

Conceptual Analysis of Graded Regulation for Physical Protection Using Risk and Performance Information

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1. Introduction

Thorough confirmation of physical protection is required as the number of facilities subject to physical protection regulation internally and externally and public interest in nuclear power plant threats increases. Compared to the increase in regulatory work, the necessity for regulatory methods increase to efficiently and effectively utilize regulatory resources in a situation where available regulatory manpower is limited.

Accordingly, this paper intends to improve the effectiveness and efficiency of physical protection regulations by differentiating regulatory activities for each facility based on the performance and characteristics of protection performance of regulated facilities.

2. Risk-Informed Periodic Inspection

Risk-informed periodic inspection means such kind of method to rationally adjust inspection contents, input manpower and time of existing periodic inspection items by using risk information.

And also, using the results of the physical protection vulnerability assessment and training evaluation, determine the importance of devices, facilities, systems, and workers that play an important role in securing the protection of nuclear facilities.

Determination of importance by deriving information on accidents and failures related to physical protection and findings and recommendations derived from regular physical protection inspections.

Finally, efficiently allocate manpower and time for inspection by reflecting the importance of each inspection item for each facility.

The brief concept of risk-informed periodic inspection was shown in Fig. 1. In case of current periodic inspection, the identical manpower and period shall be allocated for all inspection list and items. Also, periodic inspections, vulnerability assessments, training assessments performed individually. However, risk-informed periodic inspection was reflected in the importance of inspection items such as findings, accidents of physical protection boundaries, and failure results. Therefore, it was significant in terms of establishing systematic links to periodic inspection, vulnerability assessments, and training assessments.

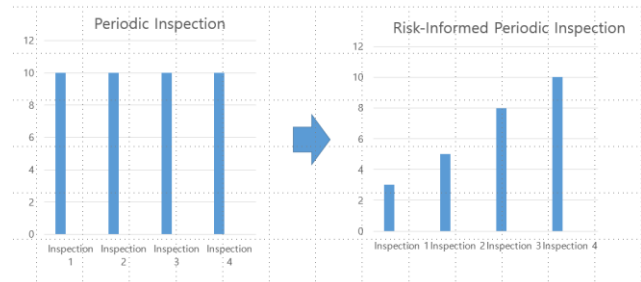


Fig. 1. Brief concept of risk-informed periodic inspection

3. Integrated Physical Protection Performance Assessment

Integrated physical protection performance assessment means comprehensive evaluation of periodic inspection, vulnerability evaluation, training evaluation, and protection-related performance to determine the protection performance grade by synthesizing each individual protection performance evaluation item for each nuclear facility.

Also, individual items composing the comprehensive performance evaluation are prioritized and supplemented so that risk and performance information can be utilized in the existing regular inspection.

For each individual item, a quantifiable method is established under a consistent standard, and weights are given reflecting the difference in importance of each item in the synthesis process similar to U.S. NRC, develop SDP (Significance Determination Process) to evaluate importance [1].

Through this, the level of protection performance for each nuclear facility is determined, and the 'differentiated regular inspection program' is established and implemented. Differentiated by grade by adjusting inspection items, detailed inspection contents, input manpower and resources.

The conceptual scheme of integrated physical protection performance assessment was shown in Fig. 2. The integrated physical protection performance assessment is classified into quantitative protection performance assessment and qualitative protection performance assessment. Specifically, these two head indicators were set to consist of six kinds of evaluation indicators for evaluating of integrated perspectives.



Fig. 2. Conceptual scheme of integrated physical protection performance assessment

4. Conclusion

In this paper, conceptual analysis of graded regulation for physical protection using risk and performance information was conducted. There are two main concepts to achieve graded regulation that are risk-informed periodic inspection and integrated physical protection performance assessment.

- Risk-informed periodic inspection means such kind of method to rationally adjust inspection contents, input manpower and time of existing periodic inspection items by using risk information.
- Integrated physical protection performance assessment means comprehensive evaluation of periodic inspection, vulnerability evaluation, training evaluation, and protection-related performance to determine the protection performance grade by synthesizing each individual protection performance evaluation item for each nuclear facility.

Acknowledgement

This work has been supported by the Nuclear Safety Research Program through the Korea Foundation of Nuclear Safety(KOFONS), using the financial resource granted by the Nuclear Safety and Security Commission (NSSC) of the Republic of Korea. (No. 2106013-0121-SB110)

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- [1] U.S. NRC inspection manual chapter 0609 appendix E, part1, Sep, 2018.