UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 12, 2016

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - REQUESTS FOR RELIEF RP-01 THROUGH RP-09, RV-01 THROUGH RV-05, AND RG-01 ALTERNATIVES TO ASME OM CODE REQUIREMENTS FOR INSERVICE TESTING FOR THE FIFTH 10-YEAR PROGRAM INTERVAL (CAC NOS. MF5911, MF5913, MF5914, MF5915, MF5916, MF5917, MF5918, MF5919, MF5920, MF5921, MF5922, MF5923, MF5924, MF5925, AND MF5926)

Dear Mr. Limpias:

By letter dated March 19, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15084A221), as supplemented by letters dated June 9, 2015 (ADAMS Accession No. ML15167A068), June 30, 2015 (ADAMS Accession No. ML15188A349), and January 13, 2016 (ADAMS Accession No. ML16020A331), Nebraska Public Power District (NPPD, the licensee) submitted requests for relief RP-01 through RP-09, RV-01 through RV-05, and RG-01 to the U.S. Nuclear Regulatory Commission (NRC), proposing alternatives to certain requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code), for the fifth 10-year inservice testing (IST) program interval for Cooper Nuclear Station.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, paragraph 50.55a(z)(1), the licensee requested to use the proposed alternatives in RP-01 through RP-06, RP-08, RP-09, and RV-01 through RV-05 on the basis that the alternatives provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in RP-07 and RG-01 on the basis that the ASME OM Code requirements present an undue hardship without a compensating increase in the level of quality or safety.

The NRC staff has reviewed the subject requests and determined that for requests RP-01 through RP-06, RP-08, RP-09, and RV-01 through RV-05, the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) for requests RP-01 through RP-06, RP-08, RP-09, and RV-01 through RV-05. Therefore, the NRC staff authorizes alternative requests RP-01, RP-02, RP-03, RP-04, RP-05, RP-06, RP-08, RP-09, RV-01, RV-02, RV-03, RV-04, and RV-05 for Cooper Nuclear Station for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

The NRC staff has determined that for alternative requests RP-07 and RG-01, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. The NRC staff concludes that complying with the specified ASME OM Code requirements would result in a hardship without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes, as set forth in the enclosed safety evaluation that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes alternative requests RP-07 and RG-01 for Cooper Nuclear Station for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

All other ASME OM Code requirements for which relief was not specifically requested and approved, remain applicable.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUESTS FOR RELIEF RP-01 THROUGH RP-09, RV-01 THROUGH RV-05, AND RG-01

RELATED TO THE INSERVICE TESTING PROGRAM

FOR THE FIFTH 10-YEAR INTERVAL

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

By letter dated March 19, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15084A221), as supplemented by letters dated June 9, 2015 (ADAMS Accession No. ML15167A068), June 30, 2015 (ADAMS Accession No. ML15188A349), and January 13, 2016 (ADAMS Accession No. ML16020A331), Nebraska Public Power District (NPPD, the licensee) submitted requests for relief RP-01 through RP-09, RV-01 through RV-05, and RG-01 to the U.S. Nuclear Regulatory Commission (NRC), proposing alternatives to certain requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code), for the inservice testing (IST) program at Cooper Nuclear Station (CNS) for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, paragraph 50.55a(z)(1), the licensee requested to use the proposed alternatives in RP-01 through RP-06, RP-08, RP-09, and RV-01 through RV-05 on the basis that the alternatives provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in RP-07 and RG-01 on the basis that the ASME OM Code requirements present an undue hardship without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

The regulation in 10 CFR 50.55a(f), "Inservice testing requirements," requires, in part, that IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs 10 CFR 50.55a(z)(1) or 10 CFR 50.55a(z)(2).

Enclosure

The regulations in 10 CFR 50.55a(z), state, in part, that alternatives to the requirements of 10 CFR 50.55a(f) may be authorized by the NRC if the licensee demonstrates that: (1) the proposed alternative provides an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The relief requests in the letter dated March 19, 2015, cited 10 CFR 50.55a(h)(3)(z)(1), that the proposed alternatives would provide an acceptable level of quality and safety, and 10 CFR 50.55a(h)(3)(z)(2), that the Code requirement presents an undue hardship without a compensating increase in the level of quality and safety. The NRC staff notes, and the licensee subsequently concurred via e-mail dated December 22, 2015 (ADAMS Accession No. ML16015A138), that these are typographical errors in the licensee's application. The correct citations are 10 CFR 50.55a(z)(1) and 10 CFR 50.55a(z)(2), respectively.

In its letter dated January 13, 2016, the licensee concurred with the NRC's position that Relief Request RP-07, Core Spray Pump B Vibration Alert Limits, is more properly requested pursuant to 10 CFR 50.55a(z)(2), as an undue hardship without a compensating increase in the level of quality and safety, not 10 CFR 50.55a(z)(1) as originally requested.

The CNS fifth 10-year IST interval is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026. The applicable ASME OM Code Edition and Addenda for the CNS fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

Based on the above, and subject to the NRC's findings with respect to authorizing the proposed alternatives to the ASME OM Code given below, the NRC staff concludes that regulatory authority exists for the licensee to request and the Commission to authorize the alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request RP-01

ISTB-3510, "Exercising Test Frequency," (b), "Range," (1) requires that "the full-scale range for each analog instrument shall not be greater than three times the reference value."

Table ISTB-3510-1, "Required Instrument Accuracy," requires a total instrument loop accuracy of ± 2 percent of full scale for pump IST.

The licensee requested to use alternative instrument range requirements for Core Spray (CS) Pumps CS-P-A and CS-P-B.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part, that "[t]he installed suction pressure gauge range of the core spray pumps is 30" Hg (inches Mercury) to 30.0 pounds per square inch gauge (psig). The actual values for suction pressure during inservice testing are approximately 4.0 psig." As a result, instrument range of 30.0 psig exceeds three times of the reference value (3 x 4.0 = 12.0 psig).

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. Pump suction pressure actual values for the core spray pumps during inservice testing are approximately 4.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 12.0 psig (3 x 4.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 0.24 psig (0.02 x 12 psig).
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> Pump discharge pressure actual values for the core spray pumps during inservice testing are approximately 300 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 900 psig (3 x 300.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 18 psig (0.02 X 900 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the code would be approximately ± 18.24 psig.
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> [...]
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> As an alternative, for the Group B quarterly test, CNS will use the installed suction pressure gauge (30" Hg to 30.0 psig), currently calibrated to within a tolerance of ± 0.3 psig, together with the installed discharge pressure gauge (0 psig to 500 psig), currently calibrated in a loop to within a tolerance of ± 10 psig. This results in a combined maximum inaccuracy of ± 10.3 psig due to the installed suction and discharge pressure indications, which is less than the code-allowed ± 18.24 psig.

The licensee asserted that, although the permanently installed suction pressure gauges (PI-36A/B) are above the maximum range limits of ASME OM Code ISTB-3510(b)(1), they, in conjunction with the permanently installed discharge pressure gauges (PI-48A/B), yield an accuracy for differential pressure more conservative than the Code requires and are, therefore, acceptable for the test.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006 (ADAMS Accession No. ML061430172).

NRC Staff Evaluation

The instrument accuracy and range requirements of ISTB-3510(b)(1) are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ISTB-3510(b)(1) states that "the full-scale range of each analog instrument shall not be greater than three times the reference values," and ISTB-3510(a), "Accuracy," states, in part, that the "instrument accuracy shall be within the limits of Table-3500-1" (e.g., ± 2 percent for differential pressure measurements).

The CNS-installed gauges for the CS pumps are 0 to 500 psig for discharge pressure and have a range of 45 psig for suction pressure. The respective reference values are approximately 300 psig and 4 psig. The installed suction pressure gauges have a range of about 11 times the reference value and therefore, are above the maximum limits of ISTB-3510(b)(1). In lieu of replacing the over-the-limit suction pressure gauges, the licensee proposed to use the installed gauge on the basis that the range and accuracy of the combined suction and discharge pressure gauges meet the intent of the accuracy requirements of ± 6 percent of the differential pressure reference value.

Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. The pump suction pressure actual values for the CS pumps during IST are approximately 4.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 12.0 psig (3 x 4.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the Code-allowed inaccuracies due to pressure effects would be ± 0.24 psig (± 0.02 X 12 psig). The pump discharge pressure actual values for the CS pumps during IST are approximately 300 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 900 psig (3 x 300.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the Code-allowed inaccuracies due to pressure effects would be ± 18 psig (0.02 x 900 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the Code would be approximately ± 18.24 psig.

The CNS-installed suction pressure gauges (PI-36A/B), which were designed to have an accuracy of ± 0.5 percent of full scale, have a range of approximately 45 psig. The current calibration tolerance is approximately ± 0.3 psig. Currently, the installed discharge pressure indicators (PI-48A/B) are 0 to 500 psig, and are calibrated to ± 10 psig, or ± 2 percent of full scale (0.02 x 500 psig = ±10.0 psig). This results in a combined maximum inaccuracy of ± 10.3 psig between the installed suction and discharge pressure indications, which is more conservative than the Code-allowed ± 18.24 psig. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

The use of the existing instrument is also supported by NUREG-1482, Revision 2, "Guidelines for Inservice Testing at Nuclear Power Plants," Section 5.5.1, "Range and Accuracy of Analog Instruments" (ADAMS Accession No. ML13295A020), which states, in part, that "when the combination of range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements..." relief may be granted by the NRC staff.

3.2 Licensee's Alternative Request RP-02

ISTB-3510(b)(1) requires that "the full-scale range for each analog instrument shall not be greater than three times the reference value."

Table ISTB-3510-1 requires a total instrument loop accuracy of ± 2 percent of full scale for pump IST.

The licensee requested to use alternative instrument range requirements for Residual Heat Removal (RHR) Pumps RHR-P-A, RHR-P-B, RHR-P-C, and RHR-P–D.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part, that "[t]he installed suction pressure gauge range of the residual heat removal (RHR) pumps is 30" Hg to 150.0 psig. The actual values for suction pressure during IST are approximately 5.0 psig." As a result, the instrument range of 150.0 psig exceeds 3 times of the reference value (3 x 5.0=15.0 psig).

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. Pump suction pressure actual values for the residual heat removal pumps during inservice testing [are] approximately 5.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 15.0 psig (3 x 5.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group A pump test, the resulting inaccuracies due to pressure effects would be ± 0.3 psig (0.02 x 15 psig).
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> Pump discharge pressure actual values for the RHR pumps during inservice testing are approximately 170 to 195 psig. Conservatively basing it on the lowest of these discharge pressure readings, ISTB-3510(b)(1) would require, as a maximum, a gauge with a range of 0 to 510 psig (3 x 170.0 psig) to bound the actual value for discharge pressure.
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> Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group A pump test, the resulting inaccuracies due to pressure effects would be ± 10.2 psig (0.02 x 510 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the code would be approximately ± 10.5 psig.
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> [...]
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> As an alternative, for the Group A quarterly test, CNS will use the installed suction pressure gauge (30" Hg to 150.0 psig), currently calibrated to within a tolerance of [±] 1 psig at the 5 psig point, together with the installed discharge pressure gauge (0 psig to 400 psig), currently calibrated to within a tolerance of ± 5 psig. This results in a combined maximum inaccuracy of ± 6 psig due to the installed suction and discharge pressure indications, which is less than the code-allowed ± 10.5 psig.

The licensee asserted that, although the permanently installed suction pressure gauges (PI-106A/B/C/D) are above the maximum range limits of ASME OM Code ISTB-3510(b)(1), they, in conjunction with the permanently installed discharge pressure gauges (PI-107A/B/C/D), yield an accuracy for differential pressure more conservative than the Code requires and are, therefore, acceptable for the test.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

The instrument accuracy and range requirements of ISTB-3510(b)(1) are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ISTB-3510(b)(1) states that "the full-scale range of each analog instrument shall not be greater than three times the reference values," and ISTB-3510(a) states, in part, that the "instrument accuracy shall be within the limits of Table-3500-1" (e.g., ± 2 percent for differential pressure measurements).

The CNS-installed gauges for the RHR pumps are 0 to 400 psig for discharge pressure and have a range of 165 psig for suction pressure. The respective reference values are approximately 170 psig and 5 psig. The installed suction pressure gauges have a range of 33 times the reference value, and therefore, are above the maximum limits of ISTB-3510(b)(1). In lieu of replacing the over-the-limit suction pressure gauges, the licensee requested relief from ISTB-3510(b)(1), on the basis that the range and accuracy of the combined suction and discharge pressure gauges meet the intent of the accuracy requirements of ± 6 percent of the differential pressure reference value.

Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. The pump suction pressure actual values for the RHR pumps during IST are approximately 5.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 15.0 psig (3 x 5.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group A pump test, the Code-allowed inaccuracies due to pressure effects would be ± 0.3 psig (± 0.02 x 15 psig). The pump discharge pressure actual values for the RHR pumps during IST are approximately 170 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 510 psig (3 x 170.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group A pump test, the Code-allowed inaccuracies due to pressure effects would be ± 10.2 psig (0.02 x 510 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications required by the Code would be approximately ± 10.5 psig.

The CNS-installed suction pressure gauges (PI-106A/B/C/D), which were designed to have an accuracy of ± 0.5 percent of full scale, have a range of approximately 165 psig. The current calibration tolerance is approximately ± 1.0 psig. Currently, the installed discharge pressure gauges (PI-107A/B/C/D) are 0 to 400 psig indicators and calibrated to within a tolerance of ± 5 psig, or ± 1.25 percent of full scale (0.0125 x 400 psig = ± 5 psig). This results in a combined maximum inaccuracy of ± 6 psig between the installed suction and discharge pressure indications, which is more conservative than the Code-required ± 10.5 psig. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

The use of the existing instrument is also supported by NUREG-1482, Revision 2, Section 5.5.1, which states, in part, that "when the combination of range and accuracy yields a reading at least equivalent to that achieved using instruments that meet the Code requirements..." relief may be granted by the NRC staff.

3.3 Licensee's Alternative Request RP-03

ISTB-3510(b)(1) requires that "the full-scale range for each analog instrument shall not be greater than three times the reference value."

Table ISTB-3510-1 requires a total instrument loop accuracy of ± 2 percent of full scale for pump IST.

The licensee requested to use alternative instrument range requirements for High Pressure Coolant Injection (HPCI) Main Pump HPCI-P-MP and HPCI Booster Pump HPCI-P-BP.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part, that "[t]he installed suction pressure gauge range of the high pressure coolant injection pumps is 30" Hg to 150.0 psig. The actual value for suction pressure during inservice testing is approximately 15.0 psig." As a result, the instrument range of 150.0 psig exceeds 3 times the reference value (3 x 5.0=15.0 psig).

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. Pump suction pressure actual values for the high pressure coolant injection pumps during inservice testing are approximately 15.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 45.0 psig (3 x 15.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 0.9 psig (0.02 x 45 psig).
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> The pump discharge pressure actual value for the HPCI pump during inservice testing is approximately 1200 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 3600 psig (3 x 1200.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 72 psig (0.02 x 3600 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the code would be approximately ± 72.9 psig.
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> [...]

