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Development of Regulatory Expectations for Licensee's Safety Culture

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1. Introduction

Safety culture has been a main subject of scrutiny in major accidents of modern complex technologies. The Fukushima accident also plausibly has its root cause deep into weak safety culture. The oversight of licensee's safety culture becomes an important issue that attracts great public and political concerns recently in Korea. Beginning from the intended violation of rules, a series of corruptions, documents forgery and disclosure of wrong-doings made the public think that the whole mindset of nuclear workers has been inadequate. Thus, they are demanding that safety culture shall be improved and that regulatory body shall play more roles and responsibilities for the improvements and oversight for them. This paper introduces, as an effort of regulatory side, recent changes in the role of regulators in safety culture, regulatory expectations on the desired status of licensee's safety culture, the pilot inspection program for safety culture and research activity for the development of oversight system.

2. Changes in the Role of Regulator regarding Licensee's Safety Culture

Safety culture has been emphasized as an important basis for achieving high level of nuclear safety. It represents people's attitude, beliefs and values which are very difficult to measure and control. Thus, it is understood that different approach and methodology needs to be developed to deal with this sophisticated, abstract and broad concept of safety culture.

In addition, as shown in sociological and organizational literatures and in many case studies, we should be cautious about the external intervention in organizational culture that could result in negative consequences. In this regard, safety culture has been considered as what should be managed by licensees themselves. Usually licensees have done voluntary commitments to promote safety awareness and safety consciousness and also conducted self-assessments to identify improvement areas. Regulatory body has refrained from imposing direct enforcement on licensee's safety culture. However, since the early 2000's new attention has been paid to safety culture oversight by regulatory side worldwide. Several events in advanced countries' nuclear power plants that were found to be related to weak safety culture made the public feel uneasy about safety culture of nuclear industry. The public began to demand more roles and responsibilities of regulatory body for licensee's safety culture.

Also in Korea, a change in regulatory position about safety culture oversight was made before and after an event of station black out cover-up in Kori unit 1 occurred in early 2012. Before the event, Korean regulator assumed that some parts of safety culture have been addressed within the existing regulatory requirements. And it deferred regulatory evaluation of attitudinal aspects until a valid methodology is developed. Rather than exerting heavy hands of regulation on attitudes, Korean regulator focused on the promotion of safety consciousness among nuclear employees through promulgating safety charter, activating campaigns, observing nuclear safety days; developing safety culture assessment tools and transferring them to licensee to encourage self-assessments; and conducting a few special inspection of safety culture on an ad hoc basis.

After the event, Korean regulator concluded that safety culture aspects were not properly managed by licensee and therefore minimum requirements should be imposed on. Based on the implications and lessons from the event, Korean regulatory authority announced the initiative of regulatory oversight and launched pilot inspection program and research project to develop oversight system and methodology.

3. Regulatory Expectations on Safety Culture

The first step to safety culture oversight is the selection of what the oversight will have to focus on. This selection process could be based on literature survey, experience of other countries' oversight, lessons from events, and so on. As shown in Figure 1, the focus is on the multiple human and organizational elements which can affect and re-enforce defense-in-depth of nuclear safety [1]. The four basic areas of prime focus are human performance, management for improvements, internal oversight, and leadership & organizational control. These basic elements shall be managed by licensee's safety culture management system.

For each area, specific components and associated regulatory expectations are now under development. Currently, the preliminary expectations are set as follows:

- SC Management System
  - ✓ A management system to promote a strong safety culture which corresponds to global safety standard
  - ✓ Safety culture specialists with exclusive charge on the management system
  - ✓ Regular assessments of safety culture using state-of-the-art methods
  - ✓ Monitoring system to detect early signs of decline in safety culture and analysis of trends
  - ✓ Causal factors analysis system to identify potential safety culture problems within major issues
  - ✓ A system to ensure that remedial actions be taken to those identified safety culture problems
- Human Performance
  - ✓ Efforts to reduce human errors using appropriate program/techniques
  - ✓ Systematic and conservative decision-making with clear communication
  - ✓ Organizational environment for procedure adherence and coaching
- Management for Improvements
  - ✓ Corrective action program used to identify safety implications timely and to ensure that necessary actions be taken rapidly
  - ✓ A review mechanism to do in-depth analysis of safety significant events to identify common cultural or institutional cause
  - ✓ Regular effectiveness evaluation of various improvement program
- Internal Oversight
  - ✓ Working environment in which workers can raise safety concerns or issues freely, including alternative to a reporting channel
  - ✓ Internal regulation and supervision not to discriminate persons to raise safety concerns
  - ✓ Education and training for the employees and managers as well about their right and responsibility to make safety conscious working environment
- Leadership & Organizational Control
  - ✓ Top management's participation in safety culture leadership program
  - ✓ Assessment program to identify leadership capability
  - ✓ Selection of plant managers with a due consideration of leadership for safety.
  - ✓ Plant performance evaluation system not compromising safety
  - ✓ Change management process to any organizational change that could affect safety
  - ✓ Changes to be classified and managed according to their safety significance.

