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

February 19, 2016

Mr. Shane M. Marik
Site Vice President and Chief Nuclear Officer
Omaha Public Power District
Fort Calhoun Station
9610 Power Lane, Mail Stop FC-2-4
Blair, NE 68008

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 – REQUESTS FOR RELIEF G-1, P-1, AND P-2 FOR THE FIFTH INSERVICE TESTING INTERVAL (CAC NOS. MF6651, MF6652, AND MF6653)

Dear Mr. Marik:

By letter dated August 27, 2015, as supplemented by letter dated January 11, 2016, Omaha Public Power District (the licensee) submitted requests for relief G-1, P-1, and P-2 to the U.S. Nuclear Regulatory Commission (NRC) for the fifth 10-year inservice testing (IST) interval at Fort Calhoun Station, Unit No. 1 (FCS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative in request P-2 on the basis that the alternative provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in requests G-1 and P-1 on the basis that the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) present an undue hardship without a compensating increase in the level of quality or safety. In G-1, the licensee proposed to use alternative testing frequency in accordance with OM Code Case OMN-20, "Inservice Test Frequency." In P-1, the licensee proposed to use alternative vibration limits for the low pressure safety injection and containment spray pumps. In P-2, the licensee proposed to use alternative hydraulic parameter reference points in accordance with OM Code Case OMN-21, "Alternate Requirements for Adjusting Hydraulic Parameters to Specified Reference Points."

The NRC staff has reviewed the subject requests and concludes, as set forth in the enclosed safety evaluation, that for alternative request P-2 for FCS, the proposed alternative provides 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 request P-2. Also, the NRC staff determined that for alternative requests G-1 and P-1 for FCS, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. 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 the use of alternative requests G-1, P-1, and P-2 for FCS for the fifth 10-year IST program interval, which begins on June 7, 2016, and is scheduled to end on June 6, 2026.

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

If you have any questions, please contact Fred Lyon at 301-415-2296 or via e-mail at Fred.Lyon@nrc.gov.

Sincerely,

Robert J. Pascarelli, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUESTS FOR RELIEF G-1, P-1, AND P-2

FOR THE FIFTH 10-YEAR INSERVICE TESTING PROGRAM INTERVAL

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION, UNIT NO. 1

DOCKET NO. 50-285

1.0 INTRODUCTION

By letter dated August 27, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15239A214), supplemented by letter dated January 11, 2016 (ADAMS Accession No. ML16011A431), Omaha Public Power District (OPPD, the licensee), submitted alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with pump inservice testing (IST) at Fort Calhoun Station, Unit No. 1 (FCS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative in request P-2 on the basis that the alternative provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in requests G-1 and P-1 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

Paragraph 10 CFR 50.55a(f), states, in part, that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations.

The regulations in 10 CFR 50.55a(z) state that alternatives to the requirements of paragraph (f) of 10 CFR 50.55a may be used, when authorized by the NRC, if the licensee demonstrates (1) the proposed alternatives would provide 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds 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 G-1

This request applies to the frequency specifications of the ASME OM Code. The frequencies for tests given in the ASME OM Code include the following but do not include a tolerance band:

- ISTA-3120, "Inservice Test Interval," (a) states, "The frequency for inservice testing shall be in accordance with the requirements of Section IST."

- ISTB-3400, "Frequency of Inservice Tests," states, "An inservice test shall be run on each pump as specified in Table ISTB-3400-1."

- ISTC-3510, "Exercising Test Frequency," states, "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. Power-operated valves shall be exercise tested once per fuel cycle."

- ISTC-3540, "Manual Valves," states, "Manual valves shall be full-stroke exercised at least once every 2 years, except where adverse conditions may require the valve to be tested more frequently to ensure operational readiness. Any increased testing frequency shall be specified by the Owner. The valve shall exhibit the required change of obturator position."

- ISTC- 3630, "Leakage Rate for Other Than Containment Isolation Valves," (a) "Frequency," states, "Tests shall be conducted at least once every 2 years."