> As an alternative, for the Group B quarterly test, CNS will use the installed suction pressure gauge (30" Hg to 150.0 psig), currently calibrated to within a tolerance of ± 1 psig, together with the installed discharge pressure gauge (0 psig to 1500 psig), currently calibrated to within a tolerance of ± 7.5 psig. This results in a combined maximum inaccuracy of ± 8.5 psig due to the installed suction and discharge pressure indications, which is less than the code-allowed ± 72.9 psig.

The licensee asserted that, although the permanently installed suction pressure gauge (PI-99) is above the maximum range limits of ASME OM Code ISTB-3510(b)(1), it, in conjunction with the permanently installed discharge pressure gauge (PI-81), yields an accuracy for differential pressure more conservative than the Code requires and is, therefore, acceptable for the test.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

The instrument accuracy and range requirements of ISTB-3510(b)(1) are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ISTB-3510(b)(1) states that "the full-scale range of each analog instrument shall not be greater than three times the reference values," and ISTB-3510(a) states, in part, that the "instrument accuracy shall be within the limits of Table-3500-1" (e.g., ± 2 percent for pressure differential measurements).

The CNS-installed gauges for the HPCI pumps are 0 to 1500 psig for discharge pressure and have a range of 165 psig for suction pressure. The respective reference values are approximately 1200 psig and 15 psig. The installed suction pressure gauge has a range of 11 times the reference value, and therefore, is above the maximum limits of ISTB-3510(b)(1). In lieu of replacing the over-the limit suction pressure gauge, the licensee requested relief from ISTB-3510(b)(1), on the basis that the range and accuracy of the combined suction and discharge pressure gauges meet the intent of the accuracy requirements of ± 6 percent of the differential pressure reference value.

Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. The pump suction pressure actual values for the HPCI pumps during IST are approximately 15 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 45 psig (3 x 15.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 0.9 psig (± 0.02 x 45 psig). The pump discharge pressure actual values for the HPCI pumps during IST are approximately 1200 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 3600 psig (3 x 1200.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 72 psig (0.02 x 3600 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the Code would be approximately ± 72.9 psig.

The CNS-installed suction pressure gauge (PI-99), which was designed to have an accuracy of ± 0.5 percent of full scale, has a range of approximately 165 psig. The current calibration tolerance is approximately ± 1.0 psig. Currently, the installed discharge pressure indicator (PI-81) is 0 to 1500 psig and calibrated to within a tolerance of ± 7.5 psig, or ± 0.5 percent of full scale (0.005 x 1500 psig = ± 7.5 psig). This results in a combined maximum inaccuracy of ± 8.5 psig between the installed suction and discharge pressure indications, which is more conservative than the Code-required ± 72.9 psig. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

The use of the existing instrument is also supported by NUREG-1482, Revision 2, Section 5.5.1, which states that "when the combination of the range and accuracy yields a reading at least equivalent to that achieved using instruments that meet the Code requirements..." relief may be granted by the NRC staff.

3.4 Licensee's Alternative Request RP-04

ISTB-3510(b)(1) requires that "the full-scale range for each analog instrument shall not be greater than three times the reference value."

Table ISTB-3510-1 requires a total instrument loop accuracy of ± 2 percent of full scale for pump IST.

The licensee requested to use alternative instrument range requirements for the Reactor Core Isolation Cooling (RCIC) Main Pump RCIC-P-MP.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part, that "[t]he installed suction pressure gauge range of the reactor core isolation cooling pump is 30" Hg to 150.0 psig. The actual value for suction pressure during inservice testing is approximately 15.0 psig." As a result, the instrument range of 150.0 psig exceeds 3 times the reference value (3 x 5.0=15.0 psig).

Proposed Alternative

By letter dated March 19, 2015, as supplemented by letter dated January 13, 2016, the licensee stated, in part:

> Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. Pump suction [pressure] actual values for the [RCIC pump] during inservice testing is approximately 15.0 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 45.0 psig (3 x 15.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 0.9 psig (0.02 x 45 psig).
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> The discharge pressure actual value for the RCIC pump during inservice testing is approximately 1250 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 3750 psig (3 x 1250.0 psig) to bound the

actual value for discharge pressure. Applying the accuracy requirement of ± 2% of full scale (± 6% of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 75 psig (0.02 x 3750 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the code would be approximately ± 75.9 psig.

[...]

As an alternative, for the Group B quarterly test, CNS will use the installed suction pressure gauge (30" Hg to 150.0 psig), currently calibrated to within a tolerance of ± 1 psig, together with the installed discharge pressure gauge (0 psig to 1500 psig), currently calibrated to within a tolerance of ± 15.0 psig. This results in a combined maximum inaccuracy of ± 16.0 psig due to the installed suction and discharge pressure indications, which is less than the code-allowed ± 75.9 psig.

The licensee asserted that, although the permanently installed suction pressure gauge (PI-66) is above the maximum range limits of ASME OM Code ISTB-3510(b)(1), it, in conjunction with the permanently installed discharge pressure gauge (PI-59), yields an accuracy for differential pressure more conservative than the Code requires and is, therefore, acceptable for the test.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

The instrument accuracy and range requirements of ISTB-3510(b)(1) are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ISTB-3510(b)(1) states that "the full-scale range of each analog instrument shall not be greater than three times the reference values," and ISTB-3510(a) states, in part, that the "instrument accuracy shall be within the limits of Table-3500-1" (e.g., ± 2 percent for differential pressure measurements).

The CNS-installed gauge for the RCIC pump is 0 to 1500 psig for discharge pressure and has a range of 165 psig for suction pressure. The respective reference values are approximately 1250 psig and 15 psig. The installed suction pressure gauge has a range of 11 times the reference value and therefore, is above the maximum limits of ISTB-3510(b)(1). In lieu of replacing the over-the limit suction pressure gauge, the licensee requested relief from ISTB-3510(b)(1), on the basis that the range and accuracy of the combined suction and discharge pressure gauges meet the intent of the accuracy requirements of ± 6 percent of the differential pressure reference value.

Pump suction pressure is used along with pump discharge pressure to determine pump differential pressure. The pump suction pressure actual value for the RCIC pump during IST is approximately 15 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 45 psig (3 x 15.0 psig) to bound the actual value for suction pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 0.9 psig (0.02 x 45 psig). The pump discharge pressure actual value for the RCIC pump during IST is approximately 1250 psig. Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 3750 psig (3 x 1250.0 psig) to bound the actual value for discharge pressure. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group B pump test, the resulting inaccuracies due to pressure effects would be ± 75 psig (0.02 x 3750 psig). Therefore, the maximum inaccuracies due to the suction and discharge pressure indications allowed by the Code would be approximately ± 75.9 psig. The CNS-installed suction pressure gauge (PI-66), which was designed to have an accuracy of ± 0.5 percent of full scale, have a range of approximately 165 psig. The current calibration tolerance is approximately ± 1.0 psig. Currently, the installed discharge pressure indicator (PI-59) is 0 to 1500 psig and calibrated to within a tolerance of ± 15 psig, or ± 1 percent of full scale (0.01 x 1500 psig = ± 15.0 psig). This results in a combined maximum inaccuracy of ± 16.0 psig between the installed suction and discharge pressure indications, which is more conservative than the Code required ± 75.9 psig. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

The use of the existing instrument is also supported by NUREG-1482, Revision 2, Section 5.5.1, which states that "when the combination of range and accuracy yields a reading at least equivalent to that achieved using instruments that meet the Code requirements..." relief may be granted by the NRC staff.

3.5 Licensee's Alternative Request RP-05

ISTB-3510(a), "Accuracy," states, in part, that "Instrument accuracy shall be within the limits of Table-ISTB-3510-1. If a parameter is determined by analytical methods instead of measurement, then the determination shall meet the parameter accuracy requirement of Table ISTB-3510-1 (e.g., flow rate determination shall be accurate to within ± 2 percent of actual). ... For a combination of instruments, the required accuracy is loop accuracy."

Table ISTB-3510-1, "Required Instrument Accuracy," requires that pressure and flow rate instruments for Group A and Group B Pumps have an accuracy of ± 2 percent.

The licensee requested to use an alternative from the requirement of ASME OM Code ISTB. The components affected by this alternative request are identified in Table 3.5-1, below.

Table 3.5-1

Pump ID	Description of Pump
CS-P-A	Core Spray (CS) Pump A
CS-P-B	Core Spray (CS) Pump B
HPCI-P-MP	High Pressure Coolant Injection (HPCI) Main Pump
HPCI-P-BP	High Pressure Coolant Injection Booster Pump
SW-P-BPA	Service Water Booster (SWB) Pump A
SW-P-BPB	Service Water Booster Pump B
SW-P-BPC	Service Water Booster Pump C
SW-P-BPD	Service Water Booster Pump D
Note: In a request for additional information (RAI) response dated January 13, 2016, CNS withdrew RCIC pump flow rate loop instrumentation from RP-05.	

Reason for Request:

The licensee stated that the installed pumps' instrument loop accuracies do not meet the Code-required accuracies for flow rate and pressure. As a result, the instrument loop accuracies exceed the requirement of Table ISTB-3510-1. The licensee proposed to calibrate the instrument loops involved to meet the ASME OM Code-allowed accuracies of ± 2 percent, as presented in Table 3.5-2, below.

Table 3.5-2

Pump Parameter Pressure/ Flowrate	Equipment Loop Accuracy (%)	Calibrated Loop Accuracy (%)	Code-Required Loop Accuracy (%)
CS Pump Discharge Pressure	2.06	≤ 2.00	≤ 2.00
CS Pump Flow rate	2.02	≤ 2.00	≤ 2.00
HPCI Pump Flow rate	2.03	≤ 2.00	≤ 2.00
SWB Pump Flow rate	2.03	≤ 2.00	≤ 2.00

Proposed Alternative

The ASME OM Code, ISTA-2000 defines, in part, "Instrument Loop Accuracy," as "accuracy of an instrument loop based on the square root of the sum of the squares of the inaccuracies of each instrument or component in the loop when considered separately." The licensee will be using the square root of the sum of squares of the inaccuracies method to determine the instrument loop accuracies.

The licensee proposes to use installed instruments. In lieu of the Code requirement to determine the loop accuracies of the loop instruments by use of their nameplate accuracies, the licensee proposes to calibrate these loop instruments such that the determined loop accuracies will be within the Code-required accuracies of ± 2 percent for the Group A and Group B pumps.

In its letter dated March 19, 2015, the licensee stated, in part:

[CS Pump]

> CS pump discharge pressure loop is made up of a pressure indicator (range of 0 to 500 psig) and a pressure transmitter. The pressure indicator (PI-48A/B) has a nameplate accuracy of ± 2%, and the pressure transmitter (PT-38A/B) has a nameplate accuracy of ± 0.5%. Therefore, based on the nameplate accuracies alone, the equipment loop accuracy for discharge pressure indication is ± 2.06% (square root of the sum of the squares), which exceeds the code requirement of ± 2%. ... However, CNS is currently calibrating this discharge pressure loop to within ± 10 psig, which is equivalent to a ± 2% of full scale tolerance (0.02 X 500 psig = ± 10 psig), which meets the accuracy requirements of the [ASME OM] code.
>
> CS pump flow rate loop is made up of a flow indicator (range of 0 to 6000 gallons per minute [gpm]), and a flow transmitter. The flow indicator (FI-50A/B) has a nameplate accuracy of ± 2%, and the flow transmitter (FT-40A/B) has a nameplate

> accuracy of ± 0.25%. Therefore, based on the nameplate accuracies alone, the equipment loop accuracy for discharge [flow] indication is ± 2.02% (square root of the sum of the squares), which exceeds the code requirement of ± 2%. ... However, CNS is currently calibrating this flow loop to within ± 50 gpm,...or approximately ± 0.83 percent of full scale (± 0.0083 X 6000 = ± 50 gpm), which [meets] the ± 2% of full scale accuracy requirements of the [ASME OM] code. If a preservice test were to be run, CNS would ensure that the loop was calibrated to ≤ [less than or equal to] 2% over the full range of the test prior to performing it.

[HPCI Pump]

> HPCI pump flow rate loop is made up of a flow indicating controller (range of 0 to 5000 gpm), a flow transmitter, and a flow square rooter. The flow indicating controller (FIC-108) has a nameplate accuracy of ± 0.25%, the flow transmitter (FT-82) has a nameplate accuracy of ± 0.25%, and the flow square rooter (SQRT-118) has a nameplate accuracy of ± 2% from approximately 0 to 1000 gpm and ± [0.5]% from approximately 1000 to 5000 gpm. Therefore, based on the nameplate accuracies alone, the equipment loop accuracy for flow indication is approximately ± 2.03% (square root of the sum of the squares) from 0 to 1000 gpm, which does not meet the code requirement of ± 2%, and approximately ± 0.61% from 1000 to 5000 gpm, which does meet the [ASME OM] code requirement of ± 2%. ... However, CNS is currently calibrating this flow loop to within ± 100 gpm (at the IST reference of 4000 gpm and at other points from 1000 gpm to 5000 gpm) [or ± 2 percent of full scale (± 0.02 X 5000 = ± 100 gpm), which meets the ± 2 percent of full scale accuracy requirements of the ASME OM Code].

[SWB Pumps]

> The SWB [Pump] flow rate is made up of a flow indicator (range of 0 to 10,000 gpm), a flow transmitter, and a flow square rooter. The flow indicator (FI-132A/B) has a nameplate accuracy of ± 2%, the flow transmitter (FT-97) has a nameplate accuracy of ± 0.25%, and the flow square rooter (SQRT-132) has a nameplate accuracy of ± 0.25%. Therefore, based on the nameplate accuracies alone, the equipment loop accuracy for flow indication is approximately ± 2.03% (square root of the sum of the squares), which exceeds the code requirement of ± 2%. However, CNS is currently calibrating this flow loop to within ± 100 gpm, which is equivalent to a ± 1% of full scale tolerance (0.01 X 10,000 gpm = ± 100 gpm), which [meets] the ± 2 percent of full scale accuracy requirements of the [ASME OM] code.

Based on the above, it can be seen that, while the loop accuracies fail to meet the requirements of ASME OM Code, Table ISTB-3510-1, when calculated using nameplate accuracies for individual instruments, the licensee proposes that it is meeting the OM Code requirements for loop accuracy via calibration of the loop as a whole.

In its March 19, 2015, submittal, the licensee stated in part, that "[a]lthough not anticipated, if any revisions to the current tolerance information provided occurs within the CNS fifth 10-year interval, this relief request will remain valid as long as the calibrated loop accuracies meet the code required tolerances of ≤ 2.00% of full scale."

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

The instrument accuracy and range requirements of the ASME OM Code, ISTB-3510 are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ASME OM Code, ISTB-3510(a) states, in part, that the "[i]nstrument accuracy shall be within the limits of Table-3500-1. ...(e.g., flow rate determination shall be accurate to within ± 2 percent of actual). ... For a combination of instruments, the required accuracy is loop accuracy."

