REQUEST FOR ADDITIONAL INFORMATION

PRESSURIZED WATER REACTOR OWNERS GROUP

TOPICAL REPORT PWROG-14001-P, REVISION 1 "PRA MODEL FOR THE GENERATION III WESTINGHOUSE SHUTDOWN SEAL"

TAC NO. MF4397

RAI-APHB-11

Westinghouse Electric Company (Westinghouse) designed the SHIELD® Passive Thermal Shutdown Seal (Generation III SDS) to address the potential for a loss-of-coolant accident (LOCA) that could occur if both seal injection and seal cooling fail, and result in a consequential failure of the reactor coolant pump (RCP) seals. The statistical failure probabilities of the Generation III SDS proposed by the Pressurized Water Reactor Owners Group (PWROG) were derived from test data as described in TR-FSE-14-1-P, Revision 1, "Use of Westinghouse SHIELD® Passive Shutdown Seal for FLEX Strategies," March 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14084A496). In accordance with TR-FSE-14-1-P, Revision 1, Westinghouse has tested a Generation III SDS that has been in service for one cycle (approximately 18 months) in October 2015 as part of the final step in the qualification.

The Generation III SDS failure is characterized by a constant failure on demand probability and will provide significant risk reductions compared to the current RCP seal packages for plants that are crediting them in risk-informed licensing actions. Standby components, such as the Generation III SDS, may experience a standby failure rate which would cause the failure on demand to increase over time. Periodic actuation tests such as those described in the in-service testing programs are generally applied to stand-by equipment to provide confidence that the demand failure probability remains constant. However, periodic actuation testing is not feasible for this device because such test is destructive and requires the component to be removed from service. The PWROG has not provided performance monitoring strategies that will be utilized to verify the assumptions and analyses supporting the associated failure rate of the Generation III SDS. Without additional testing and inspections, the NRC staff cannot conclude that the PWROG has provided sufficient technical bases supporting the proposed demand failure probability throughout the lifetime of the seal. A few industry-wide tests, in which the Generation III SDS is exposed to actual service environments for varying periods of time, would support the proposal that the demand failure probability remains constant throughout its design service life. The NRC staff is requesting that the PWROG provide the following additional information:

- Provide a post-service testing plan for the Generation III SDS assemblies to address the lack of operating experience for in-service conditions.

- Include the rationale for the proposed number of post-service tests and the exposure times associated with each of the test specimen.

Enclosure

- If any actual in-service demands to actuate due to loss of seal cooling event will be credited for an actuation test, clarify the process and criteria that will be used to identify which planned actuation test will be credited.

- Clearly indicate whether a test that fails due to issues with the test facility will be repeated to obtain a valid test result.

RAI-APHB-12

Topical Report (TR) PWROG-14001-P/NP, Revision 1, "PRA Model for the Generation III Westinghouse Shutdown Seal" (ADAMS Accession No. ML14190A329), as supplemented by letters dated September 29, 2014, and March 3, 2015 (ADAMS Accession Nos. ML14280A117 and ML15068A014, respectively), has been discussed and clarified in several meetings between the NRC staff and the PWROG. It has been determined that the following supplements to the TR are required:

- Provide a discussion of the performance monitoring strategies that will be utilized to verify the assumptions and analyses supporting the associated failure rates of the Generation III SDSs, considering:

    - Post-service testing (see RAI-APHB-11)

    - Identify inspections that will be performed for the Generation III SDS assemblies when they are in service, during normal maintenance, or during replacement.

        - Clarify whether inspections will be performed to identify inadvertent actuations.

        - Clarify whether inspections will be performed to identify any unexpected debris, wear, or corrosion products.

- Identify the process that will be followed if a SHIELD® failure (e.g., inadvertent actuation, failure to actuate, failure to remain sealed, etc.) is identified during operation, maintenance, replacement, or post-service testing.

    - Provide the justifications for the inclusion of a "random failure" result, given a robust root-cause analysis is not likely to result in a "random failure" conclusion.

    - If credit is proposed for "random" failures, clearly identify the process which will be followed to reach the conclusion that the failure is indeed "random." Describe the steps that will be taken to ensure that failures that are not completely understood, but may be attributable to a design deficiency or test facility issue, are not attributed as a "random failure."

- Provide information about radiation qualification for the Generation III SDS actuator.