- ISTC-3700, "Position Verification Testing," states, in part, "Valves with remote position indicators shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated."

- ISTC-5221, "Valve Obturator Movement," (c)(3) states, "At least one valve from each group shall be disassembled and examined at each refueling outage; all valves in each group shall be disassembled and examined at least once every 8 years."

- Appendix I, I-1320, "Test Frequencies, Class 1 Pressure Relief Valves," (a), "5-Year Test Interval," states, in part, "Class 1 pressure relief valves shall be tested at least once every 5 years, starting with initial electric power generation."

- Appendix I, I-1330, "Test Frequency, Class 1 Nonreclosing Pressure Relief Devices," states, "Class 1 nonreclosing pressure relief devices shall be replaced

every 5 years unless historical data indicates a requirement for more frequent replacement."

- Appendix I, I-1340, "Test Frequency, Class 1 Pressure Relief Valves That Are Used for Thermal Relief Application," states, "Tests shall be performed in accordance with I-1320, Test Frequencies, Class 1 Pressure Relief Valves."

- Appendix I, I-1350, "Test Frequency, Classes 2 and 3 Pressure Relief Valves," (a), "10-Year Test Interval," states, in part, "Classes 2 and 3 pressure relief valves, with the exception of PWR main steam safety valves, shall be tested every ten years, starting with initial power generation."

- Appendix I, I-1360, "Test Frequency, Classes 2 and 3 Nonreclosing Pressure Relief Devices," states, "Classes 2 and 3 nonreclosing pressure relief devices shall be replaced every 5 years, unless historical data indicates a requirement for more frequent replacement."

- Appendix I, I-1370, "Test Frequency, Classes 2 and 3 Primary Containment Vacuum Relief Valves," states, "(a) Tests shall be performed on all Classes 2 and 3 containment vacuum relief valves at each refueling outage or every 2 years, whichever is sooner, unless historical data requires more frequent testing. (b) Leak tests shall be performed on all Classes 2 and 3 containment vacuum relief valves at a frequency designated by the Owner in accordance with Table ISTC-3500-1."

- Appendix I, I-1380, "Test Frequency, Classes 2 and 3 Vacuum Relief Valves, Except for Primary Containment Vacuum Relief Valves," states, "All Classes 2 and 3 vacuum relief valves shall be tested every 2 years, unless performance data suggest the need for a more appropriate test interval."

- Appendix I, I-1390, "Test Frequency, Classes 2 and 3 Pressure Relief Devices That Are Used for Thermal Relief Application," states, "Tests shall be performed on all Classes 2 and 3 relief devices used in thermal relief application every 10 years, unless performance data indicate more frequent testing is necessary. In lieu of tests the Owner may replace the relief devices at a frequency of every 10 years, unless performance data indicate more frequent replacements are necessary."

- Appendix II, II-4000, "Condition-Monitoring Activities," (a), "Performance Improvement Activities," (1), states, in part, "If sufficient information is not currently available to complete the analysis required in II-3000, or if this analysis is inconclusive, then the following activities shall be performed at sufficient intervals over an interim period of the next 5 years or two refueling outages, whichever is less, to determine the cause of failure or the maintenance patterns."

- Appendix II, II-4000, "Condition-Monitoring Activities," (b), "Optimization of Condition-Monitoring Activities," (1)(e), states, "Identify the interval of each activity. Interval extensions shall be limited to one fuel cycle per extension.

> Intervals shall not exceed the maximum intervals shown in Table II-4000-1. All valves in a group sampling plan must be tested or examined again, before the interval can be extended again, or until the maximum interval would be exceeded. The requirements of ISTA-3120, Inservice Test Interval, do not apply."

The licensee has requested to use the proposed alternative for all pumps and valves contained within the FCS IST Program scope.

