Analysis of Expert Survey Results for Efficient Collaboration between Related Organizations in case of Nuclear Accident

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1. Introduction

To accomplish the goals of the Second National Radiological Emergency Response Plan (2020-2024) of Korea and enhance the collaboration between related organizations in case of a nuclear accident such as fire at a nuclear power plant, the Standard Testing and Engineering Inc. is conducting the project "Establishment of Collaboration System for Cooperative Organizations in case of Nuclear Power Plant Accident and Radiological Emergency" [1]. In 2023, Year 4 of the project, the collaboration manual for cooperation between related organizations in case of a nuclear accident was completely developed, and a survey was recently performed with the experts in the government, universities, research institutes, and industry in pursuit of efficient application of the collaboration manual. A total of nine questions, including "What is the most important thing for efficient response to a nuclear accident?", were used to collect opinions from 21 experts. In addition to the answers to the survey questions, various opinions were provided to increase the effectiveness of the collaboration. This paper is intended to collect opinions from experts on collaboration manuals and use them as a reference for making the final manual in the future.

2. Methods and Results

2.1 Survey with experts and opinion leaders

The survey was conducted to gather opinions from the employees at nuclear power plants, research institutes, universities, public servants at municipal governments, experts in regulatory authorities, and hands-on workers.

- Date: May to June 2023 (2 months)
- Survey method: Document-based survey conducted with the developed manual and relevant materials provided in advance.
- Survey questions: Nine questions, including six multiple choice questions and three descriptive questions.
- Survey subjects: Twenty one experts from governmental institutions (affiliated institutions), research institutes, industry, and universities.

Table I: Configuration of the survey subjects.

Governmental institutions	6
Research institutes	4
Industry	6
Universities	2
(Total)	21

2.2 Survey results

According to the survey results, the subjects answered that the most important thing for efficient response to an accident is 'the development and application of a collaborative system for cooperative organization (38%)' and 'the unification of the commanding system for the response to an accident (31%).'

The survey subjects mentioned that among the organizations that are to respond to a nuclear accident and radiological emergency, the organizations that require collaboration most are 'municipal governments-nuclear power plant operators-National Fire Agency.'

The survey subjects considered that the most probable causes of an accident at a nuclear power plant in Korea are 'natural disasters such as earthquake and tsunami (34%)' and 'missile attack by North Korea (including terrorism using drones).'

With regard to the periodic training assuming a nuclear power plant accident (comprehensive training/joint training in preparation of a radiological emergency), most of the survey subjects provided negative comments, including the comments "The training is a formality that is far from the application to an actual situation (50%)' and "The training is not appropriately improved because no assessment is carried out after the training (23%)' (see Fig. 1 to 3).

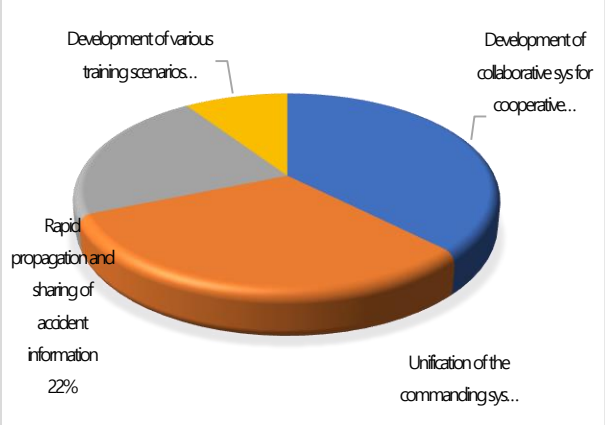

Fig. 1. Answers to the question ""What is the most important thing for efficient response to a nuclear accident?"

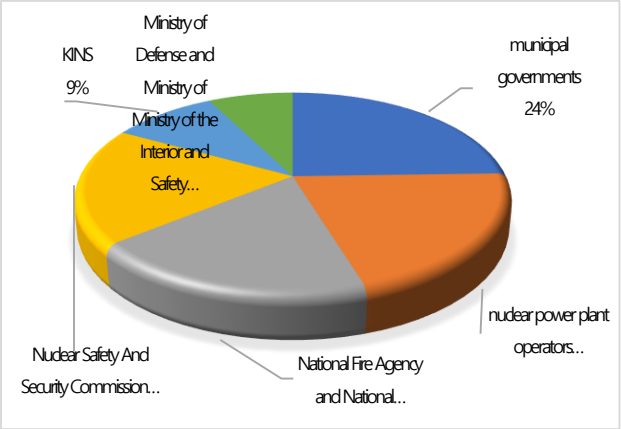

Fig. 2. Answers to the question, "What are the organizations that requires collaboration most?"

