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Your ref: Docket No. 52-006
Our ref: DCP/NRC2255

September 9, 2008

Subject: AP1000 Response to Request for Additional Information (SRP3.9.6)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 3.9.6. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

A response is provided for RAI-SRP3.9.6-CIB1-02,-03,-04,-08,-09,-10,-12 and -20, as sent in emails from Mike Miernicki to Sam Adams dated April 4, 2008 and April 23, 2008. This response completes all requests received to date for SRP Section 3.9.6. A response for RAI-SRP3.9.6-CIB1-13 through -19 was submitted under letter DCP/NRC2213 dated July 24, 2008. A response for RAI-SRP3.9.6-CIB1-01 and -11 was submitted under letter DCP/NRC2207 dated July 18, 2008. A response for RAI-SRP3.9.6-CIB1-05, -06, and -07 was submitted under letter DCP/NRC2200 dated July 14, 2008.

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,

D. A. Lindgren /For

Robert Sisk, Manager
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/Enclosure

1. Response to Request for Additional Information on SRP Section 3.9.6

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NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 3.9.6

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-02
Revision: 0

Question:

Clarify the use of nonintrusive techniques within the IST program. Subsection 3.9.6.2, "Inservice Testing of Valves," in the AP1000 DCD Tier 2 in the third paragraph states that inservice testing incorporates the use of nonintrusive techniques to periodically assess degradation and performance of selected valves.

Westinghouse Response:

This is a similar response as CIB1-19. All valves are capable of being exercised tested, however, due to operational issues of future ASME OM Code changes, it will be the responsibility of the licensee to define the nonintrusive technique and methods for periodic assessment of check valve performance/degradation.

Nonintrusive techniques such as acoustic monitoring, magnetic resonance and ultrasonic are examples of methods which may be used provided they are qualified under the licensee's quality assurance program. In addition, the results of the Nuclear Industry Check valve Group (NIC) may be relied on for the evaluation of nonintrusive techniques.

Design Control Document (DCD) Revision:
Revise the third paragraph of 3.9.6.2 as follows: (Note blue text added in APP-GW-GLN-138 (TR138), Rev 0)

> The valve test program is controlled administratively by the Combined License holder and is based on the plan outlined in this subsection. Valves (including relief valves) subject to inservice testing in accordance with the ASME Code are indicated in Table 3.9-16. This table includes the type of testing to be performed and the frequency at which the testing should be performed. The test program conforms to the requirements of ASME OM, Subsection ISTC, to the extent practical. The guidance in NRC Generic Letters, AEOD reports, and industry and utility guidelines (including NRC Generic Letter 89-04) is also considered in developing the test program. Inservice testing may incorporate~~se~~ the use of nonintrusive techniques to periodically assess degradation and performance of selected check valves. The testing of power operated valves utilizes guidance from Generic Letter 96-05 and the Joint Owners Group (JOG) MOV Periodic Verification (PV) study, MPR 2524-A (November 2006). During the inservice testing period the following are performed to demonstrate the acceptability of the functional performance of power operated valves other than motor-operated valves; (1) periodically assess the diagnostic methods used in the verification for valve function; and (2) evaluation of lessons learned through other related programs such as MOV Generic Letter (GL) 89-10 and (96-05 Programs.

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Response to Request For Additional Information (RAI)

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-03
Revision: 0

Question:

Describe the incorporation of lessons learned from valve programs in planning the IST program for power-operated valves (POVs) other than MOVs. TR 134 modifies the third paragraph in Subsection 3.9.6.2 of Revision 16 to AP1000 DCD Tier 2 by including a statement that POV testing utilizes guidance from Generic Letter 96-05 and the Joint Owners Group (JOG) Program for MOV Periodic Verification, MPR 2524-A (November 2006). TR 134 also includes a statement that during the IST period, the following are performed to demonstrate the acceptability of the functional performance of POVs other than MOVs: (1) periodically assess the diagnostic methods used in the verification for valve function; and (2) evaluation of lessons learned through other related programs such as MOV GL 89-10 and 96-05 Programs.

Westinghouse Response:

The description in the DCD will be revised to clarify that the inservice testing program requirements included in Table 3.9-16 includes the consideration of the guidance identified. The description in the DCD will be revised to describe the updating of the IST program taking into account diagnostic test equipment and methods, emergent industry issues and changes to equipment alignment. The use of Joint Owners Group programs to inform the Inservice Testing Program is already incorporated into the DCD description. A statement will be added to state explicitly that lessons learned are included in inservice testing program requirements and valve procurement testing requirements.

