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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002809

March 5, 2010

Subject: AP1000 Response to Proposed Open Item (Chapter 3)

Westinghouse is submitting the following responses to the NRC open item (OI) on Chapter 3. These proposed open item responses are submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in these responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following proposed Open Item(s):

OI-SRP3.9.6-CIB1-02 R2
OI-SRP3.9.6-CIB1-06 R1

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk, Manager
Licensing and Customer Interface
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/Enclosure

1. Response to Proposed Open Item (Chapter 3)

D063
NRO

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ENCLOSURE 1

AP1000 Response to Proposed Open Item (Chapter 3)

AP1000 DESIGN CERTIFICATION REVIEW

Response to SER Open Item (OI)

RAI Response Number: OI-SRP3.9.6-CIB1-02
Revision: 2

Question:

The DCD reference to static testing identified in RAI-SRP3.9.6-CIB1-08 needs to be consistent with the JOG MOV Program, which might require dynamic testing based on the results of the evaluation of the MOV margin.

Westinghouse Response:

Based on a review of the JOG report, MPR-2524, revision 0, the only time a dynamic test is required is if the functional margin is based on a coefficient of friction less than the "threshold" value (with allowance) is applied and the resulting functional margin is less than zero (see page 7-18). In the "Power-Operated Valve Operability Tests" discussion in DCD subsection 3.9.6.2.2, Valve Testing, a commitment to perform a "combination of static and dynamic tests" is included.

The current language in DCD subsection 3.9.6.2.2 of "Meet" or "Do not meet" JOG is not clear. The JOG document has many variables and the end user can opt out of using the "threshold" values. The DCD revision markup shown below is provided to clarify the requirements for the AP1000.

Response Revision 1:

The current language in DCD subsection 3.9.6.2.2 has been clarified to be consistent with the guidance set forth in the JOG MOV Program.

Response Revision 2:

The DCD revisions shown below have also been revised only to add the Supplemental SER to Reference 38.

Design Control Document (DCD) Revision (The Revision 2 changes shown below supersede the changes shown in Revision 1):

Revise the discussion of "Power-Operated Valve Operability Tests" in Revision 17 of DCD Subsection 3.9.6.2.2 as shown below. This revision includes revisions that also address both OI-SRP3.9.6-CIB1-03 and OI-SRP3.9.6-CIB1-04.

> **Power-Operated Valve Operability Tests** - The safety-related, power-operated valves (POVs) are required by the procurement specifications to have the capabilities to perform

diagnostic testing to verify the capability of the valves to perform their design basis safety functions. ~~Operability t~~Testing as required by 10 CFR 50.55a(b)(3)(ii) is performed on motor-operated valves (MOVs) that are included in the ASME OM Code inservice testing program to demonstrate that the MOVs are capable of performing their design basis safety function(s). Table 3.9-16 identifies valves that will require valve operability testing. ~~For POVs that meet the JOG MOV Program requirements, the initial test frequency will be consistent with the JOG MOV Program based on the valve risk ranking and margin.~~

~~The POVs meeting the JOG MOV Program will be statically tested consistent with MPR-2524-A with a maximum test frequency of once every 10 years.~~

~~For POVs that do not meet the JOG MOV Program, the initial test frequency will be based on the functional margin determined from QME-1 and baseline testing with supplementary analysis covering uncertainties and risk ranking. The initial test frequency shall be in accordance with OMN-1, paragraph 3.3.1, until sufficient data is collected. The POVs that do not meet the JOG MOV Program will have a combination of static and dynamic tests performed to confirm operability and develop the basis for future testing. See subsection 3.9.8.4 for a discussion on developing the inservice test program, which will also include analysis of trends of valve test parameters resulting from the valve operability.~~

POVs will be tested at periodic frequencies consistent with the Joint Owners Group (JOG) MOV Periodic Verification (PV) Program (MPR-2524-A, Reference 37; see also NRC Safety Evaluation on periodic verification, Reference 38). This approach utilizes POV risk ranking and functional margin as its basis.