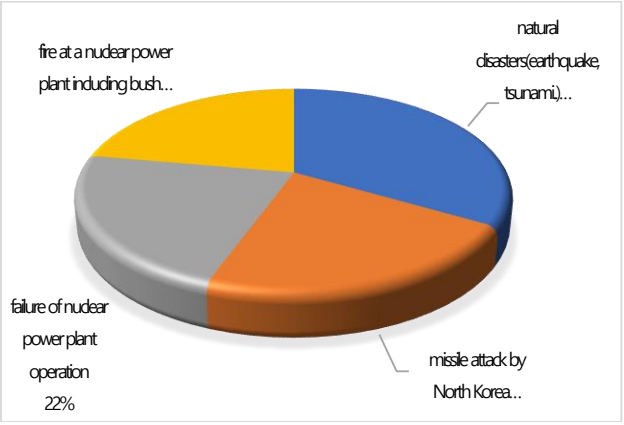

Fig. 3. Answers to the question, "What are the most probable causes of an accident at a nuclear power plant in Korea?"

2.3 Additional comments on efficient application of the collaboration manual

In addition to the provided survey questions, various comments were presented as described below.

- A nation-wide comprehensive disaster response system needs to be established, including natural disasters and social disasters, rather than a collaboration manual limited to a nuclear accident.
- Referring to overseas accident cases, efforts should be made to predict the difficulties that on-hand workers of individual organizations may face at an accident and to resolve the difficulties in advance.
- National integrated training for related organizations needs to be performed periodically in preparation of the continued increase of unprecedented situations such as special and composite disasters.
- The emergency warnings according to the National Emergency Management Manual are standardized into Attention, Caution, Alert, and Severe, but the nuclear power safety manual classified the warnings into five levels, which are Attention, Caution, White Emergency, Blue Emergency, and Red Emergency. This may cause misunderstandings to fire fighters, policemen, and soldiers.
- Ambiguity or redundancy of roles and responsibility in collaboration may make it difficult to coordinate the activities by various organizations. To overcome the problem, it is important to establish an integrated commanding structure and clearly define the decision-making process.
- The operation of the collaborative system between cooperative organizations should be forced by laws to make the organizations fulfill their roles in response to a nuclear accident or radiological disaster.
- The time when the collaboration between cooperative organizations is most required is the early stage of an accident. However, the time is when the information about the accidental situation (development) is most uncertain.
- A text messaging system should be provided to immediately inform all the residents in the disaster-stricken area about the behavioral instructions. A system needs to be established to utilize the position tracking function of the mobile phones to quickly save the residents who are falling behind and who are injured.
- Scenarios that are most likely in the real world should be discovered to carry out mock-up trainings under the situations according to the scenarios.
- An organization such as '(Tentative) Integrated Disaster Response Headquarters' needs to be established to prepare a collaborative system for comprehensively controlling organizations such as the National Fire Agency and National Police Agency.

3. Conclusions

The collaboration manual for cooperation between related organizations in case of a nuclear accident and a radiological emergency was completely developed, and a survey was performed with the experts in the government, universities, research institutes, and industry in pursuit of efficient application of the collaboration manual.

For efficient response to an accident, the collaborative system of the individual organizations should be consolidated and more importantly, the commanding system should be unified to prevent the confusion in the early stage of an accident.

To enhance the effectiveness of accident response, '(Tentative) Integrated Disaster Response Headquarters' may be established in the nuclear power plant areas as a permanent organization (e.g., East Region Headquarters and West Region Headquarters), which facilitate decision-making, situation information propagation, and initial counteractions.

As the survey indicated that the organizations that require collaboration most in case of an accident are municipal governments, nuclear power plant operators, and National Fire Agency, the Nuclear Safety And Security Commission needs to supervise the organizations well in pursuit of smooth collaboration.

The survey results also pointed out that the effective means of providing the collaboration manual include 'smartphone app' and 'a devoted website.' In preparation of a case where these means do not function properly, the manual may need to be provided in the form of a booklet or downloadable app contents.

Ultimately, there is a need for research activities and government-wide preparations in case of unprecedented incidents, including not only a nuclear accident but also natural disasters such as fire, flood, and drought, and social disasters such as North Korean nuclear missile attack and Chinese nuclear power plant accident.

REFERENCES

[1] Nuclear Safety and Security Commission, https://www.nssc.go.kr, 2020.1.