

Analysis on Domestic Law and Management Trend Related to Small-Quantity Nuclear Material

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1. Background

International Atomic Energy Agency (IAEA) has requested Korea to establish and manage the law ruling all nuclear materials through the INFCIRC/153. Now, it has been 30 years since Korea made the agreement, INFCIRC/153, with IAEA. Korea has tried their best to accomplish the international standard in nuclear control field and it is a fact that Korea finally produced some results in the nuclear control field. Related to nuclear material control, Korea is above the common level appropriately ranked 6th in the world in terms of nuclear power. Before 2000, Korea was making the foundation secure in the nuclear control. IAEA did not urge to establish the law supervising the small-quantity nuclear material and depleted uranium (DU). In a turnaround from early IAEA moderate line to Korea, the situation was changed. Since IAEA brought up the agenda to 2000 Joint Review Meeting between Korea-IAEA, IAEA has asked Korea to establish the control system for small-quantity nuclear material and DU. In 2003, the Korean government set up a project establishing the control system about all nuclear material including small-quantity nuclear material and DU. National Nuclear Management and Control Agency (NNCA), delegating the business relating to international controlling materials from government, developed some modules in nuclear material control system and operated it. The system includes a controlling system for small-quantity nuclear material. NNCA on behalf of government has collected the information and Korea Ministry of Science and Technology (MOST) has reported the information to the IAEA. This paper introduces you the background of controlling the small-quantity nuclear material and the system of controlling nuclear material in Korea. And it will suggest the improvement of the management method in the system for small-quantity nuclear material.

2. Importance of Small-Quantity Nuclear Material and DU

Small-quantity nuclear material mainly means that the DU is used as shielding material in exposure device. Also, these terms includes Thorium and small-quantity fissionable material. It is especially hard to divert DU to make nuclear bomb. In the review of the significant quantity (SQ) as terms used in making nuclear bomb, 1

SQ is 8 kg in Pu, 25 kg in HEU, 75 kg in LEU, 10 tons in natural uranium (NU), 20 tons in DU. To make the nuclear bomb from DU, someone has to collect 20 tons of DU. Even if he gathers the amount of DU used for the shield material in exposure device, it is hard to make a nuclear bomb technically. Many nuclear experts say that it is impossible to make a nuclear bomb from the DU. But someone says that it is not impossible to make a nuclear bomb from the DU. Furthermore, small-quantity nuclear material can be used in dirty bomb. Dirty bomb can be made by nuclear material including radioactive substance. Traumas from the dirty bomb are more serious than physical damages. So, IAEA is concerned about the material including small-quantity nuclear material. After the 911 terror attacks in USA, it is hard to purchase the nuclear material, HEU and Pu, in the black market. So, international societies worry that some terrorist and war-like countries may gather the material to make a nuclear bomb. Failure to establish the control system about small-quantity nuclear material may lead to great disasters in the world in a few years.

3. Domestic Law of Small-Quantity Nuclear Material and DU

Much negotiation between Korea and IAEA was needed for mutual understanding. INFCIRC/153 requested the government to establish the system and report to IAEA the information of all the nuclear material in the 7 articles of statute. So, Korea has to establish and manage the system ruling nuclear material regardless of quantity. Korea amended 4 notifications (MOST 2004-4 through 7) related to small-quantity nuclear material in 2004. Any person or company using any nuclear material must report the information to the government according to MOST 2004-5 30 articles. Penalty article related to report obligation expressed clearly in Article 118 Clause 7 of the Korean nuclear law. If someone does not discharge the obligation, he must go to jail for below 1 year and/or pay penalty as much as 10 million won or less. There is a definition of the special nuclear material on MOST notification 2004-5, Chapter 3. Application of small-quantity nuclear material is following the special nuclear material rule. Also, special nuclear material is divided by 2 cases in usage. One is nuclear usage and the other is non-nuclear usage. Most companies use the small-quantity nuclear material for the non-nuclear usage.

Furthermore, non-nuclear usage is divided by 2 in the 0.1 effective-kg.

Table 1 shows the 0.1 effective-kg in accordance with the concentration.

Table 1. 0.1 Effective-kg Based on the Concentration

Concentration (%)	Mass (kg)	Effective-kg	Remark ¹
0.04	62.5	0.1	Multiply (Con*Con)
0.03	111.111	0.1	
Enriched uranium used in power plant			
0.02	250	0.1	
0.01	1000	0.1	
0.008	1000	0.1	Multiply 0.0001
0.007	1000	0.1	
Natural uranium			
0.006	1000	0.1	Multiply 0.00005
0.005	1000	0.1	
0.005	2000	0.1	
Depleted uranium			
0.004	2000	0.1	
0.002	2000	0.1	
0.001	2000	0.1	
0.0001	2000	0.1	

Therefore, companies using small-quantity nuclear material also have to be divided by the above guideline. But, until now, there is no effort to do that. There was not any benefit to very small-quantity nuclear material's owner.

4. Result of Study about Small-Quantity Nuclear Material

The definition of the special nuclear material in Japan, USA and IAEA is different from Korea's. Korea has a broader concept than other countries. That can be due to the fact that a greater burden is placed on Korean companies than foreign companies. Special nuclear material definition belongs to small-quantity nuclear material in Korea. In 2004, the Government studied the status of small-quantity nuclear material. As shown in Table 2, fifty-four companies were listed in the study. Companies possessing below 1 kg in an inventory are 10. About 31% of total companies possess below 100 kg of nuclear material.

Table 2. Reservoir of Nuclear Materials in the 2004 Survey Report

	Names and Number	Reservoir (kg)
Industrial	Besides KNFC, there are 47 sites.	25,040.863
Education center	Besides Yonsei Univ., there is 1 site.	0.112
Research center	Besides Hankuk Mech. Research center, there are 3 sites.	108.100

5. Conclusion

Now, the report period was decided by company's property. But reporting period and report form and method have to be decided by amount of possessing nuclear material. Last study shows that 10 companies possessed above 1 ton in nuclear material. So we have to establish the guideline according to the amount not the kind of company. That guideline will give some benefits to small-medium companies using very small nuclear material.

REFERENCES

- [1] Study for exempted and unreported nuclear material, Korea Association for Promotion of Nondestructive Testing (2004.5).
- [2] MOST control notification 2004-4 through 7, TCNC in KAERI (2004).

¹ MOST notification 2004-5 Article 2