The FCS fifth 10-year IST program interval begins on June 7, 2016 and is scheduled to end on June 6, 2026. The applicable ASME OM Code edition and addenda for the FCS fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

Reason for Request

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

ASME OM Code Section IST 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 the Table 3.2 of NUREG-1482, Revision 2, "Guidelines for Inservice Testing at Nuclear Power Plants," October 2013 (ADAMS Accession No. ML13295A020)) and Owners routinely applied the surveillance extension time period (i.e., grace period) contained in the plant technical specifications (TSs) surveillance requirements (SRs). The TS typically allow for a less than or equal to 25 percent extension of the surveillance test interval to accommodate plant conditions that may not be suitable for conducting the surveillance (SR 3.0.2). However, regulatory issues have been raised concerning the applicability of the TS "grace period" to ASME OM Code-required IST frequencies irrespective of allowances provided under TS Administrative Controls.

The lack of a tolerance band on the ASME OM Code IST frequency restricts operational flexibility. There may be a conflict where a surveillance test could be required (i.e., its frequency could expire), but where it is not possible or not desired that it be performed until sometime after a plant condition or associated Limiting Condition for Operation is within its applicability. Therefore, to avoid this conflict, the surveillance test should be performed when it can be and should be performed.

The NRC recognized this potential issue in the TS by allowing a frequency tolerance as described in FCS TS SR 3.0.1. The lack of a similar tolerance applied to ASME OM Code testing places an unusual hardship on the plant to adequately schedule work tasks without operational flexibility.

Thus, just as with TS-required surveillance testing, some tolerance is needed to allow adjusting ASME OM Code testing intervals to suit the plant conditions and other maintenance and testing activities. This assures operational flexibility when scheduling surveillance tests that minimize the conflicts between the need to complete the surveillance and plant conditions.

Proposed Alternative

The licensee proposed to adopt the wording of ASME OM Code Case OMN-20, repeated below, for determining acceptable tolerances for pump and valve test frequencies. This code case was approved by the ASME OM Code Standards Committee in February 2012. The proposed alternative will be utilized for the entire fifth 10-year interval and will apply to the various frequency specifications of the ASME OM Code for all pumps and valves contained within the IST Program scope.

Code Case OMN-20
Inservice Test Frequency

ASME OM, Division 1, Section IST and earlier editions and addenda of ASME OM Code specify component test frequencies based either on elapsed time periods (e.g., quarterly, 2 years, etc.) or based 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 the table below. 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 less than two year test frequencies not specified in the table below.

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.

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

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 Code 2004 Edition through OMb-2006 Addenda and all earlier editions and addenda of ASME OM Code.

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). Recently, the NRC staff reconsidered the allowance of the TS testing intervals and interval extensions, for IST not associated with TS SRs. As noted in Regulatory Issue Summary (RIS) 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 cannot 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 OM Code Case OMN-20, as shown above, was approved by the ASME Operation and Maintenance Standards Committee and published in the 2012 Edition of the ASME OM Code. The licensee proposes to use the ASME OM Code Case OMN-20 entirely from the 2012 Edition of the ASME OM Code for grace period associated with IST requirements. The NRC staff notes that currently it has not approved Code Case OMN-20 in Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code."

Implementation of ASME OM Code Case OMN-20 requires implementation of this code case in its entirety, including the above stated restrictions/limitations, without exceptions. 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.

Based on the above, the NRC staff concludes that the proposed alternative provides reasonable assurance that the affected pumps and valves are operationally ready.

3.2 Licensee's Alternative Request P-1

Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria," provides the Acceptable Range, the Alert Range, and the Required Action Range for centrifugal pump vibration tests.

The licensee has requested an alternative to the Alert Range and the Required Action Range for Group A vibration testing for the pumps listed in Table 1.