Design Control Document (DCD) Revision:

Revise the third paragraph of 3.9.6.2 as follows: (Note blue text added in APP-GW-GLN-138 (TR138), Rev 0)

> The valve test program is controlled administratively by the Combined License holder and is based on the plan outlined in this subsection. Valves (including relief valves) subject to inservice testing in accordance with the ASME Code are indicated in Table 3.9-16. This table includes the type of testing to be performed and the frequency at which the testing should be performed. The test program conforms to the requirements of ASME OM, Subsection ISTC, to the extent practical. The guidance in NRC Generic Letters, AEOD reports, and industry and utility guidelines (including NRC Generic Letter 89-04) is also considered in developing the test program and is reflected in the inservice testing requirements identified in Table 3.9.16. Inservice testing incorporates the use of nonintrusive techniques to periodically assess degradation and performance of selected valves. The testing of power-operated valves utilizes

guidance from Generic Letter 96-05 and the Joint Owners Group (JOG) MOV Periodic Verification (PV) study, MPR 2524-A (November 2006). The lessons learned from this guidance and study is reflected in the inservice testing program requirements and valve procurement testing requirements. During the inservice testing period, the following are performed to demonstrate the acceptability of the functional performance of power operated valves other than motor-operated valves; (1) periodically assess the diagnostic methods used in the verification for valve function; and (2) evaluation of lessons learned through other related programs such as MOV Generic Letter (GL) 89-10 and 96-05 Programs. The Inservice Test Program requires periodic updating that takes into account changes to diagnostic methods and test equipment, emergent industry issues and equipment alignment.

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-04
Revision: 0

Question:

Clarify the use of static tests for operability determinations of POVs. Subsection 3.9.6.2 in the AP1000 DCD Tier 2 in the fourth paragraph states that the operability test for safety-related POVs with an active function may be either a static or a dynamic (flow and differential pressure) test.

Westinghouse Response:

The response to RAI-SRP3.9.6-CIB1-08 item d addresses the static testing of power-operated valves consistent with the Joint Owner's Group MOV program. Reference to the operability testing in 3.9.6.2.2 will be added to the discussion in 3.9.6.2.

Design Control Document (DCD) Revision:

The fourth paragraph of Subsection 3.9.6.2 will be revised as follows:

> Safety-related check valves with safety function to open or with a safety function to close or remain closed to prevent reverse flow are exercised to both the open and closed positions regardless of safety function position in accordance with the ASME OM Code. Safety-related power-operated valves with an active function are subject to an exercise test and an operability test. The operability test may be either a static or a dynamic (flow and differential pressure) test as described in subsection 3.9.6.2.2, Power-Operated Valve Operability Tests. Refer to subsection 3.9.6.2.1 for additional information.

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-08
Revision: 0

Question:

Clarify the discussion of POV operability in the AP1000 DCD. Subsection 3.9.6.2.2, "Valve Testing," in the AP1000 DCD Tier 2 discusses valve testing in a subsection titled "Power-Operated Valve Operability Tests." TR 134 includes a revision to this subsection that operability testing as required by 10 CFR 50.55a(b)(3)(ii) is performed on MOVs in the ASME OM Code IST program to demonstrate that the MOVs are capable of performing their design-basis safety functions. The areas of clarification are as follows:

a. The use of non-intrusive diagnostic techniques for inservice operability testing of POVs indicated in the first sentence of Subsection 3.9.6.2.2 of the AP1000 DCD Tier 2.

b. The valves to undergo operability testing with regard to the statement in the second sentence of this subsection that Table 3.9-16 identifies valves that may require operability testing.

c. The initial test frequency for periodic design-basis verification of POV capability and its applicability to the JOG Program for MOV Periodic Verification established in response to Generic Letter 96-05.

d. The use of static testing with diagnostic measurements for operability assessments in light of the weaknesses in this approach revealed by valve operating experience and research programs.

e. The approach for determining risk ranking and functional margin as indicated in this DCD subsection, or the application of an approved methodology (such as the JOG program for MOVs).

f. The basis and justification for proposed determination of functional margin without dynamic performance data.

