
REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 434-8352
SRP Section: SRP 19
Application Section: 19.1.
Date of RAI Issue: 03/08/2016

Question No. 19-90

10 CFR 52.47(a)(27) states that a DC application must contain an FSAR that includes a description of the design-specific PRA and its results. In addition, Standard Review Plan (SRP) Chapter 19.0, draft Revision 3, Section IV "Evaluation Findings," Item 3 states "The PRA reasonably reflects the as-designed, as-built, and as-operated plant, and the PRA maintenance program will ensure that the PRA will continue to reflect the as-designed, as-built, and as-operated plant, consistent with its identified uses and applications."

Therefore, in order for the staff to reach an assurance finding on the conformance to SRP Chapter 19.0 regarding PRA maintenance and update, please describe the process for monitoring PRA inputs and tracking the issues/findings (e.g., design changes, peer review findings, staff review findings, model errors, etc.) for which PRA update is needed. Also, describe the process for maintaining and upgrading the PRA to be consistent with the certified design and revise the DCD accordingly.

Response – (Rev.2)

1) Input Monitoring and Issue Tracking:

The resolution of review findings and other model issues is controlled by the procedure for "Risk Management Engineering Peer Reviews, Independent Reviews and Self Assessments (EP-6.47)." Identified findings are entered into an appropriate tracking database for timely resolution. Minor items may be resolved by periodic updates (nominally every four years), while significant issues will be addressed immediately.

2) PRA Maintenance and Upgrade:

The "Risk Management Engineering Procedure (EP-6.40)," specifies that the scope, level of detail, and capability of each risk model shall be commensurate with its intended use. Procedure for "Risk Management Engineering Configuration Control

(EP-6.41),” monitors and controls PRA model conformance with the ASME/ANS standards and Regulatory Guide 1.200. This procedure explicitly requires that the risk models shall represent the “...as-designed, as-built, as-operated...plant to the extent needed to support the risk applications.” Periodic risk model upgrades will be evaluated to support this ongoing requirement. Model documentation is controlled by the Procedure for “Risk Management Engineering Documentation (EP-6.42).” PRA staff qualifications are controlled by the Procedure for “Risk Management Engineering Training and Certification (EP-6.45).” Model use is controlled by the Procedure (DC-DG-03-24) for “Risk Management Procedure,” for risk assessments, risk applications and risk management configuration control which ensures compliance with applicable regulatory requirements, codes & standards for a design certification application.

DC-DG-03-24 and EP's are uploaded in ERR (location : 01 PRA/SA/RAP – Audit / No_11 / 04_EP)

Impact on DCD

The DCD will be revised as shown in the Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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- a. Monitor PRA inputs and collect any new information relevant to the PRA.
- b. Maintain and upgrade the PRA to be consistent with the design.
- c. Consider cumulative impacts of pending changes when applying the PRA.
- d. Consider impacts of changes for previously implemented risk-informed decisions that used the PRA (e.g., RAP).
- e. Maintain configuration control of the computational methods used to support the PRA.
- f. Document the PRA model and processes.

To meet the guidance of NRC RG 1.206 (Reference 10), the PRA should be maintained to provide reasonable assurance that it reasonably reflects as-designed, as-to-be-built, and as-to-be-operated conditions. A COL applicant that references the APR1400 design certification needs to describe the plant-specific PRA maintenance and upgrade program.

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19.1.3 Special Design/Operational Features

Design and operational characteristics of the APR1400 that result in improved plant safety as compared to currently operating nuclear power plants, include the following:

- a. An in-containment refueling water storage tank (IRWST)
- b. A four-train safety injection system (SIS) that injects borated water directly into the reactor vessel (RV) through direct vessel injection (DVI) nozzles
- c. Four pumps for component cooling water and essential service water systems (CCWS and ESWS)
- d. An emergency containment spray backup system (ECSBS)
- e. A cavity flooding system (CFS)
- f. A hydrogen control system (HG)

The PRA has influenced the selection of design changes such as:

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In order to achieve these objectives, the following controls are established to track and correct identified model issues by DC-DG-03-24, “Risk Management Procedure” (Reference 59).

Input Monitoring and Issue Tracking: The resolution of review findings and other model issues is controlled by the procedure, “Risk Management Engineering Peer Reviews, Independent Reviews and Self Assessments” (Reference 59). Identified findings are entered into an appropriate tracking database for timely resolution. Minor items may be resolved by periodic updates, while significant issues will be addressed **immediately**.

PRA Maintenance and Upgrade: the “Risk Management Engineering Procedure” (Reference 59), specifies that the scope, level of detail, and capability of each risk model to be commensurate with its intended use. Therefore, “Risk Management Engineering Configuration Control” (Reference 59), monitors and controls PRA model conformance with the ASME/ANS standards and Regulatory Guide 1.200. This procedure explicitly requires that the risk models shall represent the “...as-designed, as-built, as-operated...plant to the extent needed to support the risk applications.” Periodic risk model upgrades will be evaluated to support this ongoing requirement. Model documentation is controlled by “Risk Management Engineering Documentation” (Reference 59). PRA staff qualifications are controlled by “Risk Management Engineering Training and Certification” (Reference 59). Model use is controlled by DC-DG-03-24, “Risk Management Procedure” (Reference 59), for risk assessments, risk applications and risk management configuration control.

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42. NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," U.S. Nuclear Regulatory Commission, November 2009.
43. EPRI 1016735, "Fire PRA Methods Enhancements: Additions, Clarifications, and Refinements to EPRI 1019189," Electric Power Research Institute, December 2008.
44. NUREG/CR-4527, "An Experimental Investigation of Internally Ignited Fires in Nuclear Power Plant Control Cabinets, Part II: Room Effects Tests," U.S. Nuclear Regulatory Commission, April 1987.
45. Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, September 1976.
46. EPRI 1021086, "Pipe Rupture Frequencies for Internal Flooding Probabilistic Risk Assessments (PRAs)," Electric Power Research Institute, October 2010.
47. NUREG/CR-6144 (BNL-NUREG-52399), "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1," U.S. Nuclear Regulatory Commission, June 1994.
48. Inspection Manual Chapter 0609, Appendix G, "Shutdown Operations Significance Determination Process," U.S. Nuclear Regulatory Commission, February 2005.
49. NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Energy Institute, July 2000.
50. NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," Rev. 0, Nuclear Energy Institute, July 2005.
51. CAFTA 6.0b, Software Manual, EPRI, Palo Alto, CA, 2014.
52. NUREG/CR-7114, "A Framework for Low Power/Shutdown Fire PRA," U.S. Nuclear Regulatory Commission, September 2013.
53. NUREG/CR-7150, "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)," May 2014.

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59. Procedure DC-DG-03-24, "Risk Management Procedure."