The initial test frequency of POVs shall be in accordance with applicable ASME OM Code Cases and the OM Code. The use of ASME OM Code Cases is consistent with NRC Regulatory Guide 1.192, Operation and Maintenance Code Case Acceptability, ASME OM Code. This approach may utilize POV risk ranking and functional margin as its basis. The initial functional margin shall be determined from ASME QME-1 (Reference 36) and baseline testing with supplementary analysis covering uncertainties and risk ranking.

- Risk Ranking

  The risk ranking shall consist of calculating the at-power risk importance, developing component ranking worksheets, and conducting an expert panel review.

- Functional Margin

  The functional margin for POVs will use the methodology in the JOG MOV Program considering the valve design features, material of construction, operating parameters, actuator capability, and uncertainties. The uncertainties shall consider degradations, and variations of diagnostic measurements and control logic. ~~For the POVs that do not meet the JOG MOV Program, the functional margin will be~~

~~determined by analysis and supplemented by QME-1 testing with uncertainties taken into account.~~

~~Valves for which functional margins have not been determined due to the use of different valve design features, materials of construction, operating parameters, actuator capability, and other uncertainties will require a dynamic test program (differential pressure testing) to determine the appropriate margins.~~

Add the following references to Subsection 3.9.9, References:

36. ASME-QME-1-2007, Qualification of Active Mechanical Equipment Used in Nuclear Power Plants.

37. MPR-2524 "Joint Owners' Group (JOG) Motor Operated Valve Periodic Verification Program Summary," Revision A, November 2006.

38. Final Safety Evaluation by the Office of Nuclear Reactor Regulation Joint Owners' Group Program On Periodic Verification Of Design-Basis Capability of Safety-Related Motor-Operated Valves Project Nos. 691, 693, and 694, U. S. Nuclear Regulatory Commission, September 2006 (ADAMS Accession Number ML061280315) and its Supplement, September 2008 (ADAMS Accession Number ML082480638).

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 DESIGN CERTIFICATION REVIEW

Response to SER Open Item (OI)

RAI Response Number: OI-SRP3.9.6-CIB1-06
Revision: 1

Question:

In RAI-SRP3.9.6-CIB1-09, the NRC staff requested that Westinghouse clarify the discussion of the AP1 000 IST Program to support implementation of the AP1000 DCD provisions for check valves by a COL applicant referencing the AP1 000 reactor design. In its response to this RAI in a letter dated September 9, 2008, Westinghouse stated that all AP1000 check valves can be full stroke exercised with flow without the need for nonintrusive techniques. In the future, Westinghouse stated that a licensee might use nonintrusive techniques in accordance with ASME OM Code, Subsection ISTC-5221, "Valve Obturator Movement." Westinghouse specified that the acceptance criteria for assessing individual valve performance will be based on full open (full disk lift or achieving design accident flow rates) and valve closure verification using differential pressure/backflow tests. Westinghouse noted that all check valves can be exercised to verify open and closed functionality, except as indicated in response to RAI-SRP3.9.6-CIB1-12. Westinghouse stated that it is anticipated that Appendix II, "Check Valve Condition Monitoring Program," of the ASME OM Code will be implemented after sufficient operational data are obtained for the AP1000 check valves. The NRC staff considers the RAI response to be acceptable, but that the AP1000 DCD needs to include the specified acceptance criteria for check valve testing. Further, the reference in the RAI response to RAI-SRP3.9.6-CIB1-12 needs to be clarified.

Westinghouse Response:

The AP1000 check valves (except PXS-V119A/B) included in the Inservice Testing Program may be tested with flow in accordance with the requirements set forth in ASME OM Code ISTC-5221(a), (1), (2), or (3). The acceptance criteria for both the open and closed tests are indicated in the Table 1 below. All valves are tested open with flow to the position required for full disk opening except as indicated by Note (1). Those valves indicated by Note (1) are tested to their maximum accident flow rates.

Check valves PXS-V119A/B (Note 2) are tested using a mechanical exerciser in accordance with ASME OM Code ISTC-5221(b). DCD Table 3.9-16, Note 11, will be revised to clarify the use of a mechanical exerciser.