Westinghouse Response:

a. The safety related POVs are required by the procurement specification to have the capabilities to perform non-intrusive diagnostic testing to verify the valves are capable of performing their design basis safety function. Also, the POVs are required to be baseline tested at the factory using non-intrusive test equipment prior to shipment. The diagnostic techniques measure critical parameters and are based on the valve and actuator type. The collected data may include, as appropriate, seat load, running torque

and thrust, valve travel, actuator spring rates, bench setting, air pressures, hydraulic pressures, coil strength, and operating times. These critical parameters in conjunction with uncertainties and margins are used to verify the POV capability to perform its intended safety related functions.

b. POVs identified in Table 3.9-16 as identified under "Inservice Test Type and Frequency" with "Operability Test" will require testing to verify the valve is capable of performing its design basis safety function in lieu of "may require". The sentence will be modified.

c. 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. For POVs that do not meet the JOG MOV Program the initial test frequency will be based on the functional margin determined from the 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.

d. POVs meeting the JOG MOV Program will be statically tested consistent with MPR-2524-A. POVs that do not meet the JOG MOV Program will have a combination of static and dynamic tests performed to confirm operability and to develop the basis for future testing.

e. Risk ranking is not used to develop the base case test frequencies included in DCD Table 3.9-16. Risk ranking is used as part of the inservice testing program to extend the frequency of testing. The COL Information Item in DCD Subsection 3.9.8.4 requires development of an inservice testing program. It is expected that the risk ranking approach developed as part of the Joint Owners Group will be used for the risk ranking.

f. Functional Margin: For POVs that meet the JOG MOV Program the functional margin methodology will be consistent with MPR-2524-A. For POVs that do not meet the JOG MOV Program the functional margin will be determined by analysis and supplemented with QME-1 testing with uncertainties taken into account.

g. The last sentence under Power-Operated Valve Operability Tests will be have the word "may" revised to "will".

Design Control Document (DCD) Revision:

Revise the write-up under the heading Power-Operated Valve Operability Tests in Subsection 3.9.6.2.2 as follows:

Power-Operated Valve Operability Tests - The safety related 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. ~~The inservice operability testing of power-operated valves rely on non-intrusive diagnostic techniques to permit periodic assessment of valve operability at design basis conditions.~~ Operability 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 ~~may~~ 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 specified frequency for operability testing is a maximum of once every 10 years. The initial test frequency is the longer of every 3 refueling cycles or 5 years until sufficient data exists to determine a longer test frequency is appropriate in accordance with Generic Letter 96-05.~~

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~~Static testing with diagnostic measurements will be performed on these valves. The specific frequency for operability testing will be based on the risk ranking and the functional margin of the individual valve.~~ 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 the 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. ~~The factors below are used to determine the risk ranking and functional margin.~~ 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.

- 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 POVs that meet the JOG MOV Program will use the methodology in the JOG MOV Program ~~will be determined~~ 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 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 – ~~may~~ will require dynamic testing (differential pressure testing) to determine the appropriate margins.

Technical Specification Impacts

The Technical Specifications and Technical Specification Bases include references to the Inservice Testing Program. The following shows changes the correct the reference to ASME Code Section XI to the ASME OM Code.

Revise Section 5.5.5 of the Technical Specifications, DCD Section 16.1, as follows:

5.5.3 Inservice Testing Program

This program provides control for inservice testing of ASME Code Class 1, 2, and 3 components including applicable supports. The program shall include the following:

a. Testing frequencies specified in ~~Section XI of~~ the ASME ~~Boiler and Pressure Vessel~~ OM Code and applicable Addenda as follows:

ASME Boiler and Pressure Vessel Code and applicable Addenda Terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days
Monthly	At least once per 31 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days

Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies for performing inservice testing activities;

Revise the Technical Specifications Bases and associated references for SR 3.4.6.1, DCD Section 16.1, as follows:

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

SRs are specified in the Inservice Testing Program. Pressurizer safety valves are to be tested one at a time and in accordance with the requirements of ASME OM Code ~~Section XI~~ (Ref. 4), which provides the activities and Frequency necessary to satisfy the SRs. No additional requirements are specified.
The pressurizer safety valve setpoint is ± 3% for OPERABILITY; however, the values are reset to ± 1% during the Surveillance to allow for drift.

REFERENCES

1. ASME Boiler and Pressure Vessel Code, Section III, NB 7614.3.
2. WCAP-16779, "AP1000 Overpressure Protection Report, April 2007."
3. Chapter 15, "Accident Analyses."
4. ASME ~~Boiler and Pressure Vessel~~ OM Code, ~~Section XI,~~ "Rules for Inservice Inspection of Nuclear Power Plant Components."

Revise the Technical Specifications Bases for SR 3.4.11.3, DCD Section 16.1, as follows:

SR 3.4.11.3

This Surveillance requires verification that each ADS stage 4 squib valve is OPERABLE in accordance with the Inservice Testing Program. The Surveillance Frequency for verifying valve OPERABILITY references the Inservice Testing Program.
The squib valves will be tested in accordance with ~~ASME Section XI which specifies valve testing in accordance with~~ the ASME OM Code. The applicable ASME OM Code squib valve requirements are specified in paragraph 4.6, Inservice Tests for Category D Explosively Actuated Valves. The requirements include actuation of a sample of the installed valves each 2 years and periodic replacement of charges.

