A Study on Measures to Systematize Regulatory Requirements related to Safeguards Regulation

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1. Introduction

The needs for new types of nuclear facilities such as dry storage for LWR spent fuel and multi-purpose small modular reactors is emerging, and R&D is being carried out, currently in Korea. In this situation, it is necessary to apply safeguards regulatory requirements to the new types of nuclear facilities, and I would like to think about the current status of a national safeguards regulation.

Unlike existing nuclear power plants and nuclear fuel fabrication facility, the new types of nuclear facilities are the first to be introduced in Korea. Therefore, application of safeguards different from the existing practice of applying safeguards is expected. In addition, as the safeguards of the IAEA, such as IS (Integrated Safeguards) and SLA (State Level Approach), have been developed and changed a lot, the application of safeguards to nuclear facilities are developing and changing.

Regulation related to safety and security in process of introducing the new types of nuclear facilities present clear regulatory requirements. However, in the case of safeguards, there is no clear regulatory requirements. The safeguards regulation focuses on measures for preparing nuclear material accounting information that must be submitted to the IAEA and supporting IAEA's nuclear material verification activities, rather than presenting regulatory requirements for nuclear facilities. And this regulatory approach obscures nuclear licensees' perception of safeguards regulation.

In this paper, we will examine the national safeguards regulation and check the safeguards requirements used by the IAEA and the problems that these requirements were not reflected in national safeguards regulation. And in order to solve these problems, we would like to suggest measures to systematize regulatory requirements related to the national safeguards regulation.

2. Status of regulatory requirements for national safeguards regulation, etc.

Basically, there are two acts for nuclear regulations, one is NSA (Nuclear Safety Act) and the other is APPRE (Act on Physical Protection and Radiological Emergency). 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 [1].

Regarding safety regulation, the regulatory requirements are addressed in enforcement regulation, and public notice level. The enforcement regulation has "Regulations on Technical Standards for Nuclear Reactor Facilities, Etc." and "Regulations on Technical Standards for Radiation Safety Control, Etc.". And there are many other subdivided standards in the public notice [2]. For more detailed and subdivided standards, there are nuclear safety standard document prepared by KINS, a safety expert organization [3].

In physical protection regulation, the APPRE and its enforcement decree mentions physical protection requirements. The requirements are based on IAEA's nuclear security series, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/rev.5)". These requirements are utilized in the process of building the physical protection system of nuclear facilities and provide guidance to nuclear licensees.

The current status of safeguards regulation is focused on the approval and inspection of the safeguards plan, and support for the inspection activities of the IAEA. The safeguards regulation was aimed at establishing the SSAC (State System of Accounting for and Control of nuclear material) for supporting activities of the IAEA. Also, when applying safeguards measures to nuclear facilities by the national safeguards regulation, the requirements presented by the IAEA have been applied in a way that accepts them through negotiation among the IAEA, national regulatory body, and nuclear licensees. These safeguards measures have changed sometimes according to policy direction changes of the IAEA such as IS and SLA based on CSA (Comprehensive Safeguards Agreement) and AP (Additional Protocol). Therefore, it was difficult to reflect the internal requirements related to the IAEA safeguards for nuclear facilities in the national safeguards regulatory system, and it has developed to reflect the contents of the CSA and AP only.

The reason why the safeguards regulation differs from the other two regulations is as follows. It has to do with regulatory responsibility. Responsibility for safety and physical protection regulations rest with each state, not the IAEA or other international organization. Although the IAEA prepares international recommendations or guidelines for the safety and physical protection areas and distribute them to member states, it is up to the state to decide whether to reflect

them and to revise them according to the state's situation. However, responsibility for safeguards rests with the IAEA. Many states have safeguards agreements with the IAEA such as CSA and AP. And based on that, the IAEA establishes and implements measures to apply safeguards for nuclear facilities in member states in consultation with regulatory body and nuclear licensees of the state. In addition, the IAEA reports the result of implementation of safeguards by member states to the IAEA Board of Governors every year. Since the regulatory responsibility lies with the IAEA, the IAEA has been leading the development and application of requirements related to the implementation of safeguards.

3. Introduction to the current status of IAEA safeguards requirements

The IAEA is using the safeguards requirements as an internal document (Safeguards Manual), and based on this it is preparing the safeguards application plan (FA, Facility Attachment) and implementation procedure (Implementation Procedure for Inspection Activities) for nuclear facilities in member states.

Safeguards Manual consists of Implementation(SMI), Development and Support(SMS), Management and Administration(SMM), Reference(SMR), and Criteria(SMC). Although these documents are not officially disclosed as internal documents of the IAEA, they are used in the process of negotiation of safeguards measures for each nuclear facility in member states, so it is possible to grasp the approximate contents. And these requirements are not strictly applied, but are flexibly applied according to the situation of each member state and facility and the direction of the safeguards policy of the IAEA.

Facility Attachment is a document issued by the IAEA to determine how the safeguards will be applied to each facility, and is prepared based on the subsidiary arrangements of the CSA and AP concluded with the member state and using design information provided by the member state [4]. And the IAEA's inspection is carried out according to the other document, Implementation Procedure for Inspection Activities. The IAEA encourages the participation of member state's regulatory bodies and nuclear licensees in the preparation of these documents.

