Development of Safety Culture Indicators for HANARO

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1. Introduction

Safety culture is more important than a technical matter for the management of nuclear facilities. Some of the accidents that have occurred recently in nuclear plants are important as a social problem besides a technical problem. That's why the management of nuclear plants has been focused on the safety culture to improve confidence of nuclear facilities. As for a safety culture, there are difficulties in that a tangible result does not come out clearly in spite of an effort for a long time. Some IAEA guides and reports about a safety culture and its evaluation method for nuclear power plants (NPP) were published after the Chernobyl accident.

Until now there is no tool to evaluate a safety culture of for research reactors. HANARO developed its own safety culture indicators based on the IAEA's documents. The purpose of the development of the safety culture indicators is to evaluate and enhance the safety attitude in HANARO.

2. IAEA's safety culture indicators

The term 'Safety Culture' was first introduced in the INSAG's Summary Report from the Post Accident Review Meeting on the Chernovyl Accident, published by the Safety Principles for Nuclear Power Plants group [1].

In 1991 a Safety Series report on a Safety Culture by the International Nuclear Safety Advisory Group (INSAG) was published as SS-75-INSAG-4. This document describes a safety culture concept along with its definitions, features and tangible manifestations [2].

Safety Culture Indicators were suggested to encourage a self-examination of organizations and individuals the Appendix SS-75-INSAG-4. Then, safety culture evaluation indicators were developed by the IAEA-TECDOC-860, ASCOT Guidelines for measuring a plant's safety attitude in 1996. It can be used not only in a NPP but also in other nuclear facilities to evaluate and improve a safety attitude level.

IAEA ASCOT Guideline classifies the subjects for an evaluation of a safety culture as the following 4 categories;
- The Government and its organizations
- Operating Organizations
- Research Organizations
- Design Organizations

The ASCOT Guideline suggests a total of 18 areas for a safety culture evaluation with regard to the 4 categories mentioned above ; 2 for the Government and its organizations, 13 for the Operating organizations, 1 for the Research organizations and 2 for the Design organizations.

3. Safety culture indicators for a NPP in Korea

The Korean government needed to develop and establish a safety culture concept and an evaluation method for a NPP. In 1996, the Korea Institute of Nuclear Safety (KINS) developed the safety culture indicators for a Korean NPP [3]. KINS established a set of safety culture indicators by referring to the IAEA ASCOT Guidelines. These safety culture indicators consist of 8 evaluation areas and 45 detail indicators. They include the following indicators, for example;
- Unit Capability Factor
- Unplanned Outage Rate
- Unplanned Scrams for a Critical Period
- Safety System Actuation
- Safety System Failures
- Fuel Reliability
- Collective Radiation Exposure
- Radioactive Waste

4. Safety culture indicators for HANARO [4]

In particular, research reactors have a specific purpose and characteristics for research and development using a neutron beam. But the existing safety culture indicators were focused on the operation of a NPP. It is the first time to try to develop the safety culture indicators for a research reactor. What should be considered are not only a reactor operation but the research and design fields different from a NPP.

HANARO considered 3 organization groups as follows;
- Operating Organization
- Research Organization
- Design Organization

These 3 organization groups include 15 evaluation areas. Table 1 shows the evaluation areas for the HANARO safety culture.

Table 1. Evaluation areas for the HANARO safety culture

15 Evaluation items for HANARO Safety Culture	
A. Operation organization	1. Safety policy at the corporate level
	2. Safety practices at the corporate level
	3. Highlighting safety
	4. Definition of responsibilities
	5. Selection of managers
	6. Relations between plant management and regulators

	7. Review of a safety performance
	8. Training
	9. Local practices
	10. Field supervision by management
	11. Work-load
	12. Attitudes of managers
	13. Attitudes of individuals
B. Research organization	1. Research input to safety analyses
C. Design organization	1. Design review process

These 15 evaluation areas include 48 detail indicators which are shown in Table 2.

Table 2. Safety culture indicators for HANARO

Evaluation areas	Detail indicators
Safety policy at the corporate level	- establishment of safety policy statement
Safety practices at the corporate level	- formal meetings by safety review committee
Highlighting safety	- periodic meetings on safety - propagations of safety matters - safety attitude of irregular employees - reporting on safety related concerns - reward and punishment
Definition of responsibilities	- safety responsibilities of managers and staffs
Selection of managers	- safety attitude of managers
Relations between plant management and regulators	- relationship between plant managers and regulation agency - frank and open discussion - confidence
Review of safety performance	- safety performance of senior management - results of safety review - information exchanges related to safety concern - application of operation experiences - reporting systems for accidents and incidents
Training	- effectiveness of training program - selection of lecturers - positive attitude - effectiveness of training - contents of training program - OJT
Local practices	- useful records of performance or maintenance - state of plant - management of supporting companies
Field supervision by management	- leadership of management - inspection of the conduct of safety related works
Work-load	- work loads
Attitudes of managers	- safety attitude - safety review - improvement of safety related concerns - audit and inspection - actions when accidents and incidents occurred - training and practices - review safety related activities and improvement of physical working environment
Attitudes of individuals	- understanding safety polish - attitude and action when mistakes occurred - understanding of safety responsibility - understanding of procedures - active attitudes on safety - trainings and practices - exchange of experiences - inspections and audits
Research input to safety analyses	- application of research results - publication of research results
Design review process	- outside experts review - design review procedure

5. Summary and future plan

Some activities have been performed for an improvement of the safety culture in HANARO during the last 10 years. A systematic approach and an effective scheme for an evaluation of HANARO's safety culture were required to enhance its safety. An effort was placed on the development of safety culture indicators specific to HANARO for the purpose of a self-assessment. 48 specific safety culture indicators were selected. They will be an effective tool to check and review the attitude of HANARO's personnel to its safety culture.

Based on these indicators a new survey and an interview of all the employees in the HANARO Center will be conducted next year to evaluating the level of the safety culture attitude in the HANARO Center. A survey will be helpful to understand the safety trends of the employees and to set the safety culture activities necessary for an improvement of a safe operation of the plant. HANARO will continuously pursue the trend of a safety culture attitude based on the above safety culture evaluation indicators to enhance its safety.

REFERENCES
[1] IAEA Safety Series No. 75-INSAG-4, Safety Culture, 1991
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