Revise the Technical Specifications Bases and associated references for SR 3.4.14.4, DCD Section 16.1, as follows:

SR 3.4.14.4

The RNS suction relief valve shall be demonstrated OPERABLE by verifying that two RNS suction isolation valves in one flow path are open and by testing it in accordance with the Inservice Testing Program. (Refer to SR 3.4.14.2 for the RNS suction isolation valve Surveillance.) This Surveillance is only required to be performed if the RNS suction relief valve is being used to meet this LCO. The ASME OM Code~~, Section XI~~ (Ref. 5), test per Inservice Testing Program verifies OPERABILITY by proving proper relief valve mechanical motion and by measuring and, if required, adjusting the lift setpoint.

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix G, "Fracture Toughness Requirements."
2. Generic Letter 88-11, "NRC Position on Radiation Embrittlement of Reactor Vessel Materials and Its Impact on Plant Operation."
3. ASME Boiler and Pressure Vessel Code, Section III.
4. Section 5.2.2, "Overpressure Protection."
5. ASME, ~~Boiler and Pressure Vessel~~OM Code Rules for Inservice Inspection of Nuclear Power Plant Components~~, Section XI~~.

Revise the final paragraph of the Technical Specifications Bases and associated references for SR 3.4.15, DCD Section 16.1, as follows:

Testing shall be performed every 24 months, a typical refueling cycle. The 24 month Frequency is consistent with 10 CFR 50.55a(g) (Ref. 4) as contained in the Inservice Testing Program and is within frequency allowed by the American Society of Mechanical Engineers (ASME) OM Code~~, Section XI~~ (Ref. 5).

REFERENCES

1. 10 CFR 50.2.
2. 10 CFR 50.55a(c).
3. 10 CFR 50, Appendix A, Section V, GDC 55.

4. 10 CFR 50.55a(g).

5. ASME~~,~~ ~~Boiler and Pressure Vessel~~ OM Code, Rules for Inservice Inspection of Nuclear Power Plant Components ~~Section XI~~.

Revise the Technical Specifications Bases for SR 3.5.6.7, DCD Section 16.1, as follows:

SR 3.5.6.7

This Surveillance requires verification that each IRWST injection and each containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program. The Surveillance Frequency for verifying valve OPERABILITY references the Inservice Testing Program. The squib valves will be tested in accordance with ~~ASME Section XI which specifies valve testing in accordance with~~ the ASME OM Code. The applicable ASME OM Code squib valve requirements are specified in paragraph 4.6, Inservice Tests for Category D Explosively Actuated Valves. The requirements include actuation of a sample of the installed valves each 2 years and periodic replacement of charges.

Revise the Technical Specifications Bases and associated references for SR 3.7.1.1, DCD Section 16.1, as follows:

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

This SR verifies the OPERABILITY of the MSSVs by the verification of each MSSV lift setpoint in accordance with the Inservice Testing Program. The ~~ASME Code, Section XI (Ref. 4), requires that~~ safety and relief valve tests are required to be performed in accordance with ASME OM Code (Ref. 5). According to Reference 5, the following tests are required:

a. Visual examination;

b. Seat tightness determination;

c. Set pressure determination (lift setting);

d. Compliance with owner's seat tightness criteria; and

e. Verification of the balancing device integrity on balanced valves.

REFERENCES

1. Chapter 10, "Steam and Power Conversion Systems Description."
2. ASME Boiler and Pressure Vessel Code, Section III, Article NC-7000, "Overpressure Protection," Class 2 Components.
3. Section 15.2, "Decreased Heat Removal by Secondary System."
4. ASME Boiler and Pressure Vessel Code, Section XI, Article IV-3500, "Inservice Test: Category C Valves."
5. ASME OM Code-1995 and Addenda through the 1996 Addenda, "Code for Operation and Maintenance of Nuclear Power Plants."
6. NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam System," August 22, 1994.

Revise the Technical Specifications Bases and associated references for SR 3.7.2.1, DCD Section 16.1, as follows:

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

This SR verifies that MSIV closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. The MSIV isolation time is assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. The MSIVs should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the MSIVs are not tested at power, they are exempt from the ASME OM Code~~, Section XI~~ (Ref. 7), requirements during operation in MODE 1 or 2.