DCD Section 3.9.6.2.2, Check Valve Tests will be revised to clarify the acceptance criteria for assessing individual check valve performance as indicated below.

Table 1, Check Valves included in the AP1000 Inservice Testing Plan

Valve	Open	Closed
CVS-V100 (1)	2.0 gpm	1 cc/hr
CAS-V015	147.5 scfm	2 cc/hr
PSS-V024	13.9 scfm	1 cc/hr
DWS-V245	18.4 gpm	2 cc/hr
CVS-V085	100 gpm	1 cc/hr
RNS-V015A/B	627.2 gpm	6 cc/hr
PCS-V039	377.0 gpm	4 cc/hr
WLS-V071A/B/C	377.0 gpm	4 cc/hr
WLS-V072A/B/C	377.0 gpm	4 cc/hr
CVS-V080	176.0 gpm	3 cc/hr
CVS-V082	176.0 gpm	3 cc/hr
SFS-V037	1200.0 gpm	4 cc/hr
CAS-V205	657.0 scfm	3 cc/hr
PXS-V028A/B	1078.0 gpm	8 cc/hr
PXS-V029A/B	1078.0 gpm	8 cc/hr
PXS-V119A/B (2)	19 ft-lbs	Positive Indication
RNS-V013	1086.0 gpm	8 cc/hr
PXS-V016A/B	0 gpm	8 cc/hr
PXS-V017A/B	0 gpm	8 cc/hr
VWS-V062	945.0 gpm	8 cc/hr
RNS-V017A/B	629.2 gpm	6 cc/hr
SFS-V071A/B	863.4 gpm	6 cc/hr
FPS-V052	860.0 gpm	6 cc/hr
CCS-V201	2343.0 gpm	10 cc/hr
PXS-V122A/B (1)	629.0 gpm	8 cc/hr
PXS-V124A/B (1)	629.0 gpm	8 cc/hr

Westinghouse Response (Revision 1):

A revision to DCD Table 3.9-16, Note 11, is included to clarify that the test device used for the containment recirculation check valves (PXS-V119A/B) is a mechanical exerciser.

Design Control Document (DCD) Revision (Revision 0 changes):

Revise the Check Valve Exercise Tests discussion of DCD Subsection 3.9.6.2.2 as shown below.

> **Check Valve Exercise Tests** - Safety-related check valves identified with specific safety-related missions to transfer open or transfer closed or maintain close are tested periodically. Category C check valves are exercised to both the open and closed positions regardless of safety function position in accordance with ASME OM Code ISTC. The exercise test shows that the check valve opens in response to flow and closes when the flow is stopped. Sufficient flow is provided to fully open the check valve unless the maximum accident flows are not sufficient to fully open the check valve. During the exercise test, valve obturator position is verified by direct measurements using nonintrusive devises or by other positive means (i.e., changes in system pressure, temperature, flow rate, level, seat leakage, or nonintrusive tests results). The acceptance criteria for assessing individual valve performance will be based on full open (full disk lift or achieving design accident flow rates) and valve closure verification using differential pressure/backflow tests. Valves that cannot be checked using a flow test may use other means to exercise the valve to the open and closed position.

Design Control Document (DCD) Revision (Revision 1 changes in addition to the Revision 0 change above):

Revise DCD Table 3.9-16, Note 11, as shown below.

11. This note applies to the PXS containment recirculation check valves (PXS-V119A/B). Squib valves in line with the check valves prevent the use of IRWST water to test the valves. To exercise these check valves an operator must enter the containment, remove a cover from the recirculation screens, and insert a test device (a mechanical exerciser) into the recirculation pipe to push open the check valve. The test device is made to interface with the valve without causing valve damage. The test device incorporates loads measuring sensors to measure the initial opening and full open force. These valves are not exercised during power operations because of the need to enter highly radioactive areas and because during this test the recirculation screen is bypassed. These valves are not exercised during cold shutdown operations for the same reasons. These valves are exercised during refueling conditions when the recirculation lines are not required to be available by Technical Specifications LCOs 3.5.7 and 3.5.8 and the radiation levels are reduced.

PRA Revision:
None

Technical Report (TR) Revision:
None