As indicated above, the nameplate accuracies of the installed instruments for the affected pumps in relief request RP-05 are slightly above the ASME OM Code-required value of ± 2 percent. In lieu of replacing the installed instruments, the licensee requested relief from ISTB-3510(a), on the basis that the installed instrument loops can be calibrated to meet the ASME Code allowed accuracies of ± 2 percent as demonstrated in the following Tables:

CS Pump - Pressure		
Pressure Indicator Range (psig)	0 – 500 psig	Remark
Pressure Indicator Nameplate Accuracy	± 2 %	
Pressure Transmitter Nameplate Accuracy	± 0.5 %	
Equipment Loop Accuracy (Note 1)	± 2.06 %	Note 1: Square root of the sum of the squares $= \sqrt{(2)^2 + (0.5)^2} = 2.06$
ASME OM Code allowed Accuracy	± 2 %	
Calibration Loop Accuracy	≤ 2%	
CNS Calibrated Discharge Loop Pressure (Note 2)	± 10 psig	Note 2: ± 2 % of full-scale tolerance (0.02 x 500 psig = 10 psig)
CNS Discharge Loop full-scale tolerance (Note 2)	± 2 %	

Pumps - Flow				
Item	CS Pump	HPCI Pump		SWB Pump
Flow Indicator Range (gpm)	0 – 6000	0 – 5000		0-10,000
Flow Indicator Range Split for Accuracy (if any) gpm	----	0-1000	1000-5000	----
Flow Indicator Nameplate Accuracy (FI)	± 2 %	± 0.25 %	± 0.25 %	± 2 %
Flow Transmitter Nameplate Accuracy (FT)	± 0.25 %	± 0.25 %	± 0.25 %	± 0.25 %
Flow Square Rooter Nameplate Accuracy(FR)	----	± 2 %	± 0.5 %	± 0.25 %
Equipment Loop Accuracy (Note 1)	± 2.02 %	± 2.03 %	± 0.61 % (Note 2C)	± 2.03 %
ASME OM Code allowed Accuracy	± 2 %	± 2 %	± 2 %	± 2 %
Calibrated Loop Accuracy	≤ 2%	≤ 2%	≤ 2%	≤ 2%
CNS Calibrated Discharge Flow Loop	± 50 gpm (Note 2A)	± 100 gpm (Note 2B)	± 100 gpm (Note 2C)	± 100 gpm (Note 2D)
CNS Discharge Loop full-scale tolerance	± 0.83 % (Note 2A)	± 2 % (Note 2B)	± 2 % (Note 2C)	± 1 % (Note 2D)
Remarks:				
Note 1: Square root of the sum of the squares = $\sqrt{(FI)^2 + (FT)^2 + (FR)^2}$				
Note 2A: CS Pump Calibrated Discharge Flow Loop is ± 50 gpm, which is equivalent to ± 0.83% of full-scale tolerance (0.0083 x 6000 gpm = ± 50 gpm).				
Note 2B: HPCI pump flow from 0-1000 gpm. HPCI Pump Calibrated Discharge Flow Loop is ± 100 gpm, which is equivalent to ± 2.00% of full-scale tolerance (0.02 x 5000 gpm = ± 100 gpm).				
Note 2C: For HPCI pump flow from 1000-5000 gpm, Instrumentation loop accuracy is ± 0.61%, which meets the ASME Code requirements of ± 2 %. Whereas, HPCI Pump Calibrated Discharge Flow Loop is ± 100 gpm with Discharge loop tolerance of ±2%.				
Note 2D: SWB Pump Calibrated Discharge Flow Loop is ± 100 gpm, which is equivalent to ± 1.00% of full-scale tolerance (0.01 x 10,000 gpm = ± 100 gpm).				

Although the permanently installed instrument loops do not meet the accuracy requirements of Table ISTB-3500-1, when looking at nameplate accuracies, the licensee has demonstrated that all installed instrument loops are calibrated to meet the Code-allowed accuracies of ± 2 percent. Therefore, the NRC staff finds that the proposed alternative of using the existing instruments with the proposed calibration, instead of replacing them, provides an acceptable level of quality and safety.

3.6 Licensee's Alternative Request RP-06

ISTB-3510(b)(1) requires that "the full-scale range of each analog instrument shall not be greater than three times the reference value."

Table ISTB-3510-1 requires a total instrument loop accuracy of ± 2 percent of full scale for pump IST.

The licensee requested to use alternative instrument range requirements for Reactor Equipment Cooling (REC) Pumps REC-P-A, REC-P-B, REC-P-C, and REC-P-D.

Reason for Request

The licensee stated that the installed flow Instruments REC-FI-450A and REC-FI-450B range of the REC pumps is 0 to 4000 gpm. The reference value for discharge flow during IST is 1100 gpm. As a result, the instrument range exceeds the requirement of ISTB-3510(b)(1).

Based on ISTB-3510(b)(1), this would require, as a maximum, a gauge with a range of 0 to 3300 gpm (3 x 1100 gpm). Applying the accuracy requirements of ± 2 percent for the Group A or comprehensive pump test, the resulting inaccuracies due to flow would be ± 66 gpm (0.02 X 3300 gpm).

Proposed Alternative

The licensee stated that as an alternative, CNS will use the installed flow rate instrumentation (0 to 4000 gpm) calibrated to ±1.25 percent (less than ± 2 percent) such that, the inaccuracies due to flow will be less than or equal to those required by the ASME OM Code (± 66 gpm) for the REC pump ISTs. This will ensure that the installed flow rate instrumentation is equivalent to that required by the ASME OM Code, or better, in terms of measuring flow rate.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year IST program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

The instrument accuracy and range requirements of ISTB-3510 are provided to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. ISTB-3510(b)(1) states that "the full-scale range of each analog instrument shall not be greater than three times the reference value," and ISTB-3510(a) requires, in part, that the "instrument accuracy shall be within the limits of Table-ISTB-3510-1. If a parameter is determined by analytical methods instead of measurement, then the determination shall meet the parameter accuracy requirement of Table-3510-1 (e.g., flow rate determination shall be accurate to within ± 2% of actual). For individual analog instruments, the required accuracy is percent of full-scale."

The CNS-installed flow gauges for the REC pumps have a range of 0 to 4000 gpm. The reference values for flow rate during IST are approximately 1100 gpm. The installed flow gauges have a range of 3.63 (4000/1100) times the reference value and therefore, are above the maximum limits of ISTB-3510(b)(1). In lieu of replacing the over-the-limit flow rate gauges, the licensee requested relief from ISTB-3510(b)(1), on the basis that the combined range and accuracy of the installed gauges meets the intent of the accuracy requirements of ± 6 percent of the reference value (Reference: NUREG-1482, Revision 2, Section 5.5.1).

References flow rates for the REC pumps are 1100 gpm. Based on ISTB-3510(b)(1), this would require, as a maximum, a flow gauge with a range of 0 to 3300 gpm (3 x 1100 gpm) to bound the lowest value for flow. Applying the accuracy requirement of ± 2 percent of full scale (± 6 percent of reference) for the quarterly Group A or Group B pump test, the maximum inaccuracies due to flow indications allowed by the ASME OM Code would be ± 66 gpm (± 0.02 x 1100 gpm).

CNS proposes to use the installed flow rate gauges (REC-FI-450A/B) but will calibrate them to less than ± 2 percent such that the inaccuracies due to flow will be less than or equal to that required by the Code (± 66 gpm). Currently the instruments are calibrated to within 1.25 percent of full scale, which yields a total accuracy of within 50 gpm (0.0125x 4000 gpm), which is less than the Code allowed ± 66 gpm.

Despite the fact that flow instruments REC-FI-450A and REC-FI-450B do not meet the ASME OM Code requirements for range, they are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by the ASME OM Code. Based on the least accurate instrument that would theoretically be allowed by the ASME OM Code, the minimum required indicated accuracy is ± 6 percent. Therefore, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety on the basis that installed instrumentation provides a measurement accuracy that is more conservative than the Code required.

The use of the existing gauges is also supported by NUREG-1482, Revision 2," Section 5.5.1, which states, in part, that when the combination of range and accuracy yields a reading at least equivalent to the reading achieved from instruments that meet the ASME OM Code requirements, the relief may be granted by the NRC staff.

3.7 Licensee's Alternative Request RP-07

ISTB-5123, "Comprehensive Test Procedure," (e) states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200. The vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5121-1. For example, if vibration exceeds either $6V_r$ or 0.7 in./sec [inches per second (ips)], the pump is in the required action range."

Table ISTB-5121-1 specifies the pumps' vibration alert range from 0.325 ips to 0.700 ips.

The licensee requested to use an alternative to Table ISTB-5121-1 during the biennial comprehensive pump test or any time vibrations are taken to determine pump acceptability (i.e., post-maintenance testing, other periodic testing, etc.) for Core Spray Pump B (CS-P-B).

Reason for Request

(Note: the figures and trends referenced in the reason for relief and proposed alternative and basis sections were submitted as part of the original package dated March 19, 2015, and have not been repeated in the NRC staff's safety evaluation).

The licensee stated that the IST program at CNS has consistently required (prior to obtaining relief during the third 10-year interval program) that CS pump, CS-P-B, be tested on an increased frequency (as required by ISTB-6200) due to vibration values at points 1H and 5H periodically being in the alert range. Relief is requested from the requirements in Table ISTB-5121-1 to test the pump on an increased frequency due to vibration levels for points 1H and 5H exceeding the ISTB alert range for the comprehensive pump test.

Proposed Alternative

Relief is requested from the requirements in Table ISTB-5121-1 to run the pump on an increased frequency due to vibration level exceeding the "Alert Range" limit. This is based on analysis of the vibration data indicating that no pump degradation is taking place. CNS is proposing to use alternative vibration "Alert Range" limits based on historical vibration data and analysis. This provides an alternative method that still meets the intended function of monitoring the pump degradation over time while keeping the "Required Action" level unchanged.

The licensee is proposing to increase the lower alert range limit for vibration points 1H and 5H from 0.325 ips to 0.400 ips, while the required action vibration range limit will remain at the ASME OM Code value of 0.700 ips. Relief is requested for CS-P-B during the biennial comprehensive pump test or any other time that the vibrations are taken to determine pump acceptability (i.e., post-maintenance testing, other periodic testing, etc.). The piping-induced vibration, which occurs at low frequencies, occasionally causes the overall vibration value for these two points to exceed 0.325 ips, resulting in CS-P-B being on an increased test frequency. However, several expert analyses and maintenance history reviews have shown that this piping-induced vibration has not resulted in degradation to the pump. Additionally, the overall vibration levels have remained steady over the past 24.5 years. Therefore, it has been demonstrated that doubling the test frequency under the current conditions does not provide additional assurance as to the condition of the pump and its ability to perform its safety function. The licensee has evaluated this relief request to the four key components identified in NUREG/CP-0152, "Proceedings of the NRC/ASME Symposium on Valves, Pumps and Inservice Testing," that should be addressed in a relief request of this type. These key components and the licensee's evaluation are briefly summarized below.

Vibration History

The licensee should have sufficient vibration history from IST, which verifies that the pump has operated at this vibration level for a significant amount of time, with any "spikes" in data justified.

The licensee explained that inconsistent vibrations on CS-P-B have been a condition that has existed since original installation of this pump in 1973 due to randomly distributed bursts of energy at the natural frequency of the total system. It was subsequently determined that the hydraulic disturbances found in the piping was the source of energy. Consistent with ASME Code requirements prior to 1990, at least one displacement vibration amplitude was read. Since 1990, vibration levels were measured in velocity units (inches per second). Velocity data since 1990 has been submitted with the relief request to demonstrate that vibration levels are not trending upward.

Consultation with Pump Manufacturer/Vibration Expert

The licensee should have consulted with the pump manufacturer or vibration expert about the level of vibration the pump is experiencing to determine if pump operation is acceptable.

The licensee consulted with Byron Jackson, the pump manufacturer. In 1973, Byron Jackson determined there was unusual turbulence in the piping and the vibrating piping was, in turn, vibrating the pump. The pump manufacturer determined that the motor and pump can operate with these levels of vibration with absolutely no impairment of operating life. Although the vibration was found to be acceptable, CNS took successful actions to install new pipe supports to reduce these piping-induced vibrations. In 2001, an independent industry vibration expert evaluated the CS-P-B vibrations and determined that there is no evidence of motor bearing wear and that this poses no threat to the long term reliability of either the pump or the motor. The consultant concluded that the only negative impact is on vibration levels relative to a generic standard. The consultant recommended the continued collection of data to verify that the system response does not change. CNS continued to monitor the source of the vibrations and, in 2002, concluded that several years of spectral data show no degrading trend (i.e., the low frequency piping-induced vibrations are not expected to adversely impact pump operability).

Attempts to Lower Vibration

The licensee should describe attempts to lower the vibration below the defined Code absolute levels through modifications to the pump.

As identified above, CNS-installed additional pipe restraints during the preoperational period to reduce piping-induced vibration. In 1993, CNS also replaced single stage orifices with multi-stage orifices to reduce flow-induced vibrations.

Spectral Analysis

The licensee should perform a spectral analysis of the pump-driver system to identify all contributors to the vibration levels. The licensee submitted spectrum trend data that validate the analysis performed by an independent consultant that vibrations are piping induced and are not indicative of degraded pump performance.

Licensee's Proposed Alternative Testing

CNS is proposing to increase the absolute alert limit for vibration points 1H and 5H from 0.325 ips to 0.400 ips. The new alert limits will still allow for early detection of pump degradation or piping-induced vibration increases prior to component failure, while the required action range limit will remain at the ASME OM Code value of 0.700 ips.

Note that the proposed alternative was previously authorized for the CNS fourth 10-year program interval by NRC letter dated June 14, 2006.

NRC Staff Evaluation

ASME OM Code, ISTB-5123, requires that, when overall pump vibration measurement in any one measured direction falls in the range of greater than 0.325 ips to 0.700 ips, the pump shall be declared in the "Alert Range" and testing doubled until the cause of the deviation is determined and condition is corrected. Although a pump is considered operable while in the alert rage, increased vibration to this level may be an indicative of degradation that would warrant further investigation. Therefore, the ASME OM Code requires that frequency be doubled until the cause of the increased vibration is determined and corrected.

For CS-P-B pump, the vibration at points 1H and 5H consistently exceeds the "Alert Range" lower limit of 0.325 ips; the measured vibration values have been approximately 0.400 ips. In lieu of doubling the test frequency, the licensee proposes to raise the vibration alert range limits from 0.325 to 0.400 ips, while the required action vibration range limit remains at the ASME OM value of >0.700 ips. The proposed alternative is a resubmittal of NRC-approved alternative request RP-07 for the CNS fourth 10-year IST Program. The proposed alternative was previously authorized by the NRC staff in a letter dated June 14, 2006, on the bases that:

1. Vibration History: Vibration data measured since 1990 has demonstrated that vibration levels are not trending upward.

2. Consultation with Pump Manufacturer/Vibration Expert: Byron Jackson, the pump manufacturer determined that motor and pump can operate with these levels of vibration with absolutely no impairment of operating life. An independent vibration expert concluded that several years of spectral data shows no degrading trend and low frequency piping-induced vibrations are not expected to adversely impact the pump operability.

3. Attempt to Lower Vibration: The licensee has attempted to reduce the vibration level through modifications to the pump and the installation of additional pipe restraints.

4. Spectral Analysis: Licensee has performed spectral analysis to identify all contributors to the vibration levels. The submitted spectrum trend data validates the analysis performed by an independent consultant (i.e., that vibrations are piping-induced and not indicative of degraded pump performance).

