

Development of Nuclear Safety Issues Program

S. O. Yu, Y. G. Yune, M. J. Jung, H. J. Kim, D. G. Kang, K. W. Roh, and J. C. Jo
Safety Issue Research Department, Korea Institute of Nuclear Safety, 19 Guseong-dong, Yuseong-gu, Daejeon,
k378yso@kins.re.kr

1. Introduction

Since the first commercial nuclear power plant, Shippingport in USA, started to operate in 1957, a lot of safety issues which should be resolved priorly to minimize the potential for accident/incident occurrence at operating nuclear power plants worldwide have been identified.

Thus, to identify and resolve the safety issues for the nuclear reactors under design, construction or operation timely and effectively, it is required to establish and implement a systematic integrated nuclear safety issue management system.

This paper presents the nuclear safety issues program [1] developed by KINS recently, which deals with the proposal, identification, resolution and management of the nuclear safety issues.

2. Nuclear Safety Issues Program

2.1 Review of Generic Issues Program

The detailed review of Generic Issues Program (GIP) [2] which is one of the management directives of USNRC has been performed and the general procedure of GIP is shown at Fig. 1. The generic issue of GIP is defined as a regulatory matter involving the design, construction, operation, or decommissioning of several, or a class of, NRC licensees, certificate holders, or holders of other regulatory approvals (e.g., design certification rules) that is not sufficiently addressed by existing rules, guidance, or programs. The general issues of GIP consist of as follows;

- adequate protection issues
- substantial safety enhancement issues, and
- reduction in unnecessary regulatory burden issues

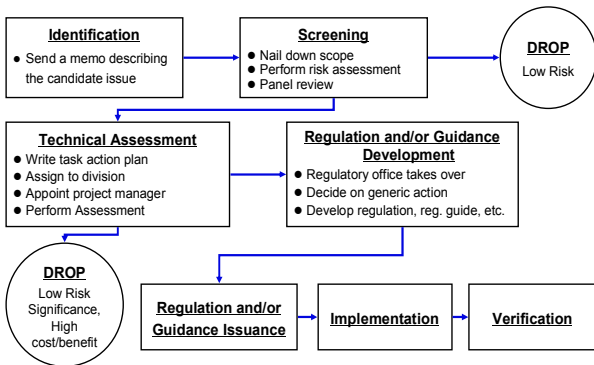


Figure 1. Procedure of general issues program of USNRC.

According to the detailed review of GIP, it is found that GIP mainly focuses on the revision/abolition of current act/guidance or the enactment of new act/guidance for nuclear safety regulation. It is also noticeable that GIP utilizes the results of PSA in screening the generic issues.

2.2 Development of Nuclear Safety Issues Program

The nuclear safety issues program (NSIP) which deals with the overall procedural requirements for the nuclear safety issues management process has been developed. The nuclear safety issue is defined as the case which affects the design and operational safety of nuclear power plants and also requires the resolution action. As shown in Fig. 2, the NSIP consists of the following 4 steps;

- Step 1: Proposal of nuclear safety issues
- Step 2: Identification
- Step 3: Categorization/resolution
- Step 4: Implementation, verification and closure

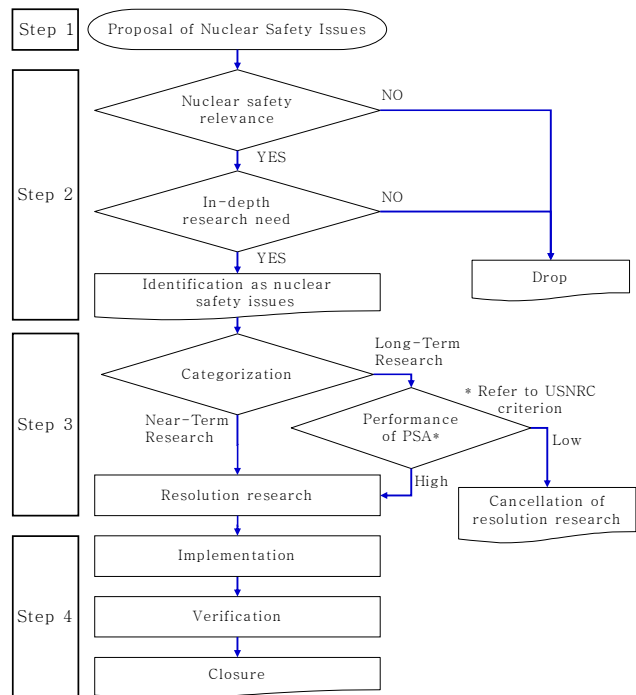


Figure 2. Procedure of nuclear safety issues program.

