

An Independent Review of PSAs for Accident Management Plan

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1. Introduction

The independent review has performed to the five types of domestic nuclear power plant(NPP) probabilistic safety assessment(PSA) developed for accident management plan(AMP). The purpose of this review process is to check the technical adequacy and quality of each NPP PSA has submitted for AMP regulation. This review process was performed based on U.S ANS/ASME PRA standard and includes the review of internal and external event PSA. In this study, the review results and insights for an internal PSA are presented.

2. Independent Review Process

The AMP PSA independent review process has performed based on U.S ASME/ANS PRA standard and NEI Peer Review Guidance and consist of three stage. The review team was staffed by those who has expertise in various PSA fields and was not participate in the review target PSA. The review team have addressed the general quality and completeness of each AMP PSA for about eight months. The review process was conducted through three stages based on the U.S. NEI Peer Review guide. During two weeks pre on-site review stage, the review team members were provided with each plant PSA reports and related supporting documents and performed initial review of the materials to familiarize with each plant and methodologies used for the PSA model development and to identify need of any additional materials to support the review. During one week on-site review stage, the review team and host team got together in a place to perform the on-site review. During on-site review, the host team explained each plant designs and systems to the review team. A question and answer session followed between the review and the host team for further discussion and clarifications. Then the reviewer started to review the PSA materials starting from internal events PSA for eight technical elements. The review was interactive in nature because as soon as the reviewer had a comment, it was verbally communicated with the host team and a discussion was followed. Some comments had been resolved as the host team showed or provided more information or clarification of which the review had not seen. For minor comments, the reviewer provided only verbal comments and were not documented in the final review report. And then on the final day of the on-site review, the reviewer met with host team and explained the preliminary review results for eight technical elements. Post on-site review process was mainly to

finalize the review report and resolution of comments from the host PSA team on the draft review report and submit the finalized review report to the host team.

3. Independent Review Results

The purpose of the independent peer review process is to assessment the technical capability and adequacy of a PRA according to a set of guidance that establishes a set of minimum requirements presented in ASME/ANS PRA Standard. The ASME/ANS PRA peer review process is a tiered review process in which the reviewer begins with a relatively high level examination of the PRA technical elements(TEs) against the requirements, and progresses successively to additional levels of detail as necessary to ensure the robustness of the PSA model. The final capability category for each SRs have decided through a consensus meeting by review team members.

The independent review results for five types of NPPs internal event PSA are summarized in Table 1. As shown in table 1, some supporting requirements(SRs) were judged not met for the SC(success criteria), QU(quantification) and AS(accident sequence analysis) and IE(initiating event analysis) technical elements, compare to others. The important SRs judged not met for each technical element are as follows.

- 1) The technical basis for the initiating event identification, grouping and frequency estimation process was not sufficient against to SR.
- 2) The dependency modeling for the accident sequence analysis was not sufficient against to SR.
- 3) The justification for success criteria analysis was not meet against to SR.
- 4) The uncertainty analysis and interpretation of quantification process was not against to SR.

The overall weak points of domestic AMP PSA are the documentation for technical basis of each TEs analysis method. The most of the Fact and Observation(identified finding) items pertained to documentation issues. The documentation for model uncertainty and related assumption for all technical elements were not meet SR..

4. Conclusion

The independent review has performed to the five types of domestic nuclear power plant PSA developed

for AMP. The review team assessed the capability category for SRs for the eight internal AMP PSA technical elements based on ASME/ANS PRA Standard and found some weak points of the AMP PSA. The justification for each PSA analysis results and the documentation for that are needed for enhancement of technical adequacy and quality for the AMP PSA.

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REFERENCES

- [1] ASME/ANS RA-Sa-2009, Addenda to ASME/ANS RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications, The American Society of Mechanical Engineers, New York, U.S., February 2009..
- [2] U.S. Nuclear Regulatory Commission, An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities, Regulatory Guide 1.200, Rev. 2, March 2009.
- [3] NEI 00-02, "Probabilistic Risk Assessment (PRA); Peer Review Process Guidance," Rev. A3, Nuclear Energy Institute, Risk-Based Applications Task Force (March, 2000).

Table 1. The Independent PSA Review Results

Technical Element	No. of SR	Type 1 NPP		Type 2 NPP		Type 3 NPP		Type 4 NPP		Type 5 NPP	
		No of Not Met SR	No of Finding(F&O)	No of Not Met SR	No of Finding(F&O)	No of Not Met SR	No of Finding(F&O)	No of Not Met SR	No of Finding(F&O)	No of Not Met SR	No of Finding(F&O)
IE	33	3	3	8	5	5	5	4	3	3	3
AS	21	1	1	4	4	5	5	4	3	1	1
SC	14	1	1	5	6	6	6	6	3	1	1
SY	42	4	4	5	5	7	7	4	3	4	3
HR	35	2	2	5	5	9	7	4	4	2	2
DA	33	2	2	2	1	4	4	4	3	2	2
QU	35	6	2	7	3	8	7	6	5	6	4
LE	41	5	4	4	3	3	3	3	3	5	4
Total	254	24	19	40	32	47	43	35	27	24	20