Suggestion of Improvement Plan for follow-up measures due to reformulating DBT

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1. Introduction

A fundamental principle of physical protection is that it should be based on the State's current evaluation of the threat. A design basis threat (DBT) is derived from this threat assessment to facilitate the development of physical protection based on a State's evaluation of the threat [1]. And the Act of Physical Protection and Radiological Emergency (APPRE) mentions that the DBT should be assessed every three years.

The ROK's DBT was first formulated in 2009 and re-assessed every three years. After reformulating the DBT, nuclear licensees should re-evaluate the physical protection system based on the new DBT. And a scenario analysis methods are generally used to evaluate physical protection systems.

This paper reviews the follow-up measures such as re-evaluation of physical protection systems due to DBT reform and discusses how to improve it.

2. DBT life cycle

The whole life cycle and progress of the DBT is defined and organized by the IAEA shown schematically in figure 1 [2].

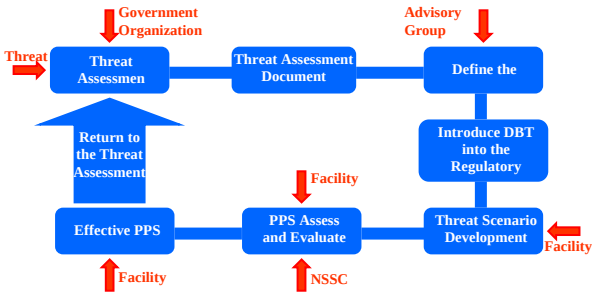

Fig. 1. DBT life cycle

A threat assessment is a formal process of gathering, organizing and assessing information about existing or potential threats that could result in or lead to a malicious act. For an effective threat assessment, personnel with different areas of expertise from various organizations need to work closely together. Therefore, government officers, national intelligence service personnel, security personnel at nuclear facilities and researchers at national laboratories are participate as an advisory group and review the new DBT draft. After reviewing the DBT by the advisories, the new DBT is submitted to the National Physical Protection Committee.

After the Committee defines the DBT, the nuclear licensees use the new DBT for their physical protection system design and evaluation process. There are several techniques for evaluation of physical protection systems such as interruption analysis, neutralization analysis, scenario analysis, etc. And the scenario analysis has been typically used for evaluation of physical protection systems after defining and re-assessing the DBT.

3. Follow-up measures due to reformulating DBT

Follow-up measures due to reformulating DBT are necessary for assessment of physical protection systems based on scenario analysis method. And its detailed process is as followed:

1) Distribution of threat and response scenario making guideline
2) Making threat and response scenarios by nuclear licensees
3) Complementing the threat and response scenarios with counsel of KINAC
4) Reviewing the threat and response scenarios by KINAC and approving them by the competent authority
5) Drawing weak points and changes of the physical protection systems and complementary measures by nuclear licensees
6) Implementation of the complementary measures

Scenario analysis is a physical protection system evaluation technique that is based on postulating adversary attack scenarios. The emphasis is on selecting adversary paths that take advantage of possible physical protection system vulnerabilities. The process involves identifying physical protection system components or procedures that may be susceptible to defeat due to a DBT.

However, the scenario analysis needs well developed adversary attack scenarios. An adversary scenario is a sequence of successive events that an adversary would follow to achieve his undesirable objective. So there can be literally hundreds of unique scenarios for a nuclear facility. The scenarios would be developed by nuclear licensees, and the person who is in charge of making the scenario is changed occasionally so the scenarios are sometimes inconsistent. Therefore, some

parts of the developing scenarios should be modified for more comprehensive analysis.

4. Improvement plan of follow-up measures

The main purpose of re-assessment DBT and scenario analysis is for evaluation of the physical protection system. In order to provide confidence that an analysis is comprehensive, it is necessary to develop a structured approach to identifying scenarios. However, making a full scope of attack scenario is difficult and depending on developers. Therefore, some changes to the making scenario process are required to reduce the burden on scenario developers.

In general, the new DBT is slightly different from the previous DBT such as the number of adversaries, weapons and explosives capabilities, tools, transportations, etc. In those cases, the previous scenario could be reused with slight modifications, because the target of the facility could be almost same. Only the modified part of the DBT should be reflected on the scenario. Eventually, a full scope of the scenario is not needed and only a part scenario which is focused on a modified parts of the new DBT can be used for the evaluation of the physical protection systems.

For example, if explosives of adversaries are amended to add for an explosion of a facility door at a new DBT, just a part of the door intrusion scenario should be developed and the performance of the door should be evaluated.

Furthermore, standard threat scenarios which reflect only modified parts of the new DBT could be developed before distribution of threat and response scenario making guideline. The standard threat scenario, a part scenario, development is much easier than making a full scope scenario. The standard threat scenario might be developed with all nuclear licensees opinions. And it helps to raise receptiveness and understanding of the DBT. The nuclear licensees could focus on making response scenarios and drawing weak points and changes of the physical protection systems.

The improvement plan of follow-up measures due to reformulating DBT is suggested as follows:

1) Developing standard threat scenarios which reflect only modified parts of the new DBT by nuclear licensees and competent authority
2) Distribution of guideline for making full scope threat scenario with modified and previous parts of threat scenario, and making response scenario
3) Making threat and response scenarios by nuclear licensees and complementing them by KINAC
4) Reviewing the threat and response scenarios by KINAC and approving them by the competent authority (If needed) Conducting a small (or part) scope performance test for checking the modified parts of threat scenario
5) Drawing weak points and changes of the physical protection systems and complementary measures by nuclear licensees
6) Reviewing the weak points and changes by KINAC and confirming them by the competent authority
7) Implementation of the complementary measures

This improvement plan is focused on that the nuclear licensees could concentrate the process for drawing weak points and changes of the physical protection system due to changes of a DBT. And it is expected that they could reduce spending time and resources for developing threat scenarios.

5. Conclusions

Reformulating DBT is needed for reflecting new and ever-changing threats on the physical protection system. And threat and response scenario should be developed using a modified DBT to evaluate physical protection system. However, it is difficult to make threat and response scenarios because the nuclear licensees are not accustomed to the DBT follow-up process. So the previous scenarios were not consistent and confident. And scenario developing process spent a lot of resources rather than evaluation of physical protection system. Therefore, the improvement plan of follow-up measures is suggested for focusing on concentrating physical protection system evaluation.

REFERENCES

[1] IAEA Nuclear Security Series No. 13, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.5), 2011.
[2] IAEA Nuclear Security Series No. 10, Development, Use and Maintenance of the Design Basis Threat, 2009.