

Improvement of Radiation Safety Inspection Process in Indonesia

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1. Introduction

To ensure safety of the radiation facilities such as hospital, industrial, and research and development field, the Nuclear Energy Regulatory Agency of Indonesia (BAPETEN) conduct a radiation safety inspection process. As a basis for conducting the inspection process, Legal and regulatory frameworks for radiation safety have been established. However, we need to check whether there are opportunities to improve the current process.

In this paper, we performed a self-assessment and review based on IAEA guidelines to compare and contrast Indonesia's current legal dan regulatory framework for radiation safety inspection with IAEA safety standards to check whether each provision was fully or partially met or not met at all. The partially met or not met result is considered a Gap. Benchmarking was also conducted with the practices of the Republic of Korea which is more advanced in its radiation inspection process. The Gap and benchmark results are then taken into consideration in providing suggestions for improvement.

2. Literature Review

2.1. Radiation Safety Inspection Framework of Indonesia

Indonesia established Act No. 10 of 1997 on Nuclear Energy. Through the Act the Independent regulatory body, BAPETEN was formed with the tasks of carrying out government duties in the field of nuclear energy oversight, one of the duties is to carry out radiation safety inspection activities [1].

In carrying out inspection activities BAPETEN has established BAPETEN Chairman Regulation (BCR) No. 1 of 2017 on the implementation of inspections in the oversight of nuclear energy [2].

2.2. IAEA Safety Standard Related to Radiation Safety Inspection

Among the IAEA's key publications are its Safety Standards, which provide the fundamental principles, requirements, and recommendations to ensure nuclear safety. There are several safety standards related to the inspection process, including General Safety Requirement (GSR) Part 1 (Rev. 1) on the Governmental, Legal, and Regulatory Framework for Safety (requirement 27, 28, and 29) [3] as the main standard followed by General Safety Guide (GSG) 13 on the

Function and Process of the Regulatory Body for Safety [4].

2.3. Radiation Safety Inspection Framework of The Republic of Korea

Korea established Act on the Establishment and Operation of the Nuclear Safety and Security Commission (NSSC) to be in charge of all aspects of nuclear safety regulation. The authority to regulate and establish nuclear safety policies is entrusted to the NSSC through relevant legislation including the Nuclear Safety Act.

The government established the Korea Institute of Nuclear Safety (KINS) and the Korea Institute of Non-proliferation and Control (KINAC) as regulatory expert organizations per the Nuclear Safety Act to strengthen technical capabilities relating to nuclear safety regulation, because nuclear safety regulation requires considerable knowledge of specialized technology.

Under entrustment from the NSSC, KINS is in charge of technical aspects of nuclear safety regulation, including safety reviews, inspections, education, and safety research, based on technical knowledge and accumulated regulatory experiences [5].

3. Results and Discussions

3.1. Compliance status of Indonesia's Legal and Regulatory Framework for Radiation Safety Inspection with IAEA Safety Standards

From the results of the self-assessment and review, there are several IAEA requirements and recommendations that partially complied with, as follows: (see Table I)

Table I: List of partially complied requirements and recommendations (Gap)

Requirement/ Recommendation	Gap
GSR Part 1, Requirement 29. Graded approach to inspections of facilities and activities	The current regulation states that planned inspection is conducted based on the principle of graded approach (high risk, moderate risk, and low risk), however, the existing regulatory inspection program does not include safety culture aspects.
GSG 13 section Objectives of	The current Act, regulation, and procedure clearly state the

Requirement/ Recommendation	Gap
regulatory inspection	inspection objective and compliance criteria. However, there are still several criteria stated in GSG 13 that are not available in the current policy. For example, confirming that the licensee has an adequate effective management system.
GSG 13 section Organization of regulatory inspection	The current regulation and supporting document show that the key element (e.g. graded approach, etc..) is considered in making an inspection program, however, based on the IAEA follow-up mission, BAPETEN's regulatory inspection program does not include safety culture aspects.
GSG 13 section Records of regulatory inspections	The current regulation and document state the list of content of the BAPETEN inspection report. However, the content does not include a reference to applicable requirements. This information is necessary for licensees to let them know which regulations they have violated.