Associated with the current alternative request, the licensee has re-addressed all the four issues and stated that the overall vibration levels have remained steady at approximately 0.400 ips, over the past 24.5 years, and that doubling the test frequency under current conditions does not provide additional assurance as to the condition of the pump and its ability to perform its safety function. Furthermore, the licensee submitted additional vibration history from the last 10-year IST interval including spectral analysis, maintenance activities, and history of oil analysis.

The NRC staff finds that these additional data and information continue to demonstrate that vibrations in excess of the Code-required lower end of the "Alert Range" have not adversely affected the pump performance and therefore, increasing the lower end of the "Alert Range" from 0.325 ips to 0.400 ips is, in this case, justified. The NRC staff also notes that the licensee-proposed "Alert Range" (0.400 to 0.700 ips) remains sufficiently wide so as to be able to assess pump degradation prior to entering the "Required Action" range (> 0.700 ips). Therefore, the NRC staff concludes that compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that the proposed alternative provides reasonable assurance of operational readiness of the CS-P-B pump.

3.8 Licensee's Alternative Request RP-08

ISTB-5123, "Comprehensive Test Procedure," (e) states, in part, that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200."

ISTB-5223, "Comprehensive Test Procedure," (e) states, in part, that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5221-1 and corrective action taken as specified in ISTB-6200."

ISTB-5323, "Comprehensive Test Procedure," (e) states, in part, that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5321-1 or Table ISTB-5321-2, as applicable, and corrective action taken as specified in ISTB-6200."

ASME OM Code Case, OMN-19, "Alternative Upper Limit for the Comprehensive Pump Test," states, in part, that "a multiplier of 1.06 times the reference value may be used in lieu of the 1.03 multiplier for the comprehensive pump test's upper 'Acceptable Range' criteria and 'Required Action Range, High' criteria referenced in the ISTB test acceptance criteria tables."

In its submittal dated March 19, 2015, the licensee has requested an alternative to the comprehensive pump testing requirements of ISTB-5123(e), ISTB-5223(e), and ISTB-5323(e). The components affected by this alternative request are listed in Table 3.8-1, below.

The CNS fifth 10-year IST program interval begins on March 1, 2016 and is scheduled to end on February 28, 2026. The applicable ASME OM Code edition and addenda for the CNS fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

Table 3.8-1

Pump Name	Pump Number	Pump Type	ASME Code Class	ASME OM Code Category	Design Basis Accident Flow Rate (gpm)	IST Comprehensive Pump Test Flow Rate (gpm)	Pump Periodic Verification (PPV) Test Required (Yes/No)
REC Pumps	REC-P-A/B/C/D	Horizontal Centrifugal	3	Group A	416	1100	No
RHR Pumps	RHR–P-A/B/C/D	Vertical Centrifugal	2	Group A	7700	7800	No
Service Water (SW) Pumps	SW-P-A/B/C/D	Vertical Line Shaft	3	Group A	5846	5500	Yes

<u>Reason for Request</u>

In its letter dated March 19, 2015, the licensee stated, in part:

> Occasionally, NPPD has had some difficulty with implementing the high required action range limit of 1.03% above the established hydraulic parameter reference value due to normal data scatter. NPPD has had to address an inoperability of a pump on at least two occasions during the fourth ten-year interval in which a pump was declared inoperable during a comprehensive pump test due to exceeding this upper limit. The result was that the plant had to enter (or remain

in) an applicable Technical Specification [TS] Limiting Condition for Operation (LCO) for reasons other than a pump degradation issue.

Based on the similar difficulties experienced by other Owners, ASME OM Code Case OMN-19 was developed and has been published in the 2011 Addenda of the ASME OM Code. The white paper for this code case, Standards Committee Ballot 09-610, record 09-657, discussed the impact of instrument inaccuracies, human factors involved with setting and measuring test parameters, readability of gauges and other miscellaneous factors on the ability to meet the 1.03% acceptance criteria. Industry operating experience is also discussed in the white paper.

Code Case OMN-19 has not yet been approved for use in RG [Regulatory Guide] 1.192, Revision 1, "Operations and Maintenance Code Case Acceptability, ASME OM Code" [October 2014 (ADAMS Accession No. ML13340A034)]

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> CNS proposes to use ASME OM Code Case OMN-19 as published in the 2011 Addenda of the ASME OM Code.... The ASME OMN-19 Code Case allows for the use of a multiplier of 1.06 times the reference value in lieu of the 1.03 multiplier for the comprehensive pump test's upper "Acceptable Range" criteria and "Required Action Range, High" criteria referenced in the applicable ISTB test acceptance criteria tables ISTB-5121-1, ISTB-5221-1, ISTB-5321-1 and ISTB-5321-2.
>
> [Instrument] inaccuracies [and human factors involved with setting and measuring flow, pressure, and speed] may cause the measured value to exceed the existing code allowed comprehensive pump test's upper "Acceptable Range" criteria and the "Required Action Range, High" criteria of 3%. The new upper limit of 6%, as approved in Code Case OMN-19, will eliminate declaring the pump inoperable and entering an unplanned Technical Specification LCO or will eliminate the extension of an existing LCO.
>
> As a condition for using OMN-19, CNS will implement a pump periodic verification (PPV) test program to verify that a pump can meet the required differential (or discharge) pressure, as applicable, at its highest design basis accident flow rate, as discussed in Mandatory Appendix V, which was published in the 2012 Edition of the ASME OM Code. CNS will not be required to perform a PPV test if the design basis accident flow rate in the licensee's safety analysis is bounded by the comprehensive pump test or Group A test [flow rate]. Also, if a pump does not have a design basis accident flow rate, then a PPV test is not required. Therefore, any pump that is utilizing the 1.06 multiplier for the comprehensive pump test, [a PPV test, if applicable, will also be required].

In its June 30, 2015, response to an RAI from the NRC staff, the licensee stated that instrument inaccuracies associated with the PPV test parameters will be accounted for within the safety analyses and/or within the test acceptance criteria. The licensee also stated that any flow rate changes associated with Table 3.8-1, above, would be available for NRC inspection, upon request.

NRC Staff Evaluation

The ASME Committee on OM developed ASME OM Code Case OMN-19 and published it in the 2011 Addenda of the ASME OM Code. OMN-19 allows the use of a multiplier of 1.06 times the reference value in lieu of the 1.03 multiplier for the comprehensive pump test's upper "Acceptable Range" criteria and "Required Action Range, High" criteria referenced in Table ISTB-5121-1 and Table ISTB-5221-1.

ASME OM Code Case OMN-19 has not been added to RG 1.192, and the 2011 Addenda of the ASME OM Code has not been incorporated by reference into 10 CFR 50.55a, Codes and standards." The NRC staff has reviewed OMN-19, and currently has no concerns with its use, provided that a condition is met. The NRC staff has determined that licensees choosing to implement OMN-19 must implement a PPV test program to verify that a pump can meet the required differential (or discharge) pressure as applicable, at its highest design-basis accident flow rate, as discussed in Mandatory Appendix V, which was published in the 2012 Edition of the ASME OM Code.

The NRC staff notes that the licensee is not required to perform a PPV test if the design-basis accident flow rate in the licensee's safety analysis is bounded by the comprehensive pump test flow rate or the Group A test flow rate. The licensee has indicated (see Table 3.8-1, above) that the design-basis accident flow rate for SW pumps SW-P-A/B/C/D is not bounded by the comprehensive pump test flow rate. Therefore, a PPV test is required for these pumps. In response to a request for additional information by letter dated June 30, 2015, the licensee stated that this alternative is requested only for the pumps listed in Table 3.8-1, above. None of the pumps listed in Table 3.8-1 are positive displacement pumps. Therefore, an alternative to the comprehensive pump testing requirements of ISTB-5323(e) for positive displacement pumps is not required.

Based on the above evaluation, the NRC staff finds that the licensee's proposed alternative provides an acceptable level of quality and safety to the specific ASME OM Code requirements of ISTB-5123(e) and ISTB-5223(e) for the pumps listed in Table 3.8-1, above.

3.9 Licensee's Alternative Request RP-09

ISTB-5121, "Group A Test Procedure," (b) states, in part, that "The resistance of the system shall be varied until the flow rate equals the reference point."

ISTB-5122, "Group B Test Procedure," (c) states that "System resistance may be varied as necessary to achieve the reference point."

ISTB-5123, "Comprehensive Test Procedure," (b) states, in part, that "For centrifugal and vertical line shaft pumps, the resistance of the system shall be varied until the flow rate equals the reference point."

ISTB-5221, "Group A Test Procedure," (b) states, in part, that "The resistance of the system shall be varied until the flow rate equals the reference point."

ISTB-5222, "Group B Test Procedure," (c) states that "System resistance may be varied as necessary to achieve the reference point."

ISTB-5223, "Comprehensive Test Procedure," (b) states, in part, that "The resistance of the system shall be varied until the flow rate equals the reference point."

ASME OM Code Case, OMN-21, "Alternate Requirements for Adjusting Hydraulic Parameters to Specified Reference Points," states:

> It is the opinion of the Committee that when it is impractical to operate a pump at a specified reference point and adjust the resistance of the system to a specified reference point for either flow rate, differential pressure or discharge pressure, the pump may be operated as close as practical to the specified reference point with the following requirements. The Owner shall adjust the system resistance to as close as practical to the specified reference point where the variance from the reference point does not exceed + 2% or - 1% of the reference point when the reference point is flow rate, or + 1% or – 2% of the reference point when the reference point is differential pressure or discharge pressure.

The licensee has requested an alternative to the pump testing reference value requirements of ISTB-5121, ISTB-5122, ISTB-5123, ISTB-5221, ISTB-5222, and ISTB-5223. The components affected by this alternative request are the pumps listed in Table 3.9-1, below.

The CNS fifth 10-year IST program interval begins on March 1, 2016, and is scheduled to end on February 28, 2026. The applicable ASME OM Code edition and addenda for the CNS fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

Table 3.9-1

Pump Name	Pump Number	Pump Type	ASME Code Class	ASME OM Code Category
CS Pumps	CS-P-A/B	Vertical Centrifugal	2	Group B
HPCI Main & Booster Pumps	HPCI-P-MP HPCI-P-BP	Turbine Driven Horizontal Centrifugal	2	Group B
RCIC Main Pump	RCIC-P-MP	Turbine Driven Horizontal Centrifugal	2	Group B
REC Pumps	REC-P-A/B/C/D	Horizontal Centrifugal	3	Group A

RHR Pumps	RHR-P-A/B/C/D	Vertical Centrifugal	2	Group A
SW Pumps	SW-P-A/B/C/D	Vertical Line Shaft	3	Group A
RHR SWB Pumps	SW-P-BP-A/B/C/D	Horizontal Centrifugal	3	Group A

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part:

> For pump testing, there is difficulty adjusting system throttle valves with sufficient precision to achieve exact flow reference values during subsequent IST exams. Section ISTB of the ASME OM Code does not allow for variance from a fixed reference value for pump testing. However, NUREG-1482, Revision 2, Section 5.3 ["Allowable Variance from Reference Points and Fixed-Resistance Systems"], acknowledges that certain pump system designs do not allow for the licensee to set the flow at an exact value because of limitations in the instruments and controls for maintaining steady flow.
>
> ASME OM Code Case OMN-21 provides guidance for adjusting reference flow/DP [differential (or discharge) pressure] to within a specified tolerance during Inservice Testing. The Code Case states "It is the opinion of the Committee that when it is impractical to operate a pump at a specified reference point and adjust the resistance of the system to a specified reference point for either flow rate, differential pressure or discharge pressure, the pump may be operated as close as practical to the specified reference point with the following requirements. The Owner shall adjust the system resistance to as close as practical to the specified reference point where the variance from the reference point does not exceed +2% or -1% of the reference point when the reference point is flow rate, or +1% or -2% of the reference point when the reference point is differential pressure or discharge pressure."

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> CNS seeks to perform Inservice Pump testing in a manner consistent with the requirements as stated in ASME OM Code Case OMN-21. Specifically, testing will be performed such that flow rate is adjusted as close as practical to the reference value and within proceduralized limits not to exceed +2%/-1% of the reference value. Or, if differential pressure or discharge pressure is set, then it will be set as close as practical to the reference value and within proceduralized limits not to exceed + 1%/-2% of the reference value.
>
> CNS plant operators will still strive to achieve the exact test flow reference values during testing. Typical test guidance will be to adjust flow to the specific reference value. If necessary, additional guidance will be provided such that if

the reference value cannot be achieved with reasonable effort, the test will be considered valid if the steady state reference value is within the procedural limits. The procedural limits will be carefully determined on a case by case basis, and will not exceed the limits provided in Code Case OMN-21. The test will be considered valid if the steady state reference value is within the proceduralized limits of the procedure.

NRC Staff Evaluation

An inquiry was submitted to the ASME OM Code to determine what alternatives may be used when it is not possible to operate a pump at a specified reference point for either flow rate or differential (or discharge) pressure. ASME Code Case OMN-21 was developed to provide guidance on alternatives. The guidance in Code Case OMN-21 states that when it is not possible to operate a pump at a specified reference point for either flow rate or differential (or discharge) pressure, the pump may be operated as close as practical to the specified reference point with the following requirements. Code Case OMN-21 specifies that the variance from the reference point shall not exceed +2 percent or -1 percent of the reference point when the reference point is flow rate, or +1 percent or -2 percent of the reference point when the reference point is differential (or discharge) pressure.

Code Case OMN-21 was approved by the ASME Operation and Maintenance Standards Committee on April 20, 2012, with the NRC representative voting in the affirmative. The licensee proposes to adopt Code Case OMN-21. The applicability of Code Case OMN-21 is the ASME OM Code 1995 Edition through the 2011 Addenda. The NRC staff notes that the language from Code Case OMN-21 has been included in the ASME OM Code, 2012 Edition. Also, the NRC staff plans to add Code Case OMN-21 as an acceptable Code Case in Revision 3 of RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code."

The NRC staff notes that in certain situations, it is not possible to operate a pump at a precise reference point. The NRC staff has reviewed the alternatives proposed in ASME OM Code Case OMN-21 and found that the proposed alternatives are reasonable and appropriate when a pump cannot be operated as a specified reference point. Operation within the tolerance bands specified in ASME OM Code Case OMN-21 provides reasonable assurance that licensees will be able to utilize the data collected to detect degradation of the pumps. Based on the NRC staff's review of ASME OM Code Case OMN-21 and the licensee's request to use the bands specified in ASME OM Code Case OMN-21 for flow rate and differential (or discharge) pressure, the NRC staff concludes that implementation of the alternatives contained in ASME OM Code Case OMN-21 is acceptable for the pumps listed in Table 3.9-1, above. Therefore, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety.

3.10 Licensee's Alternative Request RV-01

ISTC-3300, "Reference Values," states, in part, that "Reference values shall be determined from the results of preservice testing or from the results of inservice testing."

ISTC-3310, "Effects of Valve Repair, Replacement, or Maintenance on Reference Values," states, in part, that "When a valve or its control system has been replaced, repaired, or has undergone maintenance that could affect the valve's performance, a new reference value shall be determined or the previous value reconfirmed by an inservice test run before the time it is returned to service or immediately if not removed from service."

ISTC-3500, "Valve Testing Requirements," states that "Active and passive valves in the categories defined in ISTC-1300 shall be tested in accordance with the paragraphs specified in Table ISTC-3500-1 and the applicable requirements of ISTC-5100 and ISTC-5200."

