

Consideration on interfaces between safeguards and physical protection for a nuclear facility

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1. Introduction

The IAEA has recommended that consideration be given to the interface between safeguards and physical protection system with its publication of INFCIRC 225 rev.5 in February of 2011.

The safeguards approach is used to account for and control nuclear materials. the physical protection approach is utilized to prevent malicious acts of sabotage and unauthorized removal of nuclear materials from a nuclear power plant. In order to achieve this common objective of interfacing safeguards and physical protection, measures to prevent such acts should be applied to a nuclear facility.

This paper suggests consideration on interfaces between safeguards and physical protection.

2. Approach and goals in safeguards and physical protection

2.1. Safeguards approach and goals

According to IAEA INFCIRC/153, safeguards approach is to timely detect diversion of significant quantities (SQ) of nuclear material to the nuclear weapons or explosive device. SQ means the approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded.

Safeguards approach is a set of safeguards measures chosen for the implementation of safeguards at a specific facility in order to meet the applicable safeguards goals.

The activities in safeguards approach are as following; 1)Diversion assumptions(set of diversion paths, strategies, scenario etc), 2)Design diversion rate(abrupt diversion in hours or days, protracted diversion over one year), 3)Safeguards measures(nuclear material accountancy with containment and surveillance). Safeguards measures consist of effective verification of the flow of NM by the use of instruments and other techniques at key measurement points (KMP) and certain strategic points and use of containment and surveillance measures.

The IAEA have developed the inspection procedures to achieve accountancy verification and timeliness goals. Inspectors perform field operations such as physical inventory verification (PIV) then report the result of the inspection. The IAEA evaluates the result and concludes the safeguards approach in the state. (Fig.1)

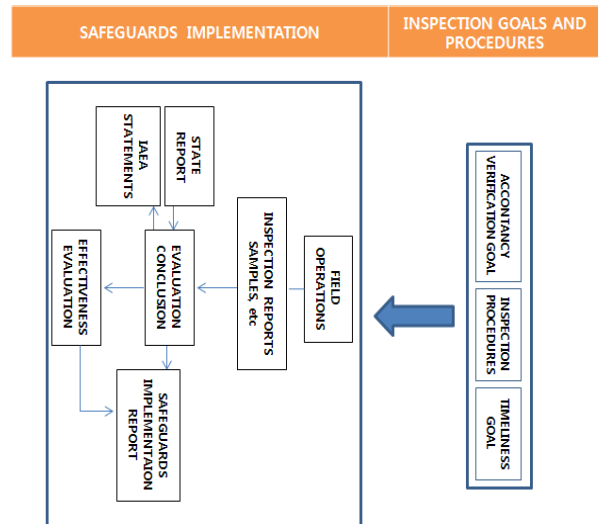


Fig.1. Procedures and implementation of the safeguards approach

2.2 Physical protection approach and goals

Physical protection approach at a nuclear facility is to minimize the possibilities for the unauthorized removal of nuclear material and/or radiological sabotage of nuclear facilities. Designers of nuclear facilities should evaluate the physical protection system effectiveness against any illicit actions to accomplish the goals of approach.

The main activities of physical protection approach are detection (to detect any adversary and threat), delay (to delay the detected adversary) and response (to respond against the detected and delayed adversary).

To detect any threat, devices (e.g. sensors) are mostly used at the nuclear facilities. The detected threat by the sensors could be delayed by installation (e.g. fences, road blocks, etc.). Response forces should neutralize the threat in the delaying period.

3. The interfaces

3.1 Authority

The safeguards and physical protection approaches are both aimed at preventing unauthorized removal of nuclear material.

In order to prevent the unauthorized removal of nuclear material, competent authority of safeguards implements the approach of accounting and managing the amount of nuclear material in a form of assembly,

rod, pellet etc. Competent authority of physical protection regulates operators in performing control access, searching facility personnel against contraband items and installing sensors on the fences.

Additionally, in order to accomplish the common purpose, the responsibility of safeguards is assigned to nuclear control division of nuclear safety and security commission (NSSC) and the responsibility of physical protection is assigned to nuclear emergency division of NSSC.

3.2. Measures

When it comes to safeguards approach, nuclear accountancy system for nuclear facility is used to manage and evaluate the amount of nuclear material.

Nuclear material in input & output and in process flows through nuclear measurement system including measurement record. Nuclear material accountancy system detects loss of material of certain nuclear facility periodically.

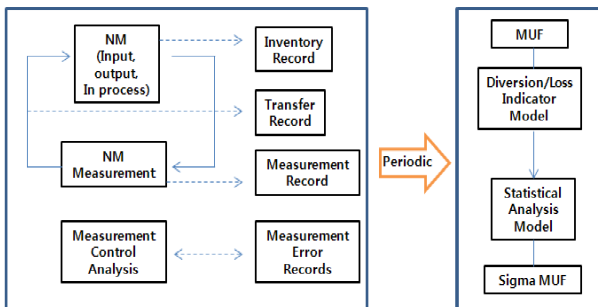


Fig.2. Safeguards measure for detecting loss of nuclear material

For detecting unauthorized nuclear material, competent authority should specify a design basis threat (DBT) of a certain facility and the operator of the facility should establish the system on the basis of the DBT. The operator should abide by the requirements for measures against unauthorized removal of nuclear material in use and storage.

3.3. Contingency plan

If missing nuclear material is found in implementing the safeguards approach, there is no contingency plan to locate and recover except reporting to the authority on a monthly basis.

Otherwise, there is the contingency plan for physical protection. The responsible organization should develop the contingency plan for the rapid location and recovery of nuclear material which has been declared missing or stolen nuclear material at the time of the incident.

4. Consideration on the interfaces

For a new nuclear facility, competent authority should take the interfaces relating to authority, measures and contingency plan into account at the time of site selection and design of the facility. Also, the operator

should assess and manage the interfaces and ensure that they do not adversely affect each other and that they are mutually supportive.

Acknowledgement

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