To identify the nuclear safety issues from the proposed issues, the definition of nuclear safety issues should be considered. In other words, to be identified as one, the proposed issues should have both of the nuclear safety relevance and the in-depth research need for resolution.

To determine whether the proposed issue is related to the nuclear safety or not, the criteria have been set up through surveying the class relationships of components and systems of nuclear power plant, as shown in Table 1.

Table 1. Criteria for determining the nuclear safety relevance

Safety Class		Quality Class		Nuclear Safety Relevance
		NSSS ¹⁾	BOP ²⁾	
1		1	Q	○
2		1	Q	○
3		1	Q	○
NNS ³⁾	Require QAP ⁴⁾	2	T R	○
	Do not require QAP	3	S	×

- 1) NSSS : Nuclear Steam Supply System
- 2) BOP : Balance of Plant
- 3) NNS : Non Nuclear Safety Class
- 4) QAP: Quality Assurance Program

where, Q means safety-related class, T safety impact class, R reliability critical class, and S industrial standard class.

The proposed ones as the nuclear safety issues are related to the failures of components or systems causing the accident/incident at nuclear power plants or those possibilities. By confirming the corresponding classes of the components or systems, therefore, the nuclear safety relevance can be determined.

Next to confirming the nuclear safety relevance of the proposed issue, the in-depth research need should be considered qualitatively with the following viewpoints;

- necessity of related regulatory technology development such as root cause analyses, follow-up measures, etc.
- contribution of regulatory reliability promotion by means of in-depth resolution researches

The identified nuclear safety issues are categorized as shown in Fig. 3, according to the research type, facility type and related technical fields with the following considerations;

- urgency of resolution research
- scope and content of resolution research
- relationship with other technical fields, etc.

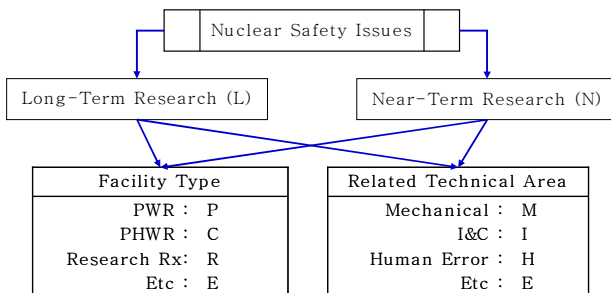


Figure 3. Categorization of nuclear safety issues.

By reviewing the information of current on-going or completed researches, the scopes and contents of the resolution research are adjusted not to be overlapped with them. In the case of long term researches, if necessary, the effect of the nuclear safety issue on the overall safety level of the nuclear power plants is evaluated by carrying out PSA (Probabilistic Safety Assessment) before the kick-off of the long term research. By comparison between the PSA results and the evaluation criterion (see Fig. 4), the long term research is determined to be commenced or cancelled.

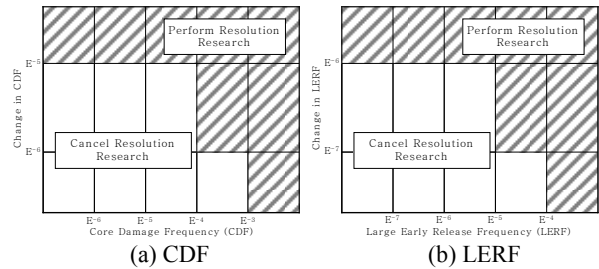


Figure 4. Evaluation criterion for PSA results [2].

The resolution research is completed when the needed regulatory technologies for establishment regulatory measure or the draft of enactment/revision of acts/guides are developed. After implementation and verification of the resolution research results, the nuclear safety issue is closed.

3. Concluding Remarks

The nuclear safety issues program dealing with the overall procedural requirements for the nuclear safety issue management process has been developed.

Through the identification of the nuclear safety issues which may be related to the potential for accident/incidents at operating nuclear power plants either directly or indirectly, followed by performance of regulatory researches to resolve the nuclear safety issues, it will be possible to prevent occurrence of accidents/incidents as well as to cope with unexpected accidents/incidents by analyzing the root causes timely and scientifically and by establishing the proper flow-up or remedial regulatory actions. Moreover, the identification and resolution of the nuclear safety issues related to the new nuclear power plants completed at the design stage are also expected to make the new reactor licensing reviews effective and efficient as well as to make the possibility of accidents/incidents occurrence minimize.

Therefore, the nuclear safety issues program is expected to contribute for the enhancement of the safety of nuclear power plants.

REFERENCES

- [1] J. C. Jo et al., Development of Nuclear Safety Issues Program, KINS/RR-449, KINS, 2006.
- [2] USNRC, "Generic Issues Program," NRC Management Directives 6.4, 2005.