Revise the Technical Specifications Bases and associated references for SR 3.7.2.2, DCD Section 16.1, as follows:

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.2.2

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This SR verifies that the turbine stop, turbine control, turbine bypass, and moisture separator reheat supply steam isolation valves' closure time is ≤ 5.0 seconds, on an actual or simulated actuation signal. These alternate downstream isolation valves must meet the MSIV isolation time assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. The alternate downstream valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. As the alternate downstream valves are not tested at power, they are exempt from the ASME OM Code, ~~Section XI~~ (Ref. 7) requirements during operation in MODE 1 or 2.

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REFERENCES

1. Section 10.3, "Main Steam System."
2. Section 6.2.1, "Containment Functional Design."
3. Section 15.1, "Increase in Heat Removal by Secondary System."
4. Section 10.2, "Turbine Generator."
5. NUREG-138, Issue 1, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff."
6. Section 10.4, "Other Features of Steam and Power Conversion Systems."
7. ASME ~~Boiler and Pressure Vessel~~OM Code, « Code for Operation and Maintenance of Nuclear Power Plants" ~~Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."~~

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Revise the Technical Specifications Bases and associated references for SR 3.7.3.1, DCD Section 16.1, as follows:

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1

This SR verifies that the closure time of each MFIV and MFCV is ≤ 5.0 seconds, on an actual or simulated actuation signal. The MFIV and

MFCV isolation times are assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage. These valves should not be tested at power, since even a part stroke exercise increases the risk of a valve closure when the unit is generating power. This is consistent with the ASME OM Code~~, Section XI~~ (Ref. 2), quarterly stroke requirements during operation in MODE 1 or 2.
The Frequency is in accordance with the Inservice Testing Program.
The test is conducted in MODE 3 with the unit at operating temperature and pressure. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows a delay of testing until MODE 3, to establish conditions consistent with those under which the acceptance criterion was generated.

REFERENCES

1. Section 10.4.7, "Condensate and Feedwater System."

2. ASME, ~~Boiler and Pressure Vessel~~ OM Code, Rules for Inservice Inspection of Nuclear Power Plant Components ~~Section XI.~~

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-09
Revision: 0

Question:

Clarify the discussion of the IST program for check valves in the AP1000 DCD. The subsection titled "Check Valve Tests," in Subsection 3.9.6.2.2 of Revision 16 to the AP1000 DCD Tier 2 provides a brief discussion of check valves within the IST program at a nuclear power plant with an AP1000 reactor. TR 134 modifies Subsection 3.9.6.2 and Subsection 3.9.6.2.2 of Revision 16 to the AP1000 DCD Tier 2, to indicate that check valves must be exercised in the open and closed directions. The AP1000 DCD should be clarified for COL applicants incorporating the DCD by reference to provide sufficient information for the NRC staff to perform its review of the IST program description for check valves using the acceptance criteria in SRP Section 3.9.6. The information to be clarified includes (a) description of the preservice and IST for each check valve (including diagnostic equipment or nonintrusive techniques, testing performed under temperature and flow conditions, how test results identify flow required to open the check valve, and how testing includes effects of rapid pump starts and stops and other reverse flow conditions); (b) description of nonintrusive diagnostic techniques to periodically assess degradation and performance characteristics; (c) description of how successful completion of pre-service and IST is assessed (including demonstrating that the disk fully opens or closes, determining disk positions without disassembly, verifying free disk movement, and demonstrating disk is stable in open position); (d) confirmation of system design features accommodate check valve testing requirements; and (e) showing, where applicable, how the IST program meets guidelines of Appendix II to ASME OM Code (including bi-directional testing of check valves).

Westinghouse Response:

a. Individual preservice and inservice test procedures for check valves have not yet been written.
b. All of the AP1000 check valves can be full stroke exercised with flow. Nonintrusive techniques are not required. However, due to operational or future ASME Code changes, nonintrusive techniques may be employed by the licensee as permitted by ASME OM Code Subsection ISTC-5221.
c. Again, individual test procedures are not yet developed. 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.
d. A thorough review of each check valve open and closed test has been performed. Except as indicated in the response to RAI-SRP3.9.6-CIB-12, all check valves can be exercised to verify the open and closed functionality.
e. It is anticipated that Appendix II will be implemented after enough operational data is obtained for the AP1000 check valves. All AP1000 check valves can be tested to verify

both the open and closed positions (bi-directional) as required by ISTC-5221 as well as Appendix II.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-10
Revision: 0

Question:

Provide, or reference the location of, information regarding the safety and relief valves (including their type and test parameters) to be used in the AP1000 reactor. The subsection titled "Pressure/Vacuum Relief Devices," in Subsection 3.9.6.2.2 of the AP1000 DCD Tier 2 provides a brief description of the IST program for pressure and vacuum relief devices.