Table 1

Pump No.	Pump Name	ASME OM Code Group	ASME Code Class	Pump Type
SI-1A & 1B	Low Pressure Safety Injection (LPSI) Pump	A	2	Horizontal Centrifugal
SI-3A, 3B, & 3C	Containment Spray (CS) Pump	A	2	Horizontal Centrifugal

Reason for Request

Table ISTB-5121-1 specifies the vibration limits for centrifugal pumps operating at or above 600 revolutions per minute (rpm) are the following for both the Group A and the comprehensive pump test (CPT):

Table 2

Vibration Reference Value	Acceptable Range	Alert Range	Required Action Range
V_r	≤2.5 V_r	>2.5 V_r – 6.0 V_r or >0.325 – 0.70 inches per second (in/sec)	>6.0 V_r or >0.70 in/sec

The absolute limits for vibration of 0.325 in/sec for the Alert Range and 0.70 in/sec for the Required Action Range are too restrictive for the FCS LPSI and CS pumps during Group A testing as they are normally above those limits when tested. No alternative is requested for CPT Table ISTB-5121-1 vibration limits since vibration levels subside at these higher flow conditions.

These pumps have exhibited these higher vibration levels their entire service life when operated on mini-flow, which is the normal alignment for Group A testing. The LPSI pump minimum flow line must be used when performing Group A testing during power operations because the only other flow path is to the reactor coolant system (RCS) using shutdown cooling alignment. This flow path cannot be used because the LPCI pump discharge pressure cannot overcome RCS

pressure. The CS pump minimum flow line must be used when performing Group A testing during power operations because the other flow paths would either result in water damage to equipment in the containment or are not permitted by the TS. The minimum flow lines ensure that the LPSI and CS pumps do not experience a no-flow condition, which would lead to pump damage. The minimum flow lines discharge back to the safety injection and refueling water tank. The LPSI and CS pumps are all of very similar design. All pumps are Ingersoll Rand Model 6UCL. The minimum flow rate for continuous unrestricted operation for the LPSI pumps, according to Flowserve, is 584 gallons per minute (gpm). The minimum flow rate for continuous unrestricted operation for the CS pumps is not defined, but it should be near the same as the LPSI pumps. The pumps are horizontal centrifugal single stage pumps. Pump hydraulic characteristics are as follows:

Table 3

System	Design Flow (gpm)	Design Head (ft)	Minimum Flow (gpm)	Shutoff Head (ft)
LPSI	1500	403	200	450
CS	1700	450	200	500

Extensive analysis of these pumps' vibration characteristics was performed in 1994, when FCS was first required to comply with these ASME OM Code vibration limits. That analysis was documented in a letter from OPPD to the NRC dated August 3, 1994 (ADAMS Legacy Library Accession No. 9408110165). It was determined that the dominant contribution to this vibration during minimum Group A test conditions was incipient cavitation caused by operating a high energy pump with a corresponding low net positive suction head. Also, spectral analysis performed on these pumps for the last 10 years does not show any discrete fault frequencies. Complying with the Table ISTB-5121-1 would cause unusual difficulty as those pumps normally exceed the Group A vibration levels and have historically done so while providing reliable and safe service. A review of fourth interval IST history to date has determined these pumps have never exceeded the modified Required Action limits during Group A tests and the Table ISTB-5121-1 Required Action limits during CPTs. The CPT Required Action levels of Table ISTB-5121-1 were not modified by the alternative request, thus during CPTs these pumps have not reached Required Action vibration or hydraulic levels even when normal Table ISTB-5121-1 limits are applied. As another measure of these pumps' reliability, during the current 4th IST interval there have been no Maintenance Rule Functional Failures for any of the LPSI and CS pumps. Finally, during 2011 - 2013 while FCS was in an extended refueling outage, internal inspections and pump refurbishment were performed for both LPSI (SI-1A and SI-1B) and two of three CS (SI-3B and SI-3C) pumps. The internal inspections revealed no abnormal accelerated degradation due to operating on mini-flow/Group A conditions. These were the only instances of LPSI/CS pump internal refurbishment during the 4th IST interval. For CS pump SI-3A, no generic condition existed which warranted its disassembly and inspection.

Proposed Alternative

The licensee is requesting that for Group A testing for the pumps in Table 1, the Alert Range limit will be changed to >0.80 in/sec, and the Required Action Range limit be changed to >1.1 in/sec. The licensee will adhere to the vibration limits in Table ISTB-5121-1 for the CPTs for these pumps.