4. Suggestions for systematizing safeguards regulatory requirements

As discussed earlier, some problems may arise depending on the characteristics of the national safeguards regulatory system.

The first thing is that the role of the national regulatory body has not been clearly established. In the meantime, the national regulatory body has been playing a role in responding to IAEA inspections and ensuring that safeguards-related issues do not arise together with domestic nuclear licensees. These efforts have resulted in increased national nuclear transparency. However, the relationship with the IAEA regarding the implementation and responsibility of safeguards for domestic nuclear facilities is not clear yet.

The unclear regulatory standards for nuclear facilities and the lengthy negotiation process with the IAEA make nuclear licensees feel burdened with safeguards regulations. The absence of safeguards regulatory requirements is also a factor in reducing awareness of the regulation. And lack of awareness of safeguards regulation sometimes results in facility design changes and increase inefficiencies. Table 1 compares the differences between the IAEA and Korea's regulatory documents on safeguards requirements.

Table 1. IAEA and Korea's regulatory documents on safeguards requirements

	IAEA	Korea	note
Legally binding	CSA & AP	CSA & AP	Agreement between IAEA and Korea
	FA	FA	Subsidiary agreement of CSA
	Implementation Procedure (of each facilities)	Implementation Procedure (of each facilities)	Signed by IAEA and Korea
	-	Act(NSA), enforcement decree, enforcement regulation, and public notice	Legal basis for domestic regulation for safeguards implementation
Legally non-binding	IAEA Safeguards Manual	-	IAEA's internal document which mentions safeguards requirements
	-	Technical Document (by KINAC)	Regulatory requirements document *(not developed yet)*

In order to reduce these problems and suggest a system development direction by strengthening the regulatory requirements for safeguards in Korea, we suggest measures to systematize regulatory requirements related to the national safeguards regulation as follows.

First, it is necessary to clarify the requirements set out in safeguards-related agreements such as the CSA

and AP. Of course, the content is already specified in the NSA and related laws, but it is needs to be expressed more clearly.

In relation to the implementation of safeguards, the most important thing is cooperation with the IAEA, and considering this, it is necessary to include procedures for cooperation with the IAEA in the regulatory requirements in NSA. In particular, it is important to reflect the equipment, procedure, etc. for the application of safeguards in advance in the design and construction stage of new nuclear facilities. Requiring the cooperation procedures for this stage, called SbD (Safeguards by Design), will reduce the burden of nuclear licensees in many ways [5].

What has been learned through the implementation of safeguards should be included in the regulatory requirements of the safeguards. In order to efficiently use equipment and tools that are commonly applied in relation to safeguards and to increase the efficiency of nuclear facility operation, it is necessary to reflect some detailed requirements in laws and regulations. For example, establishment of an independent power source for safeguards equipment, installation of protective part for containment equipment, and securing of sight of surveillance equipment. These requirements are also required by nuclear licensees for the smooth implementation of the safeguards.

It is suggested that the detailed safeguards regulatory requirements for each type of nuclear facility, reflecting the SMC contents of the IAEA, be written as technical documents prepared by KINAC, a safeguards expert organization. The technical documents must be made public and shared with nuclear licensees, sometimes explained to stakeholders through outreach programs. In addition, if there is a need to change the content through negotiations with the IAEA, it should be reflected immediately. Although these technical documents are not legally enforceable, these should ensure that nuclear licensees are clearly aware of the safeguards requirements for their nuclear facilities and reflect them in a timely manner.

Lastly, speaking of measures to systematize safeguards regulation in Korea, legally binding documents such as agreements with IAEA and non-binding documents such as technical documents should be distinguished. And the documents that actually contain the regulatory requirements will become the technical documents of KINAC like the safeguards manual of the IAEA, and as mentioned above, it is important to update the contents according to an appropriate cycle and transparently disclose these documents.

5. Conclusions

In this study, the reason why the safeguards regulatory requirements for nuclear facilities were not reflected in the NSA and the problems caused by them were mentioned. And to solve these problems, several measures were proposed to systematize the regulatory requirements for safeguards.

Among these proposals, the most important thing is to share with nuclear licensees while maintaining up-to-date regulatory requirements written as technical documents for specific safeguards for nuclear facilities. Also, outreach activities will be required if necessary.

In addition, it is necessary to clarify the regulatory requirements reflected in the current legislation and include the requirements for cooperation with the IAEA.

Through these efforts, nuclear licensees can clearly recognize the safeguards regulation, and the national nuclear transparency will also be enhanced.

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REFERENCES

[1] Jounghoon Lee, Review Current Legislation for Completeness of Safeguards Regulation through Comparison with Safety and Physical Protection Regulation, Transactions of Korean Nuclear Society Autumn Meeting, 2019.
[2] https://www.nssc.go.kr, Useful Information/Library.
[3] https://www.kins.re.kr/nussam/main/Main.do
[4] IAEA International Nuclear Verification Series No.3, “IAEA Safeguards Glossary”, PP.10, IAEA, 2001.
[5] N. Y. Lee, H. S. Yoo, J. H. Seo. The Analysis of Safeguardability Evaluation Methodology for Proliferation Resistance Improvement, KINAC Technical Report, KINAC/TR-019/2015, PP.29-30, 2015.