Westinghouse Response:

Reactor coolant system pressure relief devices are discussed in DCD Subsection 5.4.9. Pressure relief devices for other ASME Code systems are typically identified and described in the DCD system descriptions. ASME Code Class 1, 2, and 3 pressure relief valves are identified in the IST table. All safety and relief valves included in the Inservice Testing Program are required to be tested to the rules of Appendix I of the ASME OM Code. The test requirements such as frequency and the parameters are set forth in Appendix I. The Inservice Testing Program does not differentiate between safety and relief valves since the test requirements are identical. In the case of thermal relief valves, the owner may elect to replace the valves versus test them based on historical test or maintenance history. Therefore the relief valve type is not depicted in Table 3.9-16.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-12
Revision: 0

Question:

Discuss the basis for changes specified in TR 134 to Table 3.9-16, "Valve Inservice Test Requirements," of Revision 16 to AP1000 DCD Tier 2. In particular, discuss the following changes to the table:

Note 2: Addition of the sentence – "Valves with an active-to-failed function shall be tested by observing the operation of the actuator upon loss of valve actuating power. This 'fail-safe' requirement is not otherwise shown and is performed during exercise testing."

Note 20: Deletion of the provision that the main steam isolation valves and main feedwater isolation valves will be partially stroked on a quarterly basis.

Note 33: Deletion of the statement that exercise testing of valve FHS-V001 will be performed during refueling shutdowns prior to removing the fuel transfer tube flange.

Note 38: This note states that the exercise stroke test for the main control room emergency habitability system (VES) pressure regulating valves is the stroke distance sufficient to provide the pressure regulating function.

Westinghouse Response:

Note 2:

See response to RAI-SRP3.9.6-CIB1-15 as follows:

a. In cases where normal valve operator action moves the valve to the open or closed position by de-energizing the operator electrically, by venting air, or both, the exercise test will satisfy the fail safe test requirements and an additional test specific for fail safe testing will not be performed.

   Remote position indication is used as applicable to verify proper fail safe operation, provided that the indication system for the valve is periodically verified in accordance with ISTC-3700.

   The AP1000 Inservice Testing Program valves that fail open or closed upon loss of actuator power use the fail safe mechanism to stroke the valve to its safety position. For example, an air operated valve that fails closed may use air to open the valve against spring force. When the actuator control switch is placed in the closed position, air is vented from the diaphragm and the spring moves the obturator to the closed position.

b. The valves listed in Table 3.9-16 with an Active to Failed Safety Function are inherently designed for only one safety related mission direction. The active mission for these valves is to transfer to their safe position. Therefore the transfer open or transfer close position is the fail position.

Note 20:

The main steam isolation valves and main feedwater isolation valves will not be exercised during power operation since even a partial exercise may result in a plant transient and subsequent trip of the reactor. This is consistent with guidance set forth in NUREG-1482.

Note 33:

FHS-PL-V001 is a manual valve. The frequency for manual valve exercise testing is 2 years per 10 CFR 50.55a(b)(3)(vi). Deletion of the refueling frequency in Note 33 is consistent with this regulation as well as the frequency specified in Table 3.9-16.

Note 38

A stroke test measuring the stem stroke length is not possible for this valve. Testing of this valve will consist of a pressure drop test across the valve using the downstream test connection valve. Note that this testing is augmented since pressure regulating valves are exempt from testing per the ASME OM Code.

Design Control Document (DCD) Revision:
Revise Note 38 to read as follows:

> The exercise stroke test for the VES pressure regulating valves will consist of a pressure drop test across the valve using the downstream test connection. This method ensures adequate testing of the valves. ~~is the stroke distance sufficient to provide the pressure regulating function.~~

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.9.6-CIB1-20
Revision: 0

Question:

TR 134 modifies Table 3.9-16 to identify valve type, operator, class and category. Westinghouse is requested to provide the following information:

a. Discuss why a check valve exercise test is not specified for check valve CAS-PL-V205

b. Valve CVS-PL-V045 is identified as a pressure boundary Category A valve. Are valve leakage requirements other than 10 CFR 50 Appendix J applicable to this valve?

c. Valve CVS-PL-V047 is identified as a pressure boundary Category A valve. Are valve leakage requirements other than 10 CFR 50 Appendix J applicable to this valve?