3.2. Benchmarking with Radiation Safety Inspection Framework of the Republic of Korea

Benchmarking has been carried out with the Korea Regulation regarding nuclear safety particularly the Enforcement Decree of the Nuclear Safety Act of the Republic of Korea. One of the good practices that need to be considered for adoption is that Korea introduces the concepts of substitute and exemption to periodic inspections for licensees who get excellent Radiation Safety Evaluation Records. A substitute for periodic inspection is given to facilities with an inspection period of 3 and 5 years (medium and low risk), while an exemption for periodic inspection is given to facilities with an inspection period of 1 year (high risk) [6].

This concept can be a solution to the problem of both budgets and the lack of radiation safety inspectors in Indonesia. With this concept, radiation safety aspects can still be fulfilled even without carrying out direct inspections of facilities.

3.3. Suggestion for Improvement of Radiation Safety Inspection Process in Indonesia

There are 4 Gaps and 1 benchmarking result found in the preceding sub-section. Several suggestions to improve the radiation safety inspection process is provided as follows: (see Table II)

Table II: List of Suggestions

No.	Suggestion
1	BAPETEN should develop an inspection program that can assess aspects of the facility's management system and safety culture
2	BAPETEN should develop guidance for inspectors to perform management system and safety culture assessment
3	BAPETEN should update the current indicator of evaluation of the safety and security status of radiation facilities to include aspects of management systems and safety culture
4	BAPETEN should consider implementing the concept of "Substitute of periodic inspection" and "exemption from a periodic inspection"
5	BAPETEN should make an inspection report that includes the information on the reference to applicable requirements

A brief description of how we can assess the management system and safety culture of the licensee is provided in the following paragraph.

3.3.1. Management system

The management system is a set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner. The effectiveness of the management system of the facilities shall be measured, assessed, and improved to enhance safety performance, including minimizing the occurrence of problems relating to safety [7].

The following criteria can be used by BAPETEN to evaluate the management system of the facility:

- whether whole procedures are regularly evaluated for their effectiveness and for their ability to ensure safety.
- whether the cause of non-conformances of processes and the cause of safety-related events are evaluated, and any consequences are managed and mitigated.
- whether the corrective and preventive actions are determined in a timely manner, monitored, and reported to the management at an appropriate level in the organization.
- whether self-assessments and independent assessments of the management system are regularly conducted to evaluate its effectiveness and to identify opportunities for its improvement.
- whether management system review is conducted by the senior management at planned intervals to confirm its suitability and effectiveness.

3.3.2. Safety Culture

Safety culture is the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance. senior management of the facilities shall regularly commission assessments of safety culture in its own organization.

The following approach can be used by BAPETEN to evaluate the safety culture of the facilities:

- review of the self-assessment result of the licensee;
- review of independent assessment result of the licensee;
- interaction with the licensee at a senior level;
- focused safety culture on-site review;
- oversight of management system implementation; and
- integration into regulatory activities.

A key principle for the regulatory oversight of safety culture is to use multiple data collection methods and data sources. Regulatory bodies are encouraged to use not only one approach, but to select a combination of several approaches as appropriate depending on resources availability, nature of relations with the licensee, regulatory regime, and existing licensee approaches [8].

4. Conclusion

In this study, a new regulatory concept was proposed as an improvement of the radiation safety inspection process in Indonesia through a self-assessment and review of the radiation safety inspection regulatory framework of Indonesia against IAEA safety standards and benchmarking with the radiation safety inspection framework of the Republic of Korea.

The main contents of the new regulatory inspection concept are developing an inspection program and revising inspection report content. Developing an inspection program includes the addition of a management system and safety culture to the scope of the inspection program and applying the concept of exemption and substitute of periodic inspection. Whereas, developing inspection report content is to add references to applicable requirements in the report.

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