ISTC-3510, "Exercising Test Frequency," states, in part, that "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222."

ISTC-3560, "Fail-Safe Valves," states that "Valves with fail-safe actuators shall be tested by observing the operation of the actuator upon loss of valve actuating power in accordance with the exercising frequency of ISTC-3510."

ISTC-5151, "Valve Stroke Testing," (a) states that "Active valves shall have their stroke times measured when exercised in accordance with ISTC-3500."

ISTC-5151(b), states that "The limiting value(s) of full-stroke time of each valve shall be specified by the Owner."

ISTC-5151(c), states that "Stroke time shall be measured to at least the nearest second."

ISTC-5152, "Stroke Test Acceptance Criteria," states, in part, that "Test results shall be compared to reference values established in accordance with ISTC-3300, ISTC-3310, or ISTC-3320."

ISTC-5153, "Stroke Test Corrective Action," (b) states, in part, that "Valves with measured stroke times that do not meet the acceptance criteria of ISTC-5152 shall be immediately retested or declared inoperable."

The licensee requested alternative testing for the following solenoid-operated valves (SOVs):

Table 3.10-1			
Valve ID	**System**	**Cat**	**Class**
HPCI-SOV-SSV-64	HPCI	B	2
HPCI-SOV-SSV-87	HPCI	B	2

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part:

> The HPCI turbine and exhaust steam drip leg drain to gland condenser (HPCI-SOV-SSV-64) and HPCI turbine and exhaust steam drip leg drain to equipment drain isolation valve (HPCI-SOV-SSV-87) have an active safety function in the closed position to maintain pressure boundary integrity of the HPCI turbine exhaust line. These valves serve as a Class 2 to non-code boundary barrier.

> These valves are rapid acting, encapsulated, solenoid-operated valves. Their control circuitry is provided with a remote manual switch for valve actuation to the open position and an auto function which allows the valves to actuate from signals received from the associated level switches HPCI-LS-98 and HPCI-LS-680. Both valves receive a signal to change disc position during testing of drain pot level switches. However, remote position indication is not provided for positive verification of disc position. Additionally, their encapsulated design prohibits the ability to visually verify the physical position of the operator, stem, or internal components.

<u>Proposed Alternative</u>

In its letter dated March 19, 2015, the licensee stated, in part:

> CNS has been performing a robust exercise test for these two valves that verifies obturator movement since 1998 on a quarterly basis. In 2001, this test identified some leakage past HPCI-SOV-SSV64 and the valve was removed and refurbished. For the past ~14 years, the exercise test has been completed without any issues. This test is accomplished through the performance of surveillance procedure, 6.HPCI.204, HPCI-SOV-SSV64 and HPCI-SOV-SSV87 IST Closure Test. With HPCI not in operation, a demineralized water source is utilized to verify that HPCI-SOV-SSV64 opens when level switch HPCI-LS-680 (turbine exhaust drain pot high level) trips, allowing level in the gland seal condenser to start to rise due to water flow through HPCI-SOVSSV64. After HPCI-LS-680 resets and HPCI-SOV-SSV64 closes, the gland seal condenser level is verified to be steady.
>
> Similarly, CNS verifies that HPCI-SOV-SSV87 opens when level switch HPCI-LS-98 (turbine exhaust drip leg high) trips, allowing the observation of water flow to a floor drain from a drain pipe downstream of HPCI-SOV-SSV87. After HPCI-LS-98 resets and HPCI-SOV-SSV87 closes, CNS observes the drain pipe downstream of HPCI-SOV-SSV87 for gross leakage past the valve. Therefore, CNS verifies valve obturator movement for both valves open and closed while simultaneously verifying the calibration of two level switches.
>
> Typically, tests that involve hooking up pressure sources and various amounts of test tubing are not performed on a quarterly basis due to their complexities (i.e. local leak rate tests). In addition, each time this "quarterly" test has been performed, HPCI unavailability time (~1.5 hours) is consumed in addition to some minor radiological dose. Finally, this exercise test is actually a much better method of determining the valve's operational readiness than a quarterly fast acting stroke time test would have been. Therefore, based on the complexities of the test, consuming unnecessary HPCI unavailability time and personal radiation exposure, the exceptional test history dating back to 2001, and the fact that this is a robust test that verifies obturator movement, CNS proposes to exercise each valve to the full closed position, as described, on a 6 month basis.

> In addition to performing this robust exercise test every 6 months, each solenoid valve will be disassembled and examined for degradation on a periodic basis per the Preventative Maintenance [(PM)] Program. The valve body, insert, piston, plunger/stem assembly, and stem spring will all be examined per criteria outlined in surveillance procedure 6.HPCI.404. In addition, continuity and the physical condition of the coil will also be checked. The valve and/or valve parts will be refurbished and/or replaced, as necessary, based on this examination. This maintenance shall be performed at an optimized frequency, not to exceed 48 months (2 cycles).

In its June 9, 2015, response to an RAI from the NRC staff, the licensee stated, in part:

> The frequency of the PM is optimized by balancing the component reliability with the correct PM frequency. The goal is to ensure that the solenoid valves continue to perform their closure function in a reliable manner without performing the internal examination PMs too frequently. As long as the PM ensures that any minor issue is taken care of prior to it becoming an issue with the closure function of the valve meeting its acceptance criteria, then the frequency is set to an acceptable duration. This, in conjunction with acceptable exercise tests, justifies the acceptability of the frequency.
>
> If the exercise testing results in a failure of the closure acceptance criteria of one of the solenoid valves, or the examination PM of one of the solenoid valves identifies a significant component issue that may have resulted in the respective valve not being able to perform its closure function, then the examination frequency of both solenoid valves shall be moved from 48-month frequencies to 24-month frequencies. From this point, two periodic examinations would have to be performed and completed satisfactorily at the 24-month frequency prior to returning the frequency to the 48-month frequency.

In its letter dated March 19, 2015, the licensee stated, in part:

> ...The purpose of this enhanced preventative maintenance is to ensure the long term reliability of the components and to monitor for internal degradation. This is consistent with NUREG 1482, Section 4.2.3 ["Stroke Time for Solenoid Operated Valves"]. The 6 month exercise tests will ensure that the valves are operational and will fulfill their safety function when called upon.
>
> The robust 6 month exercise testing and the enhanced preventative maintenance will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Therefore, pursuant to [10 CFR 50.55a(z)(1)], NPPD requests relief from the specific ISTC requirements identified in this request.
>
> The proposed alternative will be utilized for the entire fifth ten-year interval.

NRC Staff Evaluation

The ASME OM Code requires that active valves be exercised nominally every 3 months and have their stroke times measured and assessed. The ASME OM Code recognizes that not every valve can meet the nominal exercise frequency every 3 months due to the exercise not being practicable during normal plant operation. The ASME OM Code allows extension of the exercise requirement to be performed during a cold shutdown event. Valve exercising shall commence within 48 hours of achieving cold shutdown and continue until all testing is complete or the plant is ready to return to operation at power. If valve exercising is not practicable during a cold shutdown, then exercising will be limited to refueling outages. All valve tests required to be performed during a refueling outage shall be completed before returning the plant to operation at power.

The HPCI valves, HPCI-SOV-SSV-64 and HPCI-SOV-SSV-87, are totally enclosed solenoid valves that are not equipped with position indication and their encapsulated design prohibits the ability to visually verify the physical position of the valve stem or internal components. Stroke timing and fail safe testing is not possible using conventional methods. In lieu of the ASME OM Code requirements, the licensee has proposed an alternative to exercise the valves every 6 months and to incorporate an enhanced maintenance program involving disassembly and inspection.

The 6-month exercise frequency was determined by evaluating the performance history of the valves and the feedback of the internal valve condition found during the disassembly and inspect maintenance task. In addition, by reducing the exercise test from four times a year to two times a year, a reduction in personnel radiation exposure and HPCI system unavailability is achieved. The disassembly and inspection task interval is nominally set at 24 months but can be extended with good performance history to 48 months. Should the 6-month exercise test fail to meet its acceptance criteria and/or internal examination of the valve is found to be unacceptable, the interval for disassembly and inspection is returned to 24 months. The NRC staff finds that this alternative provides an acceptable level of quality and safety and is consistent with NUREG-1482, Revision 2, Section 4.2.3.

3.11 Licensee's Alternative Request RV-02

ASME OM Code Mandatory Appendix I, "Inservice Testing of Pressure Relief Devices in Light-Water Reactor Nuclear Power Plants," Section I-1320, "Test Frequencies, Class 1 Pressure Relief Valves," (a) "5-Year Test Interval," states, in part, that "Class 1 pressure relief valves shall be tested at least once every 5 years...."

The licensee requested to use an alternative testing frequency for Main Steam (MS) Safety Valves MS-RV-70ARV, MS-RV-70BRV, and MS-RV-70CRV.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part:

> Section ISTC-3200, "Inservice Testing," states that inservice testing shall commence when the valves are required to be operable to fulfill their required function(s). Section ISTC-5240, "Safety and Relief Valves," directs that safety

> and relief valves meet the inservice testing requirements set forth in Appendix I of the ASME OM Code. Appendix I, Section 1-1320(a) of the ASME OM Code states that Class 1 pressure relief valves shall be tested at least once every 5 years, starting with initial electric power generation. This section also states a minimum of 20 percent of the pressure relief valves are tested within any 24-month interval and that the test interval for any individual valve shall not exceed 5 years. Prior to Cycle 28, CNS had refueling cycles of 18 months. With three safety valves, CNS has been meeting the ASME OM Code by removing, testing, rebuilding, and re-installing one valve per refueling outage. All three of these safety valves have an acceptable test history since 1997 [described below].
>
> However, after Refueling Outage (RE)27 (Fall/2012), CNS began the current 24-month refueling cycle. The five year frequency was met for the safety valve due in RE28 (Fall/2014), but a relief request requesting the use of Code Case OMN-17 will be necessary in order to continue with the process of testing only one valve each refueling outage for the fifth ten-year interval, beginning March 1, 2016. Without this relief request, CNS would be required to remove and test all three valves within a two cycle frequency (two one outage and one the next) in order to ensure that all three valves are removed and tested in accordance with the ASME OM Code requirements. This testing pattern would ensure compliance with the ASME OM Code requirements for testing Class 1 pressure relief valves within a 5 year interval.
>
> Extending the test interval to 6 years, as described in Code Case OMN-17, would allow CNS to continue with the current method of removing, testing, rebuilding, and re-installing one safety valve per outage so that all three safety valves would be replaced over three refuel cycles (i.e., ~6 years).
>
> Without Code relief, the incremental outage work due to the inclusion of an additional safety valve every other outage would be contrary to the principle of maintaining radiation dose As Low As Reasonably Achievable (ALARA). The removal and replacement of the additional safety valve every other outage results in an additional exposure of approximately 450 millirem (mrem) to 726 mrem. This estimate is based on the actual radiation received to remove and reinstall a safety valve during each of the last three refueling outages.

The licensee requested relief pursuant to 10 CFR 50.55a(z)(1) on the basis that the alternative testing will provide an acceptable level of quality and safety.

<u>Proposed Alternative</u>

In its letter dated March 19, 2015, the licensee stated, in part:

> NPPD requests that the test interval be increased from 5 years to 6 years in accordance with Code Case OMN-17. All aspects of Code Case OMN-17 will be followed for the MS safety valves.

As an alternative to the Code-required 5-year test interval per Appendix I, paragraph 1-1320(a), NPPD proposes that the subject Class 1 safety valves be tested at least once every three refueling cycles (approximately 6 years/72 months) with a minimum of 20% of the valves tested within any 24-month interval. This 20% would consist of valves that have not been tested during the current 72-month interval, if they exist. The test interval for any individual valve would not exceed 72 months except that a 6-month grace period is allowed to coincide with refueling outages to accommodate extended shutdown periods and certification of the valve prior to installation. This is all in accordance with OMN-17, paragraph (a).

After as-found set-pressure testing, the valves shall be disassembled and inspected to verify that parts are free of defects resulting from time-related degradation or service induced wear. As-left set-pressure testing shall be performed following maintenance and prior to returning the valve to service. Each valve shall have been disassembled and inspected prior to the start of the 72-month interval. Disassembly and inspection performed prior to the implementation of Code Case OMN-17 may be used.

Each refueling outage, CNS will remove one safety valve to be sent off-site to a test facility. Upon receipt at the off-site facility, the valves are subject to an as-found inspection, as-found seat leakage test, and as-found set pressure test in accordance with Appendix I of the ASME OM Code. Prior to returning the valve to the plant for re-installation, the safety valve is disassembled and inspected to verify that internal surfaces and parts are free from defects or service induced wear. During this process, anomalies or damage are identified for resolution. Damaged or worn parts (i.e. springs, gaskets and seals) are replaced or repaired, as necessary. Following reassembly, the valve's set pressure is recertified. This existing process is in accordance with ASME OM Code Case OMN-17, paragraphs (d) and (e). Alternatively, CNS may elect to replace the removed valve with a spare valve that has previously already been through the process just described. Up to three spare valves may be used in accordance with paragraph (b) of OMN-17.

NPPD has reviewed the as-found set point test results for all three safety valves tested since 1997. Since 1997, all as found lift tests have been within a +/-3% tolerance (maximum of +2.02%). The current Technical Specification requirements are that the as found test results fall within a +/-3% tolerance. Technical Specifications require the as left certification of the valves to meet a +/-1% tolerance. If an as found test is found to be outside of the +/-3% tolerance, the other 2 safety valves will be removed and tested in accordance with Code Case OMN-17, paragraph (c).

Accordingly, the proposed alternative of implementing all aspects of OMN-17, which will increase the test interval for the subject Class 1 safety valves from 5 years to 3 fuel cycles (approximately 6 years/72 months), will provide an acceptable level of quality and safety. This will also restore the operational and maintenance flexibility that was lost when the 24-month fuel cycle created the unintended consequences of more frequent testing. This proposed alternative will continue to provide assurance of the valves' operational readiness and provides an acceptable level of quality and safety pursuant to [10 CFR 50.55a(z)(1)].

NRC Staff Evaluation

ASME OM Code, Mandatory Appendix I-1320(a) requires, in part, that "Class 1 pressure relief valves be tested at least once every 5 years...." However, Mandatory Appendix I does not require that pressure relief valves be disassembled and inspected prior to the start of the 5-year test interval. In lieu of the 5-year test interval, the licensee proposed to implement ASME OM Code Case OMN-17, which allows a test interval of 6 years plus a 6-month grace period. The ASME Committee on OM developed Code Case OMN-17 and published it in the 2009 Edition of the ASME OM Code. ASME OM Code Case OMN-17 imposes a special maintenance requirement to disassemble and inspect each pressure relief/safety valve to verify that parts are free from defects resulting from time-related degradation or service-induced wear prior to the start of the extended test interval and at each required test during the interval. The purpose of this maintenance requirement is to reduce the potential for pressure relief valve set-point drift.