d. Valve CVS-PL-V081 is identified as an air operated (AO) stop check. Is the air operated stop check operation of the valve a safety related function that requires inclusion in the IST program (stroke time, full stroke exercise of air operator, fail safe, etc)?

e. Valves CVS-PL-V090, V091, V092, and V094 are identified as pressure boundary Category A valves. Are valve leakage requirements other than Appendix J applicable to these valves?

f. Discuss why a check valve exercise test is not specified for check valve DWS-PL-V245.

g. Discuss why a check valve exercise test is not specified for check valve FPS-PL-V052

h. Valves RCS-PL-V010A and V010B are identified as vacuum reliefs with the testing requirements of pressure relief valves (10 years, 20% within 48 months). Vacuum relief valves are required to be tested at least every two years. Discuss the apparent testing discrepancy.

i. Valves VES-PL-V002A and V002B are identified as Category B pressure regulating valves with a partial stroke requirement per Note 38. The OM Code requires full stroke exercising of Category B valves. Discuss the testing requirements for these valves and whether relief from the OM Code is required to test as directed in Note 38.

j. Note 3 states that testing these valves (ADS valves) every cold shutdown is consistent with the AP1000 Probabilistic Risk Assessment (PRA) which assumes more than 2 cold or refueling shutdowns per year. Discuss the relevance of this statement with regard to justifying testing of these valves at cold shutdown. Would testing these valves less than twice a year affect the PRA accident sequences?

k. Note 5 states that squib valve position indication will not be determined by exercising the valves but by local inspection of the position indicators. This testing methodology appears to

require relief from the ASME OM Code. Identify that relief is required from ASME Code requirements or explain why relief is not required from the OM Code position verification testing requirements.

l. Note 32 states that valves CVS-V081, V082, V084, and V085 will be tested at the same time as a group. Are these valves in a series configuration or parallel configuration? If the valves are in a series configuration identify that relief is required from ASME Code requirements or explain why relief is not required from the OM Code leak test requirements.

m. Note 32 states that leak tests will be performed at reduced reactor coolant system (RCS) pressures and that the observed leakage at lower pressures can be assumed to be the leakage at the maximum pressure. This test methodology appears to require relief from the OM Code leak test requirements. Identify that relief is required from ASME Code requirements or explain why relief is not required from the OM Code leak test requirements.

Westinghouse Response:

The responses to the above questions and changes to information in Table 3.9-16 and the notes to the table are provided below.

a. A full stroke exercise during refueling outages will be specified for CAS-PL-V205 as shown In the DCD changes below.

b. No. Valve CVS-PL-V045 is a containment isolation valve and will receive only a 10 CFR Part 50 Appendix J leakage test.

c. No. Valve CVS-PL-V047 is a containment isolation valve and will receive only a 10 CFR Part 50 Appendix J leakage test.

d. No. The air operator for Valve CVS-PL-V081 is provided to allow closure of the valve during auxiliary spray operation (defense in depth function). The operator is not supplied with safety related power. Upon loss of power the valve will act as a simple check, therefore, it is categorized as IST Category "AC" only.

e. No. Valves CVS-PL-V090, V091, V092, and V094 are containment isolation valves and will receive only a 10 CFR Part 50 Appendix J leakage test.

f. A full stroke exercise during refueling outages will be specified for DWS-PL-V245 as shown in the DCD changes below.

g. A full stroke exercise during refueling outages will be specified for FPS-PL-V052 as shown in the DCD changes below.

h. RCS-PL-V010A and V010B are considered vacuum breakers. Table 3.9-16 will be changed to reflect a test frequency of once every two years and an IST Category of "C" only, as shown in the DCD changes below.

i. Valves VES-PL-V002A and V002B are pressure regulating valves and are included in the AP1000 inservice inspection program as part of augmented inspection. The valves are not required to be included in an inservice inspection program by the rules of the OM Code. They should not be classified as IST Category B. This categorization in Table 3.9-16 will be revised as shown in the DCD changes below. Relief from the OM Code is not required.

j. Note 3, will be revised to delete the reference to the PRA assumption. The reference to the PRA assumption was extra, unnecessary information that added confusion to the note. ADS stage 1/2/3 valves will be tested at cold shutdowns when the RCS pressure is reduced to atmospheric pressure so that mispositioning of a single valve during this IST will not cause a LOCA. This testing requirement has no impact on the assumptions or results of the AP1000 PRA.

k. The squib valves are categorized as "D" in the IST Program. In accordance with ASME OM Code Table ISTC-3500-1, position indication verification is not required. Therefore relief is not required.

