of the isotope 235 to isotope 238 than the ratio occurring in nature and its compounds 3. Thorium and its compounds 4. Materials containing at least one material specified in 1~3, which can be used as fuel for reactors 5. Uranium with higher ratio of the isotope 235 to isotope 238 than the ratio occurring in nature and its compounds 6. Plutonium and its compounds 7. Uranium 233 and its compounds 8. Materials containing at least one material specified in paragraph 5~7
Nuclear raw materials	Uranium ore, thorium ore, and other materials used as raw materials for nuclear fuel materials, as prescribed by	Materials containing uranium and its compounds, and thorium and its compounds excluding the "nuclear fuel materials"

	Presidential Decree;	
Internationally controlled materials	materials subject to safeguards measures in accordance with the international treaties	[Enforcement Regulation] 1. Nuclear materials subject to the safeguards and physical protection by the International Atomic Energy Agency 2… (The rest is omitted.)
Special nuclear materials	Nuclear materials among the internationally controlled materials	[Public Notice] 1. Uranium with same ratio of the isotope 235 to isotope 238 as the ratio occurring in nature and its compounds 2. Uranium with lower ratio of the isotope 235 to isotope 238 than the ratio occurring in nature and its compounds 3. Uranium with higher ratio of the isotope 235 to isotope 238 than the ratio occurring in nature and its compounds 4. Uranium 233 and its compounds 5. Thorium and its compounds 6. Plutonium and its compounds 7. Materials containing at least one material specified in paragraph 1~6

The nuclear materials subject to safety and safeguards regulations look quite similar, so it does not seem to be necessary to distinguish them. However, there is a distinction in the exemption amount of the nuclear materials. There are exemptions for safety related nuclear materials such as less than 300 grams of U235, less than 900 grams of thorium, etc. On the other hand, exemptions of nuclear materials related to safeguards are subject to other procedures. Safeguards exemptions from regulated special nuclear materials require exemption from the IAEA [2]. Therefore, the amount of nuclear material exempted from a safety standpoint differs from the amount in terms of safeguards.

Definition on nuclear materials for physical protection regulation is not quite different from definition of the NSA, but its application amount is different. Nuclear materials subject to physical protection are same with the international norm, Convention on the Physical Protection of Nuclear Material, and are classified by three categories according to the degree of potential risks. And physical protection requirements are connected to those categories.

2.3 Regulation applicable period subject to each regulation

According to the NSA, construction permit and operation license should be obtained from the Commission when any person who intends to construct and operate a nuclear power reactor. And the licensee of a nuclear power reactor should obtain approval from the Commission to decommission the nuclear power reactor as well. The six major life cycle of a nuclear power reactor, siting, design, construction, commissioning, operation, and decommissioning, is covered by the NSA regarding safety regulation.

In regards to safeguards, nuclear licensee should make safeguards plan and obtain approval of the Commission before starting to use the special nuclear materials. In terms of physical protection, nuclear licensee should make security plan and obtain approval of the Commission before commencement of the use of nuclear facilities. The meaning of starting to use the special nuclear materials and commencement of the use of nuclear facilities is interpreted as bringing nuclear materials to the facility. And any nuclear licensee, who wishes to obtain approval for the safeguards and security plan, should submit an application for approval to the Commission at least five month prior to the time mentioned above.

The safeguards and physical protection regulations could apply after the safeguards and security plans are approved.

3. Drawbacks of Safeguards Regulation

The regulation content for safeguards, physical protection and safety were compared. In particular, the scope of the subject nuclear material and the time of application of each regulation were compared. In this section, the parts that needs to be supplemented from the viewpoint of safeguards regulation are discussed.

In regards to the scope of the subject nuclear material, the nuclear materials related safety regulation are clearly stated in NSA. The nuclear materials subject to physical protection are independently stipulated in APPRE. So nuclear licensees are easily distinguish regulated nuclear materials. However, the nuclear materials subject to safeguards are described dispersed within the NSA. It is defined as a special nuclear materials and connected to internationally controlled materials. And its detailed explanation is given in the public notice. However, the definition is not same with international norm for safeguards. Another problem is that the exemption of nuclear material is not clarified and exempted nuclear material is again regulated by the other public notice.

Originally, the nuclear materials subject to safeguards are defined and regulated by international regime, so called IAEA Statute, Comprehensive Safeguards Agreement (CSA) and Additional Protocol (AP). However, the process of applying the international safeguards regime to domestic legal system is quite complicated, and aforementioned problems have arisen.

The problem appears not only in nuclear material issues but also in the time of regulation application. Legally, safeguards regulation should be applied after the approval of the nuclear licensee's safeguards plan. And the time of approval of the safeguards plan is just

before starting to use the special nuclear materials. According to the CSA and AP, safeguards related information such as Design Information Questionnaire, general plan for nuclear power plant construction and operations, etc., should be submitted to the IAEA. And typically those information should be made and reviewed before the approval of the safeguards plan.

4. Suggestions and Conclusions

The legislation contents for safeguards are reviewed through comparison of safety and physical protection contents. In particular, the scope of the subject nuclear material and the time of application of each regulation were compared.

The safeguards regulation involves several drawbacks as mentioned above, and these are arisen in the process of holding safeguards international norm in safety legislation for safety regulation. To solve this problem, it is the best to establish an independent safeguards legislation regime, but at least an independent description of the safeguards measure is needed in the NSA. For example, definition of nuclear materials subject to safeguards, which is defined as special nuclear materials, should be descripted in definition part of the NSA. And safeguards regulatory content should be clearly stated in line with international norm. Through these efforts, licensees can clearly recognize the safeguards regulation and comply with international norm.

REFERENCES

[1] Nuclear Safety Act, Nuclear Laws of the Republic of Korea, Act no. 13078, Jan. 20, 2015.
[2] Regulation on Object of Internationally Controlled Materials, Nuclear Laws of the Republic of Korea, Public Notice of NSSC no2017-81, 2017.