ASME OM Code Case OMN-17 has not yet been added to RG 1.192, nor included in 10 CFR 50.55a by reference. However, the NRC has allowed licensees to use ASME OM Code Case OMN-17, provided all requirements in the Code Case are met. Consistent with the special maintenance requirement in ASME OM Code Case OMN-17, each MS safety valve at CNS will be disassembled and inspected to verify that internal surfaces and parts are free from defects or service induced wear prior to the start of the next test interval. This maintenance will also help to reduce the potential for set point drift, and increase the reliability of the valves to perform their design requirement functions. Consistent with the special maintenance requirement in ASME OM Code Case OMN-17, critical components will be inspected for wear and defects. This process is consistent with ASME OM Code Case OMN-17 paragraphs (d) and (e).

Furthermore, ASME OM Code Case OMN-17 is performance-based, in that it requires that the MS Safety Valves be tested more frequently if test failures occur. For example, ASME OM Code Case OMN-17 requires that two additional valves be tested when a valve in the initial test group exceeds the set pressure acceptance criteria. All remaining valves in the group are required to be tested if one of the additional valves tested exceeds its set pressure acceptance criteria.

Additionally, a review of recent set point testing results shows that CNS has had no as-found test failures since 1997, which includes 14 tests.

Based on the historical performance of the set-point testing of the MS Safety Valves at CNS and disassembly and inspection of the MS Safety Valves prior to use, the NRC staff finds that implementation of ASME OM Code Case OMN-17 for the testing of the CNS MS Safety Valves, in lieu of the requirements of the 2004 Edition through the 2006 Addenda, Mandatory Appendix I, Section 1320 of the ASME OM Code, provides an acceptable level of quality and safety.

3.12 Licensee's Alternative Request RV-03

ASME OM Code Mandatory Appendix I, Section I-1320(a), "5-Year Test Interval," states, in part, that "Class 1 pressure relief valves shall be tested at least once every 5 years...."

ASME OM Code Mandatory Appendix I, Section I-3310, "Class I Main Steam Pressure Relief Valves with Auxiliary Actuation Devices," states:

> Tests before maintenance or set-pressure adjustment, or both, shall be performed for 1-3310(a), (b) and (c) in sequence. The remaining shall be performed after maintenance or set-pressure adjustments:
>
> a. visual examination;
>
> b. seat tightness determination, if practicable;
>
> c. set-pressure determination;
>
> d. determination of electrical characteristics and pressure integrity of solenoid valve(s);
>
> e. determination of pressure integrity and stroke capability of air actuator;
>
> f. determination of operation and electrical characteristics of position indicators;
>
> g. determination of operation and electrical characteristics of bellows arm switch;
>
> h. determination of actuating pressure of auxiliary actuating device sensing element, where applicable, and electrical continuity;
>
> i. determination of compliance with the Owner's seat tightness criteria.

The licensee requested to use an alternative test interval for the following MS Safety Relief Valves (SRVs):

MS-RV-71ARV	MS-RV-71BRV	MS-RV-71CRV	MS-RV-71DRV
MS-RV-71ERV	MS-RV-71FRV	MS-RV-71GRV	MS-RV-71HRV

These eight SRVs are considered Class 1 MS pressure relief valves with auxiliary actuating devices. They are located on the MS lines. In addition to their automatic function of opening to prevent over pressurization of the reactor vessel, six of these valves are associated with the Automatic Depressurization System and two are associated with the Low-Low Set logic. The valves are two-stage Target Rock valves, each equipped with a main body, a pilot assembly for set pressure control, a solenoid valve, and an air operator assembly.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part:

> CNS has eight MS safety relief valves (SRVs). The approach for the past several years has been to remove either 2 or 3 of the entire valves (i.e. main body and pilot assembly) every refueling outage and send them off for as found testing, refurbishment, rebuilding, and re-certification in preparation for the next time they are re-installed into the plant. Those 2 or 3 entire valves have been replaced with refurbished valves that were recertified just prior to the outage. The schedule is planned so that all eight entire valves get sent off, as found tested, refurbished, and re-certified within a three cycle frequency. In addition, CNS has replaced the remainder of the pilot assemblies (5 or 6 per outage) and sent them off for testing, refurbishment, and re-certification in preparation for the next time they are re-installed into the plant. These 5 or 6 additional pilot assemblies are replaced with refurbished and recertified pilot assemblies that were recertified just prior to the outage. Therefore, the pilot assemblies for the full complement of 8 valves have been set pressure tested every outage for several years.
>
> CNS plans to continue this approach into the fifth ten-year interval. However, refueling outage 27 (Fall/2012) was the last refueling outage under an 18-month cycle. CNS is now operating with 24-month cycles. With this in mind, the refurbishment of the entire valves will eventually align with a six year frequency, which is consistent with Code Case OMN-17. However, all eight of the pilot assemblies are being removed, tested and replaced with refurbished/recertified spare pilot assemblies every refueling outage, which means a full complement of the set pressure portion of the valves are being tested every refueling outage. Therefore, although this approach is very conservative, documenting acceptability of this approach is being pursued per this relief request.
>
> Additionally, since 5-6 pilot assemblies, alone, are being replaced every outage (versus the entire valve), documenting acceptability of how portions of Appendix I-3310 are being satisfied is also being pursued per this relief request.

The licensee requested relief pursuant to 10 CFR 50.55a(z)(1) on the basis that the alternative testing will provide an acceptable level of quality and safety.

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> CNS proposes to follow Code Case OMN-17, paragraph (d), recommendations for Maintenance on these eight valves. Therefore, on a three cycle (up to 6 year) frequency, CNS proposes to remove the entire valve unit (i.e. main body and pilot assembly) for each one of these valves and ship it off for as found testing, refurbishment, and re-certification. CNS will replace these entire valve units with spare refurbished and re-certified entire valve units.

As mentioned earlier, each valve is equipped with a pilot valve assembly that controls the set pressure. The remainder of the pilot valve assemblies (5 or 6 per refueling outage) will be removed from the main body and sent off site for examination, as found testing, refurbishment, and re-qualification testing (set point, reseat, and pilot stage seat tightness). The test facility has a main body slave for this purpose. The removed pilot valve assemblies are replaced with previously refurbished and re-qualified pilot valve assemblies. By testing all of the pilot valve assemblies every outage, the potential need to expand to test additional valves due to set pressure failures is alleviated and the future valve reliability is improved. Test results are being monitored by serial numbers. Any as found set pressure failure will be addressed via the CNS Corrective Action Program.

ASME OM Code Interpretation 98-8, clarifies that a pilot operated relief valve with an auxiliary actuating device is not required to be tested as a unit. Furthermore, it clarifies that set pressure determination on the pilot operator may be performed after the pilot operator is removed from the valve body.

Appendix I, I-3310(a) visual examination is completed at the test facility for those main bodies and pilot assemblies being sent there for examination, testing and refurbishment. With the removal of the pilot assemblies from the main bodies at the plant, the accessible portions of the main bodies will be examined in place without further disassembly as permitted by 1-1310(c).

Appendix I, 1-3310(b) seat tightness, and 1-3310(c) set pressure, is satisfied through as found seat leakage and set pressure testing at the offsite test facility for those main valves and pilot valve assemblies being sent there for inspection, testing and refurbishment. Paragraph 1-3310(i) is satisfied through as left seat leakage testing at the facility. Seat leakage of installed main valves is continuously monitored and also satisfies 1-3310(i). Pressure switches in the SRV discharge lines annunciate in the control room and indicate when the main valve seat is open. In addition, there are temperature elements on the valve discharge lines which provide leakage indication.

During startup, the main valve and Auxiliary Actuation Devices are verified to function properly by being full stroke exercised open and closed. Successfully exercising these valves open and closed verifies the electrical characteristics and pressure integrity of the solenoid valve and air actuator (satisfying Appendix I, paragraphs (d) and (e)). During this exercise, Appendix I, paragraph 1-3310(f), is also satisfied through the use of the valve indicating lights, discharge pressure switches, and temperature elements.

Finally, Appendix I, paragraphs 1-3310(g) and 1-3310(h), are not applicable to the CNS MS safety relief valves.

This proposed alternative is conservative in nature and will continue to provide an acceptable level of quality and safety pursuant to [10 CFR 50.55a(z)(1)].

NRC Staff Evaluation

Evaluation of Alternative to Mandatory Appendix I, Section I-1320(a)

ASME OM Code, Mandatory Appendix I-1320(a) requires, in part, that "Class 1 pressure relief valves be tested at least once every 5 years...." However, Mandatory Appendix I does not require that pressure relief valves be disassembled and inspected prior to the start of the 5-year test interval. In lieu of the 5-year test interval, the licensee proposed to implement ASME OM Code Case OMN-17, which allows a test interval of 6 years plus a 6-month grace period. The ASME Committee on OM developed Code Case OMN-17 and published it in the 2009 Edition of the ASME OM Code. ASME OM Code Case OMN-17 imposes a special maintenance requirement to disassemble and inspect each pressure relief/safety valve to verify that parts are free from defects resulting from time-related degradation or service-induced wear prior to the start of the extended test interval and at each required test during the interval. The purpose of this maintenance requirement is to reduce the potential for pressure relief valve set-point drift.

ASME OM Code Case OMN-17 has not yet been added to RG 1.192, nor included in 10 CFR 50.55a by reference. However, the NRC has allowed licensees to use ASME OM Code Case OMN-17, provided all requirements in the Code Case are met. Consistent with the special maintenance requirement in ASME OM Code Case OMN-17, CNS will continue their practice of disassembly, inspection, and refurbishment for the sample valve assemblies (main body and pilot assembly) selected for testing at any given refueling outage as well as for all the pilot assemblies for the remaining valves. This maintenance will also help to reduce the potential for set point drift, and increase the reliability of these MS SRVs to perform their design requirement functions. Consistent with the special maintenance requirement in ASME OM Code Case OMN-17, critical components will be inspected for wear and defects. This process is consistent with ASME OM Code Case OMN-17 paragraphs (d) and (e). Also, by testing 100 percent of the pilot valve assemblies (which controls the set-pressure of the valves) each outage, the need to expand the test sample upon failure of the set-pressure portion of the test for any given test valve, as required by OMN-17 paragraph (c) will be obviated.

Based on the disassembly and inspection of the MS SRVs prior to use and the additional conservatism of 100 percent pilot assembly testing each outage, the NRC staff finds that implementation of ASME OM Code Case OMN-17 for the testing of the CNS Main Steam SRVs, in lieu of the requirements of the 2004 Edition through the 2006 Addenda, Mandatory Appendix I, Section 1320 of the ASME OM Code, provides an acceptable level of quality and safety.

Evaluation of Alternative to Mandatory Appendix I, Section I-3310

The sequence of testing performed to satisfy Mandatory Appendix I, Section I-3310 varies depending on whether an entire SRV assembly is being tested or just the pilot assembly for a given SRV. For example, if an entire SRV assembly is being tested, the test facility will perform the steps required by I-3310(a), (b), (c), and (i). The remainder of the applicable steps will be performed by plant personnel during subsequent reinstallation and exercising of the SRV. For valves for which just the pilot assembly is tested, the test facility will perform the steps required by I-3310(a), (b), (c), and (i) for the pilot. In this case, the accessible portions of the main body will be examined in place to the extent possible without further disassembly. After refitting a tested pilot to a main body, the remainder of the applicable steps required by I-3310 will be performed by plant personnel during subsequent exercising of the SRV. In either case, seat leakage for the main body is monitored continuously during operation.

While the testing sequence and practice used for satisfying Mandatory Appendix I, Section I-3310 varies depending on the type of testing being performed, the NRC staff notes that, in aggregate, the required tests are ultimately performed. The staff further notes that the additional conservatism provided by performing 100 percent pilot testing at each outage yields additional test results that would otherwise not be available in a strictly code compliant program.

Based on the above, the NRC staff finds that the alternative proposed, in lieu of the requirements of the 2004 Edition through the 2006 Addenda, Mandatory Appendix I, Section 3310 of the ASME OM Code, provides an acceptable level of quality and safety.

3.13 Licensee's Alternative Request RV-04

ISTC-3500, "Valve Testing Requirements," states that "Active and passive valves in the categories defined in ISTC-1300 shall be tested in accordance with the paragraphs specified in Table ISTC-3500-1 and the applicable requirements of ISTC-5100 and ISTC-5200."

ISTC-3510, "Exercising Test Frequency," states, in part, that "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222."

ISTC-3560, "Fail-Safe Valves," states that "Valves with fail-safe actuators shall be tested by observing the operation of the actuator upon loss of valve actuating power in accordance with the exercising frequency of ISTC-3510."

ISTC-5131, "Valve Stroke Testing," (a) states that "Active valves shall have their stroke times measured when exercised in accordance with ISTC-3500."

ISTC-5151, "Valve Stroke Testing," (a) states that "Active valves shall have their stroke times measured when exercised in accordance with ISTC-3500."

ISTC-5221, "Valve Obturator Movement," (a) states that "The necessary valve obturator movement during exercise testing shall be demonstrated by performing both an open and a close test."

The licensee requested alternative testing for the following SOV, Air Operated Valve (AOV) and Check Valve (CV):

Table 3-13-1			
Valve ID	**System**	**Cat**	**Class**
CRD-SOV-SO120*	Control Rod Drive (CRD)	B	2
CRD-SOV-SO121*	CRD	B	2
CRD-SOV-SO122*	CRD	B	2
CRD-SOV-SO123*	CRD	B	2
CRD-AOV-CV126*	CRD	B	2
CRD-AOV-CV127*	CRD	B	2
CRD-CV-114CV*	CRD	C	2
CRD-CV-138CV*	CRD	C	2

* Typical of 137 Hydraulic Control Units (HCU)

The proposed alternative testing shall be effective for the fifth 10-year interval IST program, which is currently scheduled to begin on March 1, 2016 and end on February 28, 2026. The applicable Code edition for this duration is the ASME OM Code 2004 Edition through 2006 Addenda.

<u>Reason for Request</u>

In its letter dated March 19, 2015, the licensee stated, in part:

> Pursuant to 10 CFR 50.55a, "Codes and Standards," paragraph [(z)(1)], relief is requested from the requirements of ASME OM Code ISTC-3500, ISTC-3510, ISTC-3560, ISTC-5131(a), ISTC-5151(a), and ISTC-5221(a).

<u>Proposed Alternative</u>

In its letter dated March 19, 2015, the licensee stated, in part:

> <u>CRD-CV-138CV; CRD-SOV-SO120, SO121, SO122, SO123</u>:
>
> The CRD cooling water header check valve, CRD-CV-138CV (typical of 137 HCUs), has a safety function to close in the event of a scram to prevent diversion of pressurized HCU accumulator water to the cooling water header. The exhaust water withdrawal/settle (CRD-SOV-SO120), exhaust water insert (CRD-SOV-SO121), drive water withdrawal (CRD-SOV-SO122), and drive water insert (CRD-SOV-SO123) solenoid valves (typical of 137), have a safety function to close in order to provide a boundary to non-code class piping.
>
> Normal control rod motion will verify that the associated cooling water check valve has moved to its safety function position of closed. Industry experience has shown that rod motion may not occur if this check valve were to fail in the open position.

The solenoid valves listed above have a safety function to close in order to provide a class 2 to non-code class boundary isolation. During normal operation, these solenoid valves are used for control rod insertion and withdrawal. They are exercised open and closed during normal operation of the associated CRD. They are not equipped with position indication or control switches. They automatically change position to affect control rod movement.