l. Valves V081 and V082 are in series on the CVS makeup return line. Valves V084 and V085 are in series on the pressurizer spray line. The valves in both lines are reverse flow leak tested as a group. This test is an augmented test and not required by the ASME OM Code since the valves are not IST Category A valves. A relief request is not required. Revision 16 of the DCD incorrectly identifies these valves as well as V001, V002 and V080 as IST Category A valves. The correct categorization of these valves is as follows:

V001	IST Category B
V002	IST Category B
V080	IST Category C
V081	IST Category C
V082	IST Category C
V084	IST Category B
V085	IST Category C

As such, an individual leak test of each valve is not required. The subject valves close to prevent the continuation of blowdown in the event of a gross piping failure in the non safety related portion of the CVS piping inside containment. The IST categorization in Table 3.9-16 will be revised as shown in the DCD changes below.

The leakage test described in Note 32 is beyond the testing requirements of the ASME OM Code.

m For IST Category A valves other than containment isolation valves, a reduced pressure test is permitted in accordance with ASME OM Code ISTC-3630 b(4) provided the normal service pressure will tend to diminish the overall leakage channel opening. All of the valves in question will all tend to close tighter since the service pressure will be over the seat based on valve orientation.

Note 17 Revision

During the preparation of the response for this request for additional information the following discrepancy in the notes was identified.

Note 17 in Table 3.9-16 requires testing of two RNS containment isolation valves in the reverse direction. As a result of design finalization activities we have determined that the RNS suction line containment isolation valves can be tested in the accident flow direction. Review of the containment penetration test flow paths has identified the need to install a testable pancake between the flange and discharge of V021 (suction relief valve). This will allow the valve to be tested in the accident direction. Valve V023 will be tested between the seats. The valve is a double disk gate valve. When testing between the seats, the inboard disk will be challenged in the accident direction, while the outboard disk will be considered the test boundary.

Since both valves will be tested in the accident direction, Note 17 will be deleted.

Design Control Document (DCD) Revision:

a. In DCD Table 3.9-16 revise the entry under **Inservice Testing Type and Frequency** for valve CAS-PL-V205 as follows:

Containment Isolation Leak Test
Exercise Full Stroke/Refueling Shutdown

f. In DCD Table 3.9-16 revise the entry under **Inservice Testing Type and Frequency** for valve DWS-PL-V245 as follows:

Containment Isolation Leak Test
Exercise Full Stroke/Refueling Shutdown

g. In DCD Table 3.9-16 revise the entry under **Inservice Testing Type and Frequency** for valve FPS-PL-V052 as follows:

Containment Isolation Leak Test
Exercise Full Stroke/Refueling Shutdown

h. In DCD Table 3.9-16 revise the entries under **ASME Class/ IST Category** and **Inservice Testing Type and Frequency** for valve RCS-PL-V010A and V010B as follows:

Class 3 Category ~~B~~C	~~Class 2/3 Relief Valve Tests/10 Years and 20% in 4 Years~~ Vacuum Relief 2 years

i. In DCD Table 3.9-16 revise the entry under **ASME Class/ IST Category** for valves VES-PL-V002A and VES-PL-V002B as follows:

Class 3
~~Category B~~ Augmented

l. In DCD Table 3.9-16 revise the entry under **ASME Class/ IST Category** for valves CVS-PL-V001, CVS-PL-V002, CVS-PL-V080, CVS-PL-V081, CVS-PL-V082, CVS-PL-V084, CVS-PL-V085

Valve Tag Number		ASME Class/ IST Category
CVS-PL-V001		Class 1 Category ~~A~~B
CVS-PL-V002		Class 1 Category ~~A~~B
CVS-PL-V080		Class 3 Category ~~A~~C
CVS-PL-V081		Class 1 Category ~~A~~C
CVS-PL-V082		Class 1 Category ~~A~~C
CVS-PL-V084		Class 1 Category ~~A~~B
CVS-PL-V085		Class 1 Category ~~A~~C

In DCD Table 3.9-16 revise the reference to IST Notes for Valves RNS-PL-V021 and RNS-PL-V023

Valve Tag Number		IST Notes
RNS-PL-V021		~~17,~~27
RNS-PL-V023		~~17,~~27, 31

Note 17 Revision

In DCD Table 3.9-16 revise Note 17 as follows:

17. Not used. ~~Normal residual heat removal system containment penetration relief valve (RNS V021) and containment isolation motor operated valve (RNS V023) are subjected to containment leak testing by pressurizing the lines in the reverse direction to the flow which accompanies a containment leak in this path.~~

PRA Revision:
None

Technical Report (TR) Revision:
None