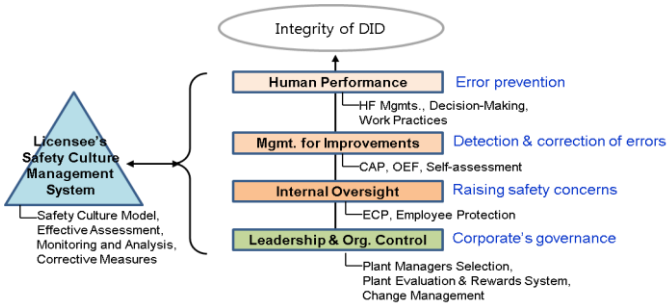

Figure 1. Overall safety culture improvement mechanism using defense-in-depth approach

4. Pilot Inspection Program and R&D Project

Licensee's safety culture oversight system is being developed in two phases. Application of pilot safety culture inspection program and R&D project are implemented complementarily. In this section overview of pilot inspection program and research project are presented.

4.1 Pilot Safety Culture Inspection Program

The purpose of pilot safety culture inspection is to verify the feasibility and effectiveness of regulatory oversight. It is crucial to have common understanding, methodologies, competencies, etc. during this trial period to develop appropriate infrastructure of both regulators and operators. It is also expected to obtain baseline data of licensee's status with regard to the preliminary regulatory expectations of safety culture.

In general, various techniques such as interview, document review, focus groups, senior-level meetings, event review, observations, surveys, and others are used to gain data and analyze them [2]. During the pilot program, interview and document review method will be mainly used. For example, interview with resident inspectors is essential to collect insights from daily inspections and field observations. Interview with plant managers and employees is also carried out to identify espoused values and basic shared assumptions in the organization. Documents associated with licensee's management system, various improvement and feedback programs are reviewed during focused safety culture on-site inspection.

Pilot inspections are carried out last year in two plants. Results and lessons are briefly addressed as follows:

- Improving competencies of staff assigned with safety culture works and work process in training programs, organizational control, and human performance areas;

- Elaborating the interview methods and skills of regulator;
- Utilizing insights of resident inspectors; and
- Reviewing the higher level framework to analyze institutional issues and organizational change management process in utility's head office.

4.2 Development of Regulatory Infrastructure and System for the Safety Culture Oversight

A research project started in November 2013 to develop oversight system of licensee's safety culture which lasts till June 2016. The goals and tasks of the project are as follows:

- Verification of safety culture components
  - ✓ Survey of regulatory approaches to safety culture in other countries
  - ✓ Selection of the safety culture components based on the promising relevance to safety performances of operating NPPs
  - ✓ Study on the content- and criteria-validity of the selected components
- Methodologies to support regulatory oversight
  - ✓ Monitoring the decline, analyzing root-causes and independent assessment of safety culture
  - ✓ Case studies to confirm the implied influences of weak safety culture
  - ✓ Build-up of database for safety culture cases of failure and/or success
- An integrated safety culture assessment system
  - ✓ Development of site inspection guides and a site observation manual
  - ✓ Methodologies and guides for the evaluation of organization's safety consciousness and shared assumptions
- Infrastructure for regulatory oversight of safety culture
  - ✓ Requirements for enforcing "proactive" corrective actions in safety culture
  - ✓ Development of education and training program for regulatory staff

Figure 2 shows the overall research plan along with the three consecutive years.

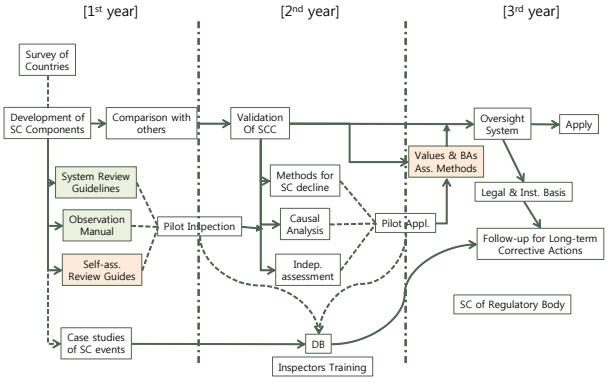

Figure 2. Implementation plan of safety culture oversight system and Infrastructure

5. Conclusion

After the Fukushima accident in Japan 2011, many critics have searched for cultural factors that caused the unacceptable negligence pervaded in Japan's nuclear society. Renewed emphasis has also been placed on rebuilding strong safety culture by operators, regulators, and relevant institutions worldwide. Significant progress has been made in approach to safety culture and this led to a new perspective different from the existing normative assessment method both in operators and regulatory side. Regulatory expectations and oversight of them are based on such a new holistic concept for human, organizational and cultural elements to maintain and strengthen the integrity of defense in depth and consequently nuclear safety. To ensure continuously improving nuclear safety and to prevent further deterioration in nuclear workers mindset, it is needed to build strong safety culture and to sustain long-term commitment to it. Every individual should keep in mind continuous learning attitude and leadership for safety.

REFERENCES

[1] Young Sung Choi, Regulatory Initiative to Oversee Licensees' Safety Culture, Transactions of the Korean Nuclear Society Spring Meeting, Gwangju, Korea, May 30-31, 2013
[2] Regulatory Oversight of Safety Culture in Nuclear Installations, IAEA, 2013