NRC Staff Evaluation

The licensee is requesting to increase the Alert Range and Required Action Range vibration limits for the LPSI and CS pumps during Group A testing. The licensee stated that for Group A testing, these pumps are tested using the minimum flow line for each pump, because full flow testing can only be effectively performed while the pumps are being used for shutdown cooling when the unit is shut down. The minimum flow lines are installed to ensure that the pumps do not experience a no-flow condition, which would lead to pump damage. The pumps were not designed to operate on minimum flow for any extended period of time.

The licensee submitted the results of an extensive analysis of these pumps' vibration characteristics in 1994 (ADAMS Legacy Library Accession No. 9408110165) when this same alternative request was previously submitted and subsequently authorized for the third 10-year IST program interval. The NRC staff notes that this same alternative request was also authorized for the fourth 10-year IST program interval. The licensee concluded that vibration levels during quarterly testing for these pumps are significantly greater due in part to incipient cavitation caused by operating a high energy pump under low flow conditions. The licensee also stated that during the current (fourth) IST internal there have been no Maintenance Rule functional failures for any of the LPSI and CS pumps. Also, during the 2011 - 2013 extended refueling outage, internal inspections and pump refurbishment was performed for both of the LPSI pumps and two of the three CS pumps. The internal inspections did not reveal any abnormal accelerated degradation due to high vibration during Group A testing. For CS pump SI-3A, no generic condition existed which warranted its disassembly and inspection. Requiring the licensee to meet the ASME OM Code requirements would result in a hardship without a compensating increase in quality and safety because the additional testing that would have to be performed on a pump that typically operates at elevated vibration levels represents a condition that could possibly damage the pump by increased running on minimum flow.

The proposed testing provides reasonable assurance of operational readiness because the pumps will continue to be tested quarterly and the licensee will maintain the ASME OM Code Alert and Required Action limits for pump full flow testing during the biennial CPT. In addition, the licensee conducts periodic spectral analysis of these pumps to closely monitor the condition of the pumps. The spectral data takes into account complex signals as opposed to assuming pure harmonic motions for peak values measured in displacement or velocity, thus providing more detailed and complete vibration data over a large frequency band. This analysis exceeds the vibration monitoring requirements of the ASME OM Code. The results of the spectrum analysis data over the past ten years have not shown any discrete fault frequencies.

Based on the above, the NRC staff concludes that proposed alternative P-1 provides an acceptable level of quality and safety.

3.3 Licensee's Alternative Request P-2

The licensee has requested an alternative to the pump testing reference value requirements of ISTB-5121, ISTB-5122, ISTB-5123, ISTB-5221, ISTB-5222, ISTB-5223, ISTB-5321, ISTB-5322, and ISTB-5323. These requirements state:

- ISTB-5121, "Group A Test Procedure," (b) states, in part, "The resistance of the system shall be varied until the flow rate equals the reference point."
- ISTB-5122, "Group B Test Procedure," (c) states, in part, "System resistance may be varied as necessary to achieve the reference point."
- ISTB-5123, "Comprehensive Test Procedure," (b) states, in part, "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, "The resistance of the system shall be varied until the flow rate equals the reference point."
- ISTB-5222, "Group B Test Procedure," (c) states "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."
- ISTB-5321, "Group A Test Procedure," (b) states, in part, "The resistance of the system shall be varied until the discharge pressure equals the reference point."
- ISTB-5322, "Group B Test Procedure," (c) states "System resistance shall be varied as necessary to achieve the reference point."
- ISTB-5323, "Comprehensive Test Procedure," (b) states, in part, that "The resistance of the system shall be varied until the discharge pressure 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 components affected by this alternative request are the pumps listed in Table 4 below.