Therefore, control rod exercising in accordance with the CNS Technical Specifications, Surveillance Requirement (SR) 3.1.3.3, will provide an acceptable level of quality and safety for these valves [CRD-CV-138CV, CRD-SOV-SO120, CRD-SOV-SO121, CRD-SOV-SO122, and CRD-SOV-SO123 (typical of 137)].

<u>CRD-AOV-CV126, CRD-AOV-CV127, and CRD-CV-114CV</u>:

These valves operate as an integral part of their respective HCU to rapidly insert the control rods in support of a scram. The CRD scram inlet valve, CRD-AOV-CV126 (typical of 137), opens with a scram signal to pressurize the lower side of the Control Rod Drive Mechanism (CRDM) pistons from the accumulator or from the charging water header. The CRD outlet isolation valve, CRD-AOV-CV127 (typical of 137), opens with scram signal to vent the top of the CRDM piston to the scram discharge header. The CRD scram outlet check valve, CRD-CV-114CV (typical of 137), opens to allow flow from the top of the CRDM piston to the scram discharge header.

Individual stroke time measurements of air-operated valves CRD AOV CV126 and CRD-AOV-CV127 are impractical due to their rapid acting operation and they are not equipped with position indication. Therefore, valve stroke times will not be measured. Additionally, the air-operated valves fail-open on a loss of air or power. Normal opening removes power to the pilot solenoid valve, simulating a loss of power. On loss of power, the solenoid vents the air operator and CRD AOV CV126 and CRD-AOV-CV127 are spring-driven open. Thus, each time a scram signal is given, the valves "experience" a loss of air/power to verify each valve's fail-safe open feature.

Testing these valves simultaneously would result in a full reactor scram. An excess number of scrams performed routinely could cause thermal and reactivity transients, which could lead to fuel, vessel, CRD, or piping damage. The CRDs cannot be tested during cold shutdown because the control rods are inserted and must remain inserted.

Therefore, control rod scram time testing in accordance with the CNS Technical Specifications, SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4, will provide an acceptable level of quality and safety for these valves. This testing method for these valves is consistent with GL [Generic Letter] 89-04, ["Guidance on Developing Acceptable Inservice Testing Programs"] Position 7, and NUREG 1482, Revision 2, Section 4.4.6 ["Testing Individual Scram Valves for Control Rods in Boiling-Water Reactors"].

NRC Staff Evaluation

As addressed above, the licensee has requested a proposed alternative testing program for certain valves found in the CRD HCU. There are 137 HCUs in the CRD system. Inlet and outlet scram valves CRD-AOV-CV126, CRD-AOV-CV127, scram outlet check valve CRD-CV-114CV, CRD withdrawal/exhaust solenoid valves CRD-SOV-SO120, CRD-SOV-SO121, CRD-SOV-SO122, CRD-SOV-SO123, and CRD cooling water header check valve CRD-CV-138CV represent only one each of 137 HCUs. The proposed alternative testing will apply to all HCUs and their associated valves.

Scram inlet valve CRD-AOV-CV126 and scram outlet valve CRD-AOV-CV127 are AOVs with an air to close – fail open design. Valve CRD-CV-114CV is a check valve located in the scram discharge riser line, which is flow actuated as a result of CRD-AOV-CV127 opening. CRD withdrawal/exhaust solenoid valves CRD-SOV-SO120, CRD-SOV-SO121, CRD-SOV-SO122, CRD-SOV-SO123 have a safety function to close in order to provide a Class 2 to non-code class boundary isolation. The CRD cooling water header check valve CRD-CV-138CV has a safety function to close in the event of a scram. These valves are required to be tested in accordance with subsection ISTC of the ASME OM Code 2004 Edition through 2006 Addenda. In lieu of ASME OM Code test requirements, the licensee requests testing the valves in accordance with the CNS Technical Specification SR 3.1.3.3, SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4.

NUREG-1482, Revision 2, Section 4.4.6 discusses the testing of the inlet and outlet scram valves (CRD-AOV-CV126 and CRD-AOV-CV127) and the scram outlet check valve (CRD-CV-114CV) found in CRD systems in boiling-water reactor (BWR) design plants. Exercising these valves quarterly during power operations could result in rapid insertion of one or more control rods. Licensees should test CRD system valves at the Code-specified frequency. However, for those CRD drive system valves for which testing could result in rapid insertion of one or more control rods, the rod scram test frequency identified in the facility's TSs may be used as the valve testing frequency to minimize rapid reactivity transients and wear of the control rod drive mechanisms. The scram time testing frequency detailed in TS SR 3.1.4.1, SR 3.1.4.2, SR 3.1.4.3, and SR 3.1.4.4 is an acceptable alternative method of detecting degradation of these valves and fully meets the recommendations of NUREG-1482, Revision 2, Section 4.4.6. Trending the stroke times of the inlet and outlet scram valves is unnecessary because they are indirectly stroke timed and no meaningful correlation between the scram time and valve stroke time can be obtained.

NUREG-1482, Revision 2, Section 4.4.6 also discusses the testing of the cooling water header check valve (CRD-CV-138CV) and CRD withdrawal/exhaust solenoid valves (CRD-SOV-SO120, CRD-SOV-SO121, CRD-SOV-SO122, CRD-SOV-SO123) found in CRD systems in BWR plants. Industry experience has shown that normal control rod motion may verify the cooling water header check valve and CRD withdrawal/exhaust solenoid valves moving to their safety function position. This is demonstrated because rod motion may not occur if these valves were to fail in the open position. Performance of TS SR 3.1.3.3 fully meets the recommendations of NUREG-1482, Revision 2. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

3.14 Licensee's Alternative Request RV-05

ISTC-3630, "Leakage rate for Other Than Containment Isolation Valves," (a) "Frequency," requires that "tests shall be conducted at least once every 2 years."

The licensee requested alternative leakage rate testing for the following twelve RHR and CS Pressure Isolation Valves (PIVs). Five of the twelve valves are also classified as Containment Isolation Valves (CIVs):

Valve	System	Function
RHR-MOV-MO25A	RHR	PIV / CIV
RHR-MOV-MO25B	RHR	PIV / CIV
RHR-MOV-MO274A	RHR	PIV
RHR-MOV-MO274B	RHR	PIV
RHR-CV-26CV	RHR	PIV
RHR-CV-27CV	RHR	PIV
RHR-MOV-MO17	RHR	PIV / CIV
RHR-MOV-MO18	RHR	PIV
CS-MOV-MO12A	CS	PIV / CIV
CS-MOV-MO12B	CS	PIV / CIV
CS-CV-18CV	CS	PIV
CS-CV-19CV	CS	PIV

The RHR and CS systems at CNS contain valves that function as PIVs. PIVs are defined as two normally closed valves in series at the reactor coolant system boundary that isolate the reactor coolant system from an attached low pressure system. These affected valves are located on the "A" and "B" CS and RHR injection lines and the RHR shutdown cooling line.

Reason for Request

Relief is requested from the requirement of ASME OM Code ISTC-3630(a). ISTC-3630(a) requires that leakage rate testing (water) for PIVs be performed at least once every 2 years. Data reviewed from RE25 and RE26 identified that PIV testing alone incurred a total dose of approximately 600 mrem in RE26, which benefited from the chemical decontamination that was performed, and approximately 1600 mrem in RE25. Therefore, assuming the PIVs remain classified as good performers, extended test intervals of three refueling outages would provide a savings of at least 1200 mrem over a three-cycle period. The reason for this relief request is to reduce outage dose.

The licensee requested relief pursuant to 10 CFR 50.55a(z)(1) on the basis that the alternative testing will provide an acceptable level of quality and safety.

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> PIVs are not specifically included in the scope for performance-based testing as provided for in 10 CFR 50 Appendix J, Option B [Appendix J, Option B]. The concept behind the Option B alternative for containment isolation valves is that licensees should be allowed to adopt cost effective methods for complying with regulatory requirements. Additionally, NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," describes the risk-informed basis for the extended test intervals under Option B. That justification shows that for valves which have demonstrated good performance by passing their leak rate tests (air) for two consecutive cycles, further failures appear to be governed by the random failure rate of the component. NEI 94-01 also presents the results of a comprehensive risk analysis, including the statement that "the risk impact associated with increasing [leakrate] test intervals is negligible (less than 0.1 percent of total risk)." The valves identified in this relief request are in water applications. The PIV testing is performed with water pressurized to normal plant operating pressures. This relief request is intended to provide for a performance-based scheduling of PIV tests at CNS.
>
> [...]
>
> NUREG 0933, "Resolution of Generic Safety Issues," Issue 105 ["Interfacing Systems LOCA [Loss-of-Coolant Accident] at LWRs [Light-Water Reactors] (Rev.4) (NUREG-0933, Main Report with Supplements 1-34,"], discusses the need for PIV leak rate testing based primarily on three pre-1980 historical failures of applicable valves industrywide. These failures involved human errors in either operations or maintenance. None of these failures involved inservice equipment degradation. The performance of PIV leak rate testing provides assurance of acceptable seat leakage with the valve in a closed condition. Typical PIV testing does not identify functional problems which may inhibit the valves ability to re-position from open to closed. For check valves, such functional testing is accomplished per ASME OM Code ISTC-3522 and ISTC-3520. Power-operated valves are routinely full stroke tested per ASME OM Code to ensure their functional capabilities. The periodic functional testing of the PIVs is adequate to identify abnormal conditions that might affect closure capability. Performance of the separate 24-month PIV leak rate testing does not contribute any additional assurance of functional capability; it only determines the seat tightness of the closed valves.

The functional test and position indication test (PIT) frequencies are as follows:

Valve	Functional Test	PIT
RHR-MOV-MO25A	Quarterly	2 years
RHR-MOV-MO25B	Quarterly	2 years
RHR-MOV-MO274A	Normally De-energized Closed (exercised during PIT test)	Refueling Outage
RHR-MOV-MO274B	Normally De-energized Closed (exercised during PIT test)	Refueling Outage
RHR-CV-26CV	Refueling Outage	Refueling Outage
RHR-CV-27CV	Refueling Outage	Refueling Outage
RHR-MOV-MO17	Cold S/D	Refueling Outage
RHR-MOV-MO18	Cold S/D	Refueling Outage
CS-MOV-MO12A	Cold S/D	Refueling Outage
CS-MOV-MO12B	Cold S/D	Refueling Outage
CS-CV-18CV	Refueling Outage	Refueling Outage
CS-CV-19CV	Refueling Outage	Refueling Outage

CNS proposes to perform PIV testing at intervals ranging from every refueling outage to every third refueling outage. The specific interval for each valve would be a function of its performance and would be established in a manner consistent with the containment isolation valve (CIV) process under 10 CFR 50 Appendix J, Option B. Five of the 12 [subject] valves...(RHR-MOV-MO25A, RHR-MOV-MO25B, CS-MOV-MO12A, CS-MOV-MO12B, RHR-MOV-MO17) are also classified as CIVs and are leak rate tested with air at intervals determined by 10 CFR 50 Appendix J, Option B. Appendix J and inservice leak testing program guidance will be established such that if any of those five valves fail either their as found CIV test or their PIV test, the test interval for both tests will be reduced to every refueling outage until they can be re-classified as good performers per Appendix J, Option B requirements.

The test intervals for the seven remaining valves with a PIV-only function will be determined in the same manner as is done under Option B. That is, the test interval may be extended to every three refueling outages (not to exceed a nominal six year period) upon completion of two consecutive, periodic PIV tests with results within prescribed acceptance criteria. Any test failure will require a return to the initial interval (every refueling outage) until good performance can again be established.

The primary basis for this relief request is the historically good performance of the PIVs. There have been no PIV seat leakage failures since PIV testing began at CNS in 1995 through the present. Leakages recorded have been a very small percentage of the overall allowed leakage.

... PIV testing has also been utilized at CNS as a post-maintenance test following packing replacements on the CS and RHR injection check valves to ensure the packing is adjusted adequately at normal system pressure. Therefore, PIV testing will continue to be utilized as post-maintenance testing, as necessary.

[...]

...corrective and preventative maintenance has been performed over the past 10 years (and beyond) in order to maintain the acceptable performance of the [subject valves]. For instance, the MOV [Motor Operated Valve] Program requires regular inspections and diagnostic tests of the motor operators to ensure that they continue to be relied upon throughout the life of the plant and the check valves have preventative maintenance plans to replace the valve packing on a periodic basis to ensure the packing material is properly maintained.

...As found LLRT [local leak rate test] test results [for the CIVs] have been excellent with no failures associated with these valves over the past 10 years and a significant amount of margin has been maintained to the administrative component operability limit. Even more so, a very large margin exists between the PIV test results and the operability limits for each PIV test. With a limit of 5 gpm, the highest recorded PIV leakage in the last 10 years was 0.435 gpm, which is only 8.7% of the allowed leakage. Historically, since 1995, all of the PIV valves have maintained this much or more of a margin to the 5 gpm acceptance criteria....

The NRC SER [safety evaluation report] for NEI TR [Topical Report] 94-01, Revision 3, resulted in a condition that the licensee report the margin between the Type B and Type C leakage rate summation and its regulatory limit and maintain an acceptable margin to the regulatory limit. A second condition requires the licensee to include considerable extra margin in order to extend the LLRT intervals beyond 5 years to a 75-month interval. In comparison, for these PIV tests, CNS will establish an administrative limit of ≤ [less than or equal to] 1 gpm for each of the PIV tests in order to maintain each test on an extended frequency. This administrative limit is only 20% of the allowed leakage and will provide considerable extra margin to the limit of 5 gpm when looking at the historical test results.

NUREG/CR-5928, "ISLOCA Research Program Final Report" [dated July 1993], evaluated the likelihood and potential severity of inter-system loss-of-coolant accident (ISLOCA) events in BWR and pressurized water reactors. The BWR design used as a reference for this analysis was a BWR/4 with a Mark 1 containment. CNS was listed in Section 4.1 of NUREG/CR-5928 as one of the applicable plants. The applicable BWR systems were individually analyzed and in each case, this report concluded that the system was "...judged to not be a concern with respect to ISLOCA risk." Section 4.3 concluded the BWR portion of the analysis by saying "ISLOCA is not a risk concern for the BWR plant examined here."

Summary of bases / rationale for this relief request:

- Performance-based PIV testing would yield a dose reduction of up to 1200 mrem over a three-cycle period.

- Performance of separate functional testing of PIVs per ASME Code.

- Excellent historical performance results from PIV testing for the applicable valves.

- Low likelihood of valve mispositioning during power operations (procedures, interlocks).

- Air testing versus water testing - degrading seat conditions are identified much sooner with air testing [for CIVs].

- Relief valves in the low pressure piping - these relief valves may not provide ISLOCA mitigation for inadvertent PIV mispositioning (gross leakage), but their relief capacity can easily accommodate conservative PIV seat leakage rates.

- Alarms identify high pressure to low pressure leakage - Operators are highly trained to recognize symptoms of a present or incipient ISLOCA and to take appropriate actions.

The intent of this relief request is simply to allow for a performance-based approach to the scheduling of PIV leakage testing. It has been shown that ISLOCA represents a small risk impact to BWRs such as CNS. CNS PIVs have an excellent performance history in terms of seat leakage testing. The risks associated with extending the leakage test interval to a maximum of three refueling outages (nominal 24 months) are extremely low. The performance-based interval shall not exceed 72 months. Standard scheduling practice may extend the program interval by 25%, not to exceed six months. This relief will provide significant reductions in radiation dose.

