

## Current Status and Future Prospects of Severe Accident Policy

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### 1. Introduction

The Korean Ministry of Science and Technology (MOST) issued the "Policy on Severe Accident of Nuclear Power Plants" in August 2001 [1,2]. It required the licensee to take measures to minimize the possibility of severe accident and, if it should occur, to take proper actions to minimize the risk of radiation exposure to the public. The major elements included in the policy are: establishment of the safety goal, performance of the probabilistic safety assessment (PSA), provisions for severe accidents prevention and mitigation capability, and set-up of a severe accident management program. Each element has been set up to move progressively toward upgrading in safety of currently and future operating plants.

In response thereto, Korea Hydraulic and Nuclear Power Company (KHNP) set up its own implementation plan, which was approved by the MOST [3]. According to the plan, KHNP conducts PSA and establishes risk monitoring systems and severe accident management programs (SAMPs) for relevant installations. And Korea Institute of Nuclear Safety (KINS) developed Safety Review Guidelines for PSA, SAMPs, and severe accident prevention and mitigation capability. Using these guidelines, KINS has been reviewing PSA results and SAMPs submitted by the licensee.

### 2. Status of Severe Accident Policy Implementation

In this section the current implementation status for each element of the Severe Accident Policy is described.

#### 2.1 Safety Goal

Quantitative health objectives were established as safety goals on issuance of the Severe Accident Policy. They are the same as those of U.S.A [4] which address the limits of the prompt fatalities to the individual and cancer fatalities to the public near a nuclear power plant in terms of risks resulting from all other accidents. To achieve the safety goals, the subsidiary performance objectives for severe accident prevention and consequence mitigation will be established after completion of conducting and reviewing the PSA for all operating nuclear power plants.

#### 2.2 Probabilistic Safety Assessment (PSA)

Seven documents on PSA and three documents on Risk Monitor (RM) were submitted for review. The PSA documents are for Kori-1, Kori-2, Kori-3&4,

Wolsung-1, Yonggwang-1&2, Yonggwang-3&4 and Ulchin-3&4 and the RM documents are for Kori-3&4, Yonggwang-3&4 and Ulchin-3&4. The KINS' review report on PSA for Kori-1 is near completion, and review reports on PSA and RM for the others are to be issued by the first half of the next year. The schedule of PSAs for the remaining nuclear power plants (NPPs) is summarized in Table 1.

Table 1. PSA schedule for the remaining NPPs

|               | New PSA        | PSA Update     |
|---------------|----------------|----------------|
| Kori-1        |                | '05.6 ~ '07.5  |
| Wolsung-1     |                | '06.7 ~ '07.6  |
| Kori-2        |                | '06.1 ~ '06.12 |
| Ulchin-1&2    | '04.2 ~ '05.12 |                |
| Wolsung-2&3&4 |                | '05.1 ~ '06.6  |
| Yonggwang-5&6 |                | '04.7 ~ '05.6  |
| Ulchin-5&6    |                | '05.1 ~ '05.12 |

#### 2.3 Severe Accident Prevention and Mitigation Capability

As a part of the implementation items of the Policy, MOST required the utility to incorporate the evaluation of severe accident prevention and mitigation capability into SAMP for each plant. For the existing plants, KINS has been examining the capability via the review on PSA results and SAMPs. The preliminary review results show that the detailed evaluations are not included in the current SAMPs. For new plants, the utility describes some measures against severe accident in the Safety Analysis Report according to the TMI action items (10CFR50.34(f)) and the follow-up actions of the previous licensing. The Safety Review Guideline 19.2, developed in 2004, will be the basis of the KINS' review.

#### 2.4 Severe Accident Management Program(SAMP)

The utility has a plan to implement SAMPs to all the operating plants by 2008. As of August 2005, SAMPs have been developed for 14 units, i.e., the Korean Standard type PWRs or Westinghouse-type PWRs. The SAMPs for Ulchin-1&2, and the Framatom-type PWRs are in preparation. Since 2003, KINS has been reviewing documents for 12 units in regard to SAMPs: Technical Basis Report and Guideline, Writers' Guideline, Training Program, V/V Program, and the SAMP Implementation Program for each plant. The main concern of the review is whether the plant specific

features are taken into account in the SAMPs and the SAMPs are appropriately verified and implemented.

### 3. Future Prospects of Severe Accident Policy

The Severe Accident Policy has been contributing to provide measures to cope with a severe accident of nuclear power plants. Most of the KHNP's current plan for implementation of the Policy will be completed by the end of 2007. Some remaining actions, such as establishment of subsidiary safety goals, conduction of PSAs not only for the new plants but also for the currently operating plants on a periodical basis, implementation of risk monitoring program, and continuous improvement of severe accident management program, will be required after the completion of the current plan. Therefore, new strategy for those actions should be established. For this purpose three ways are searched; extension of the utility's current implementation plan, provision of new regulations concerning severe accident, no action concerning the Policy but implementation according to other regulations or practices.

#### 3.1 Extension of Current Implementation Plan

In order to conduct the follow-up actions after completion of the KHNP's current plan, an extended implementation plan may be required. It should include plans for the utility concerning periodic conduction of PSA, etc. KINS will also be required to establish the subsidiary safety goals and measures for their application to its regulation activities. However, these plans have limitation in its coverage of applicable plants, i.e., it can only be applied to plants that are operating and planned at the time of establishment of the plan. Therefore, it may not be a permanent solution to implement the required follow-up actions of the Policy. Periodical update of a five or ten-year plan may be necessary, but there will be a limit for administrative measures to be effective for such a long period.

#### 3.2 Provision of New Severe Accident Regulations

It seems that legislation of the contents of the Severe Accident Policy is a prolonged solution to prevent the reiterate problem described in Sec. 3.1. Although regulation based on a statute could be considered as a burden for the utility, compared with an administrative measure based on a policy, it could be an effective way to cover all the NPPs including the future ones for conduction and review of new and periodic PSAs and update of the SAMPs during operation. KINS has drafted regulations for these measures. The main idea of the draft is as follows;

- 1) Provision of a new chapter, Ch. 19, of the Safety Analysis Report that includes PSA, assessment of severe accidents prevention and mitigation capability, and severe accident management

- 2) Provision of acceptance criteria for the above requirement
- 3) Inclusion of severe accident management guidelines into operation procedures and provision of a new regulation that requires periodic PSAs and implementation of SAMPs for the operating plants

Considering the uncertainties in severe accident assessment, it would be better to provide basic legal requirements rather than detailed technical ones.

#### 3.3 Closure of Severe Accident Policy Implementation

Closure of the Severe Accident Policy without additional requirements can be one approach. Even in this case the required follow-up actions should be dealt with in the other regulations such as ones for Periodic Safety Review (PSR) or in association with the risk-informed regulation policy. Although there was a recommendation by the Nuclear Safety Commission to include PSA results into PSR, readiness of the utility and the regulatory body has not been sufficiently established yet.

## 4. Discussions

Among the three approaches for the next stage of the Policy, legislation of its contents seems to be the best way in terms of effectiveness in continuous implementation of the necessary follow-up actions. The decision is relied on the judgment of the Government through experts' reviews.

## 5. Conclusion

The Severe Accident Policy has been contributing to provide measures to overcome a severe accident of nuclear power plants through the implementation of PSAs and SAMPs. Before completion of the utility's current implementation plan, new approach for the remaining follow-up actions should be determined. Three ways were searched, among which legislation of the Policy is considered to be the most effective way.

## REFERENCES

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