Table 4

Pump No.	Pump Name	ASME OM Code Group	ASME Code Class	Pump Type
FW-6 & 10	Auxiliary Feedwater Pump	B	3	Centrifugal
AC-3A, 3B, & 3C	Component Cooling Water Pump	A	3	Centrifugal
CH-1A, 1B, & 1C	Charging Pump	A	2	Positive Displacement
CH-4A & 4B	Boric Acid Pump	A	2	Centrifugal
AC-10A, 10B, 10C, & 10D	Raw Water Pump	A	3	Vertical Line Shaft
SI-1A & 1B	Low Pressure Safety Injection Pump	A	2	Centrifugal
SI-2A, 2B & 2C	High Pressure Safety Injection Pump	B	2	Centrifugal
SI-3A, 3B, & 3C	Containment Spray Pump	A	2	Centrifugal
FO-4A-1 & 2	Diesel Fuel Oil Transfer Pump	B	3	Positive Displacement
FO-4B-1 & 2	Diesel Fuel Oil Transfer Pump	B	3	Positive Displacement

Reason for Request

In its letter dated August 27, 2015, the licensee stated, in part, that:

> For pump testing, there is difficulty adjusting system throttle valves with sufficient precision to achieve exact flow, differential pressure, or discharge pressure to exact 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, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 2, Section 5.3, acknowledges that certain pump system designs do not allow for the licensee to set the flow, differential pressure, or discharge pressure 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 flow, differential pressure, or discharge pressure to reference values within a specified tolerance

during IST. 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 plus 2% or minus 1% of the reference point when the reference point is flow rate, or plus 1% or minus 2% of the reference point when the reference point is differential pressure or discharge pressure."

Proposed Alternative

The licensee requested to perform IST for the pumps listed in Table 4 in a manner consistent with the requirements as stated in ASME OM Code Case OMN-21. The testing of the pumps listed in Table 4 in which flow is adjusted to the reference value, the tests will be performed such that flow rate is adjusted as close as practical to the reference value and within proceduralized limits of +2 percent / -1 percent of the reference value. The testing of the pumps listed in Table 4 in which the reference parameter is differential pressure or discharge pressure, the tests will be performed such that differential pressure or discharge pressure is adjusted as close as practical to the reference value and within proceduralized limits of +1 percent / -2 percent of the reference value.

The licensee's plant operators will still strive to achieve the exact test flow or differential pressure (or discharge pressure) reference values during testing. This will be completed to limit any deviation of trends as a result in fluctuation of reference value set points.

NRC Staff Evaluation

An inquiry was submitted to the ASME OM Code to determine what alternatives may be used when it is impractical to operate a pump at a specified reference point for either flow rate, differential pressure, or discharge pressure. ASME OM Code Case OMN-21 was developed to provide guidance on alternatives. The guidance in ASME OM Code Case OMN-21 states that when it is impractical to operate a pump at 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. ASME OM 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 pressure or discharge pressure.

ASME OM Code Case OMN-21 was approved by the ASME OM Standards Committee on April 20, 2012, with the NRC representative voting in the affirmative. The code case has not yet been incorporated into Regulatory Guide 1.192. The licensee proposes to adopt ASME OM Code Case OMN-21. The applicability of ASME OM Code Case OM-21 is the ASME OM Code 1995 Edition through the 2011 Addenda. The NRC staff notes that the language from ASME OM Code Case OMN-21 has been included in the ASME OM Code, 2012 Edition.

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 commitment to use the bands specified in ASME OM Code Case OMN-21 for flow rate, differential pressure, and 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 4. Therefore, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determined that for alternative request P-2 for FCS, the proposed alternative provides 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 request P-2. Therefore, the NRC staff authorizes the use of the alternative request P-2 for FCS for the fifth 10-year IST program interval, which begins on June 7, 2016, and is scheduled to end on June 6, 2026.

As set forth above, the NRC staff determined that for alternative requests G-1 and P-1 for FCS, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. 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 the use of the alternative requests G-1 and P-1 for FCS for the fifth 10-year IST program interval, which begins on June 7, 2016, and is scheduled to end on June 6, 2026.

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

Principal Contributor: R. Wolfgang, NRR/DE/EPNB

Date: February 19, 2016

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

If you have any questions, please contact Fred Lyon at 301-415-2296 or via e-mail at Fred.Lyon@nrc.gov.

Sincerely,

/RA/

Robert J. Pascarelli, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-285

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