NRC Staff Evaluation

PIVs are defined as two valves in series within the reactor coolant pressure boundary, which separate the high pressure reactor coolant system from an attached lower pressure system. Failure of a PIV could result in an over-pressurization event that could lead to a system rupture and possible release of fission products to the environment. This type of failure event was analyzed under NUREG/CR-5928. The purpose of NUREG/CR-5928 was to quantify the risk associated with an ISLOCA event. NUREG/CR-5928 analyzed BWR and pressurized-water reactor designs. Specifically, NUREG/CR-5928 reviewed the BWR-4 design, which included CNS. The conclusion of the analysis showed that an ISLOCA was not a risk concern for the BWR-4 design.

The licensee has proposed an alternative leakage test frequency in lieu of the requirements found in the 2004 Edition through the 2006 Addenda of the ASME OM Code Section ISTC-3630 for the twelve PIVs listed above. Specifically, the licensee proposes to verify the leakage rate of these PIVs using an Appendix J, Option B performance-based schedule. Valves would initially be tested at refueling outages or 2 years as specified by ASME OM Code Section ISTC-3630(a). Per the licensee's request, valves that have demonstrated good performance for two consecutive cycles may have their test interval extended up three refueling outages or 72 months. Additionally, the licensee requested an additional grace period of 6 months as a standard scheduling practice. Any PIV leakage test failure would require the component to return to the initial testing interval of every refueling outage or 2 years until it can be reclassified as a good performer per the performance evaluation requirements of Appendix J, Option B.

Additionally, five of the PIVs (RHR-MOV-MO25A, RHR-MOV-MO25B, CS-MOV-MOI2A, CS-MOV-MO12B, RHR-MOV-MO17) are also classified as CIVs and are leak rate tested with air at intervals determined by Appendix J, Option B. Appendix J and the inservice leak testing program guidance will be established such that, if any of these five valves fail either their CIV or PIV test, the test interval for both tests will be reduced to every Refueling Outage or 2 years, until the valve can be reclassified as a good performer per the Appendix J, Option B requirements. Upon completion of two successful tests, the component leakage test interval can again be extended.

Appendix J, Option B is a performance based leakage test program. Guidance for implementation of acceptable leakage rate test methods, procedures, and analyses is provided in RG 1.163, "Performance Based Containment Leak-Test Program," dated September 1995 (ADAMS Accession No. ML003740058). RG 1.163 originally endorsed NEI TR 94-01, Revision 0, dated July 26, 1995 with the limitation that Type C component test intervals cannot extend greater than 60 months.

The current version of NEI 94-01 is Revision 3-A, which allows Type C containment isolation valves test intervals to be extended up to 75 months with a permissible extension for non-routine emergent conditions of up to 9 months (84 months total). The NRC staff subsequently found the guidance in NEI 94-01 Revision 3-A to be acceptable (ADAMS Accession Nos. ML121030286 and ML12226A546) with the condition that the licensee report the margin between the Type B and Type C leakage rate summation and its regulatory limit and maintain an acceptable margin to the regulatory limit. A second condition requires the licensee to include considerable extra margin in order to extend the LLRT intervals beyond 5 years to a 75-month interval.

Previously, the NRC's safety evaluation (SE) for the fourth interval IST Program at CNS dated August 28, 2012 (ADAMS Accession No. ML12233A176), authorized the implementation of a performance-based program for the subject PIVs with a leakage test interval not to exceed 60 months with a grace period of 25 percent not to exceed 9 months. That SE also allowed for the licensee to obtain a frequency extension up to 72 months if the licensee were to submit a separate relief request providing additional information such as valve maintenance history, acceptance test criteria, condition monitoring program information, etc., to justify the acceptability of the further extension.

The NRC staff review finds that the subject PIVs have a good history of maintenance and leakage test performance. Corrective and preventative maintenance has been performed over the past 10 years (and beyond) in order to maintain acceptable performance of these components. Supporting programs have been implemented such as the MOV Program, which requires regular inspections and diagnostic tests of the motor operators to ensure that they continue to be relied upon throughout the life of the plant. Check valve preventative maintenance plans replace valve packing on a periodic basis to ensure the packing material is properly maintained. In addition, the licensee routinely tests the valves in accordance with other ASME OM Code requirements (exercise and position indication tests) to ensure their functional capabilities. Extending the leakage test interval based on good performance and a low risk factor, as noted in NUREG/CR-5928, is a logical progression to a performance-based program. Based on the excellent valve maintenance and test history coupled with low risk factor, the proposed alternative provides an acceptable level of quality and safety and is acceptable for use.

The licensee is authorized to implement a performance-based PIV leakage rate test program for the 12 PIVs listed above. The leakage test interval for these PIVs shall not exceed 72 months. Standard scheduling practice may extend the program interval by 25 percent not to exceed 6 months. Any PIV leakage test failure will require the component to return to the initial testing interval of every Refueling Outage or 2 years until it can be reclassified as a good performer per the performance evaluation requirements of Appendix J, Option B. Additionally, for the five PIVs that are also classified as CIVs, if any of these valves fail either their CIV or PIV test, the test interval for both tests will be reduced to every Refueling Outage or 2 years, until the valve can be reclassified as a good performer per the Appendix J, Option B requirements. Upon completion of two successful tests, the component leakage test interval can be extended again. The licensee will also establish an administrative limit of less than or equal to 1 gpm for each of the PIV tests in order to maintain each test on an extended frequency. This administrative limit is 20 percent of the allowed leakage and will provide considerable extra margin to the allowed leakage limit of 5 gpm.

3.15 Licensee's Alternative Request RG-01

This request for relief applies to the frequency specification of the ASME OM Code for all pump and valve testing contained within the IST Program scope. The applicable ASME OM Code sections include the following:

Code Paragraph	Description
ISTA-3120(a)	The frequency for the inservice testing shall be in accordance with the requirements of Section IST.
ISTB-3400	Frequency of Inservice Tests
ISTB-6200	Corrective Action
ISTC-3510	Exercising Test Frequency
ISTC-3540	Manual Valves
ISTC-3560	Fail-Safe Valves
ISTC-3630(a)	Frequency
ISTC-3700	Position Verification Testing
ISTC-5221(c)(3)	At least one valve from each group shall be disassembled and examined at each refueling outage; all valves in a group shall be disassembled and examined at least once every 8 years.
ISTC-5222	Condition-Monitoring Program
ISTC-5230	Vacuum Breaker Valves
ISTC-5240	Safety and Relief Valves
ISTC-5260	Explosively Actuated Valves
Appendix I, I-1320	Test Frequencies - Class 1 Pressure Relief Valves
Appendix I, I-1330	Test Frequency - Class 1 Nonreclosing Pressure Relief Devices
Appendix I, I-1340	Test Frequency - Class 1 Pressure Relief Valves that are used for Thermal Relief Application
Appendix I, I-1350	Test Frequency - Classes 2 and 3 Pressure Relief Valves
Appendix I, I-1360	Test Frequency - Classes 2 and 3 Nonreclosing Pressure Relief Devices

Code Paragraph	Description
Appendix I, I-1370	Test Frequency - Classes 2 and 3 Primary Containment Vacuum Relief Valves
Appendix I, I-1380	Test Frequency - Class 2 and 3 Vacuum Relief Valves Except for Primary Containment Vacuum Relief Valves
Appendix I, I-1390	Test Frequency – Classes 2 and 3 Pressure Relief Valves that are used for Thermal Relief Application
Appendix II, II-4000(a)	Performance Improvement Activities
Appendix II, II-4000(b)	Optimization of Condition Monitoring Activities

The licensee requested an alternative to the test frequency specification of the OM Code for all pumps and valves contained within the IST Program scope.

Reason for Request

In its letter dated March 19, 2015, the licensee stated, in part:

> The ASME OM Code, 2004 Edition through the 2006 Addenda, establishes the inservice test frequency for all components within the scope of the Code. The frequencies (e.g., quarterly) have always been interpreted as "nominal" frequencies (generally as defined in Table 3.2 of NUREG 1482, Revision 2) and if necessary, owners applied the surveillance extension time period (i.e. grace period) contained in the plant Technical Specifications (TS) SRs. The CNS TS SR 3.0.2 states that the specified frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency. This would allow an extension of up to 25% of the surveillance test interval to accommodate plant conditions that may not be suitable for conducting the surveillance. However, regulatory issues have been raised concerning the applicability of the TS grace period to ASME OM Code required inservice test frequencies.
>
> The lack of a tolerance band (grace period) on the ASME OM Code IST frequency restricts operational flexibility. There may be a conflict where an IST test could be required (i.e., its frequency could expire), but it is not possible or not desired that it be performed until sometime after a plant condition or associated TS is applicable. Therefore, to avoid this conflict, the IST test intervals should be allowed to be extended by up to 25%.
>
> Thus, just as with TS required surveillance testing, some tolerance is needed to allow adjusting OM Code testing intervals to suit the plant conditions and other maintenance and testing activities. This assures operational flexibility when

scheduling IST tests that minimize the conflicts between the need to complete the test and plant conditions.

Pursuant to 10 CFR 50.55a(z)(2), the licensee requested relief from the frequency specification of the ASME OM Code. The basis of the relief request is that the Code requirement presents an undue hardship without a compensating increase in the level of quality and safety.

Proposed Alternative

In its letter dated March 19, 2015, the licensee stated, in part:

> Code Case OMN-20 is included in the ASME OM Code, 2012 Edition and will be used as an alternative to the frequencies of the ASME OM Code. The requirements of Code Case OMN-20 are described below.
>
> ASME OM, Division 1, Section IST and all earlier editions and addenda specify component test frequencies based either on elapsed time periods (e.g., quarterly, 2 years, etc.) or on the occurrence of plant conditions or events (e.g., cold shutdown, refueling outage, upon detection of a sample failure, following maintenance, etc.).
>
> a) Components whose test frequencies are based on elapsed time periods shall be tested at the frequencies specified in Section IST with a specified time period between tests as shown in [Table 3.15-1]. The specified time period between tests may be reduced or extended as follows:
>
> > 1) For periods specified as less than 2 years, the period may be extended by up to 25% for any given test.
> >
> > 2) For periods specified as greater than or equal to 2 years, the period may be extended by up to 6 months for any given test.
> >
> > 3) All periods specified may be reduced at the discretion of the owner (i.e., there is no minimum period requirement).
>
> Period extension is to facilitate test scheduling and considers plant operating conditions that may not be suitable for performance of the required testing (e.g., performance of the test would cause an unacceptable increase in the plant risk profile due to transient conditions or other ongoing surveillance, test or maintenance activities). Period extensions are not intended to be used repeatedly merely as an operational convenience to extend test intervals beyond those specified.
>
> Period extensions may also be applied to accelerated test frequencies (e.g., pumps in alert range) and other fewer than 2 year test frequencies not specified in [Table 3.15-1].
>
> Period extensions may not be applied to the test frequency requirements specified in Subsection ISTD, Preservice and Inservice Examination and Testing

of Dynamic Restraints (Snubbers) in Light-water Reactor Nuclear Power Plants, as Subsection ISTD contains its own rules for period extensions.

b) Components whose test frequencies are based on the occurrence of plant conditions or events may not have their period between tests extended except as allowed by ASME OM, Division 1, Section IST, 2009 Edition through OMa-2011 Addenda and all earlier editions and addenda.

Table 3.15-1 Specified Test Frequencies

Frequency	Specified Time Period Between Tests
Quarterly (or every 3 months)	92 days
Semiannually (or every 6 month)	184 days
Annually (or every year)	366 days
x years	x calendar years where x is a whole number of years ≥ 2

NRC Staff Evaluation

Historically, licensees have applied, and the NRC staff has accepted, the standard TS definitions for IST intervals (including allowable interval extensions) to ASME OM Code-required testing. (Reference NUREG-1482 Revision 2, Section 3.1.3, "Scheduling of Inservice Tests"). Recently, the NRC staff reconsidered the allowance of using TS testing intervals and interval extensions for IST not associated with TS SRs. As noted in Regulatory Issue Summary 2012-10, "NRC Staff Position on Applying Surveillance Requirements 3.0.2 and 3.0.3 to Administrative Controls Program Tests," dated August 23, 2012 (ADAMS Accession No. ML12079A393), the NRC determined that programmatic test frequencies can't be extended in accordance with the TS SR 3.0.2. This includes all IST described in the ASME OM Code not specifically required by the TS SRs.

Following this development, the NRC staff sponsored and co-authored an ASME OM Code inquiry and Code case to modify the ASME OM Code to include TS-like test interval definitions and interval extension criteria. The resultant ASME Code Case OMN-20, as shown above, was approved by the ASME Operation and Maintenance Standards Committee on February 15, 2012 with the NRC representative voting in the affirmative. ASME Code Case OMN-20 was subsequently published in conjunction with the ASME OM Code, 2012 Edition. The licensee proposes to adopt ASME Code Case OMN-20.

Requiring the licensee to meet the ASME OM Code requirements, without an allowance for defined frequency and frequency extensions for IST of pumps and valves, results in a hardship without a compensating increase in the level of quality and safety. Based on the prior acceptance by the NRC staff of the similar TS test interval definitions and interval extension criteria, the staff finds that implementation of the test interval definitions and interval extension criteria contained in ASME OM Code Case OMN-20 is acceptable. Allowing usage of ASME

Code Case OMN-20 provides reasonable assurance of operational readiness of pumps and valves subject to the ASME OM Code IST.

4.0 CONCLUSION

As set forth above, the NRC staff determines that for alternative requests RP-01, RP-02, RP-03, RP-04, RP-05, RP-06, RP-08, RP-09, RV-01, RV-02, RV-03, RV-04, and RV-05 for CNS, the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) for requests RP-01, RP-02, RP-03, RP-04, RP-05, RP-06, RP-08, RP-09, RV-01, RV-02, RV-03, RV-04, and RV-05 for Cooper Nuclear Station. Therefore, the NRC staff authorizes alternative requests RP-01, RP-02, RP-03, RP-04, RP-05, RP-06, RP-08, RP-09, RV-01, RV-02, RV-03, RV-04, and RV-05 for Cooper Nuclear Station for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

As set forth above, the NRC staff determines that for alternative requests RP-07 and RG-01, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. The NRC staff concludes that complying with the specified ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes alternative requests RP-07 and RG-01 for Cooper Nuclear Station for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

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Date: February 12, 2016

The NRC staff has determined that for alternative requests RP-07 and RG-01, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. The NRC staff concludes that complying with the specified ASME OM Code requirements would result in a hardship without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes, as set forth in the enclosed safety evaluation that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes alternative requests RP-07 and RG-01 for Cooper Nuclear Station for the fifth 10-year IST program interval, which is scheduled to begin on March 1, 2016, and is scheduled to end on February 28, 2026.

All other ASME OM Code requirements for which relief was not specifically requested and approved, remain applicable.

If you have any questions, please contact Thomas Wengert at 301-415-4037 or via e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

Meena K. Khanna, Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

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*emails dated 9/3/15, 11/4/15, 12/22/15, 1/5/16, and 1/25/16

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