

## **A Roadmap for Establishing the Physical Protection Regime of Nuclear Materials and Facilities**

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### **1. Introduction**

The importance of physical protection for nuclear materials and facilities that can be an objective for terrorists has never been more stressed. The responsibility for physical protection within a State does not rest entirely with that state because cross-border transactions related to nuclear materials increase as nuclear related industries expand. The international community has prepared measures to strengthen the regime of physical protection such as the IAEA's proposal of the 'Nuclear Security Plan for 2006-2009' and UN's resolution on 'the International Convention for the Suppression of Acts of Nuclear Terrorism'. In order to cope with this, Korea has also made efforts to establish the implementation system for physical protection in the field of nuclear industries since the law for Physical Protection of Nuclear Material & Facility & Radiological Emergency Preparedness (LPPREP)<sup>1</sup> was promulgated in 2004. The detailed plans should be prepared to accomplish this. This study has been performed to derive the items for establishing the regime of physical protection. The items derived were classified as short, mid and long-term depending on their characteristics and environmental circumstances. The regime of national physical protection will be established if the studies on these items are carried out successfully and tangible results are obtained.

### **2. Derived the items to be studied**

The national regime of physical protection can be established by formulating the implementation system based on a well established law. The first thing to be considered in order to evaluate the effectiveness of nuclear facility's physical protection system is the potential threat the facilities are faced with. The effective countermeasures against a threat can be furnished only after the nature of a threat and the characteristics of an adversary are identified. The physical protection system should be evaluated objectively in order to determine whether it is appropriate to neutralize a threat. To do this, there is need to develop the means and equipments. Radiological terror is another threat to be considered. The frequent movement of nuclear material between countries makes radiological terror a real threat. With the increase of the threat of radiological terror, countermeasures against it should be established. As explained before, these three categories such as:

development and maintenance of a design basis threat, establishment of an implementation system and measures against radiological terror were derived as items to be studied. The sub-items for each category are explained as follows.

#### *2.1 Development and maintenance of a DBT*

Development and maintenance of a DBT (Design Basis Threat) is the first step for the establishment, implementation and maintenance of a physical protection system. DBT is defined<sup>2</sup> as "the attributes and characteristics of potential insider and/or external adversaries, who might attempt unauthorized removal of nuclear material or sabotage, against which a physical protection system is designed and evaluated". A comprehensive threat assessment is a necessary step in the definition of a DBT. The result of the threat assessment process describes credible threats. The DBT is determined by the decision-making process that removes threats not relevant for the nuclear industry. It may also be decided to introduce more severe or less severe threats into the DBT than are justified by the current threat assessment. The DBT should be evaluated regularly to reflect the circumstances and environment that may be changed from when it was determined. The LPPREP stipulates re-evaluation of the DBT every three years.

#### *2.2 Establishment of implementation system*

The implementation system for physical protection is composed of six sub items that were suggested for the establishment of the system. Each item is explained in detail as follows :

- Establishment of a physical protection system for each nuclear facility: Each nuclear facility has its own unique characteristics depending on where it is located. Therefore, a physical protection system of the facility should be established while considering its environmental and geological circumstances.
- Development of technical standards for inspection and review: In order to evaluate whether the physical protection system is appropriate for the facility, quantitative and objective technical standard are needed.
- Vulnerability and risk assessment of physical protection system : A vulnerability and risk assessment is a systematic evaluation in which quantitative or

qualitative techniques are used to predict a Physical Protection System(PPS) component performance and overall system effectiveness. It identifies exploitable weaknesses in asset protection for a defined threat<sup>3,4,5]</sup>. The results of the assessment can be used to establish the requirements for an upgraded PPS design.

- Establishment of central control system: The information on physical protection including transportation of nuclear materials, the results of inspections and reviews should be treated confidentially and needs to be controlled through central system.

- Establishment of education programs for physical protection: The education for those who work in the physical protection sector such as safeguards, governmental officers and response force persons is important. Legal and education program should be developed to facilitate this.

- Establishment of exercise programs for physical protection: The regular exercises should be performed to confirm the effectiveness of the contingency plan.

### 2.3 Establishment of measures against radiological terror

The consequences of radiological terror are so great that prevention and an early response are the most effective ways to deal with this threat. To do this, two sub-items are derived: first, development of techniques for evaluation of radiological terror and the establishment of response systems against radiological terror. Techniques related to radiological terror include development of nuclear materials detection systems and the evaluation of radiological effects. Damage due to radiological terror can be minimized through quick and a well organized response system.

### 3. Roadmap for establishing the regime of PP

The ten items explained already mentioned cannot be performed simultaneously due to the restriction of funds and resources. It will be more effective to classify and prioritize each item considering its effectiveness and urgency. Table 1 shows the roadmap for those items. As short-term items that included, ‘Development of DBT’, ‘Development of technical standard for inspection and review’, ‘Establishment of physical protection system for each nuclear facility’ and ‘Establishment of education program for physical protection’ were selected. Some of those items are being developed and the specific plans for others are prepared. Mid-term and long-term programs are those which are essential but take a longer time to develop such as ‘Vulnerability and risk assessment of physical protection system’, ‘Establishment of central control system’ and ‘Measures against radiological terror’.

Table 1. Roadmap for the items derived

Items		Term
DBT (Design Basis Threat)	Development	Short
	Maintenance	Mid
Implementation System	Physical protection system for each nuclear facility	Short
	Technical standard	Short
	Vulnerability and risk assessment	Mid
	Central control system	Mid
	Education program	Short
	Exercise program	Mid
Measures against radiological terror	Evaluation Techniques	Long
	Response System	Long

### 4. Conclusion

As the potential threat on the nuclear materials and nuclear facilities exists, the establishment of a regime of physical protection reflecting the requirements of the international community is required. A specific and detailed plan is needed to accomplish this. In this study, the items for physical protection were classified into three parts such as: development and maintenance of DBT, establishment of implementation systems and measures against radiological terror and ten sub-items that were suggested. This can not finish in a short period. Therefore, we must set up a specific plan for the future. In addition, an effective development system should be provided in order to obtain substantial results.

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