April 24, 2008

Mr. Randall K. Edington
Executive Vice President Nuclear/
Chief Nuclear Officer
Mail Station 7602
Arizona Public Service Company
P. O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 – RELIEF REQUEST FOR THE THIRD 10-YEAR INTERVAL PUMP AND VALVE INSERVICE TESTING PROGRAM (TAC NOS. MD6404, MD6405, AND MD6406)

Dear Mr. Edington:

By letter dated August 13, 2007, and supplemented by letters dated November 28, 2007, and January 11, 2008, Arizona Public Service Company (APS, the licensee) submitted relief requests PRR-01, PRR-02, PRR-03, PRR-04, PRR-05, PRR-06, PRR-07, and VRR-01 for the third 10-year inservice testing (IST) program interval at Palo Verde Nuclear Generating Station (Palo Verde), Units 1, 2, and 3. The licensee requested relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). The third 10-year IST interval for the three Palo Verde units began on January 15, 2008.

In a letter dated October 9, 2007 (ADAMS Accession No. ML072740230), the Nuclear Regulatory Commission (NRC) requested additional information concerning the APS submittal. By letter dated November 28, 2007, APS provided additional information and withdrew relief requests PRR-06 and PRR-07. These matters were discussed with Mr. Glenn Michael and others members of the APS staff on December 19, 2007.

Based on the enclosed safety evaluation, the NRC staff concludes that pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55(a)(3)(i), relief request VRR-01 is authorized for the third 10-year IST interval on the basis that the proposed alternatives would provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), relief requests PRR-01, PRR-03, PRR-04, and PRR-05 are authorized for the third 10-year IST interval on the basis that complying with the specified requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

For relief request PRR-02, relief is granted for the third 10-year IST interval based on the determination that it is impractical for the licensee to comply with the specified requirement. Granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the components.

The NRC staff safety evaluation is enclosed. All other ASME OM Code requirements for which relief has not been specifically requested and approved remain applicable.

If you have any questions, please contact Michael T. Markley at (301) 415-5723 or by e-mail at mtm@nrc.gov.

Sincerely,

/RA/

Thomas G. Hiltz, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure: Safety Evaluation

cc w/encl: See next page

The NRC staff safety evaluation is enclosed. All other ASME OM Code requirements for which relief has not been specifically requested and approved remain applicable.

If you have any questions, please contact Michael T. Markley at (301) 415-5723 or by e-mail at mtm@nrc.gov.

Sincerely,

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Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUESTS FOR THE

THIRD 10-YEAR INTERVAL PUMP AND VALVE INSERVICE TEST PROGRAM

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

By letter dated August 13, 2007, and supplemented by letters dated November 28, 2007, and January 11, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML072330523, ML073450818, and ML080230450, respectively), Arizona Public Service Company (APS or the licensee) submitted relief requests PRR-01, PRR-02, PRR-03, PRR-04, PRR-05, PRR-06, PRR-07, and VRR-01 for the third 10-year interval inservice testing (IST) program at Palo Verde Nuclear Generating Station (Palo Verde), Units 1, 2, and 3. The licensee requested relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code).

In a letter dated October 9, 2007 (ADAMS Accession No. ML072740230), the Nuclear Regulatory Commission (NRC) requested additional information concerning the APS submittal. By letter dated November 28, 2007, APS provided the NRC requested information and withdrew relief requests PRR-06 and PRR-07. These matters were discussed with Mr. Glenn Michael and others members of the APS staff on December 19, 2007. The third 10-year IST interval for the three Palo Verde units began on January 15, 2008.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a, requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations, except where alternatives have been authorized or relief has been requested by the licensee and granted by the NRC pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In accordance with 10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or

addenda may be used provided that all related requirements of the respective editions and addenda are met.

In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility. 10 CFR 50.55a(a)(3)(i), (a)(3)(ii), and (f)(6)(i) authorize the NRC to approve alternatives and to grant relief from ASME OM Code requirements. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements which are acceptable. Additional guidance is provided in Supplement 1 to GL 89-04, and NUREG-1482, Revision 1, "Guidelines for Inservice Testing at Nuclear Power Plants."

3.0 TECHNICAL EVALUATION

3.1 Pump Relief Request PRR-01

3.1.1 Code Requirements

The licensee requested relief for the essential auxiliary feedwater (AF) pump (turbine-driven) AFA-P01 and the essential AF pump (motor-driven) AFB-P01 from the requirements of ISTB-3300(e)(2), "Reference Values," and ISTB-5122, "Group B Test Procedure." The pumps are classified as Group B pumps for IST.

ISTB-3300(e)(2) requires that reference values shall be established within ± 20 percent of pump design flow for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

ISTB-5122 requires that Group B tests shall be conducted with the pump operating at a specified reference point. The test parameter valued identified in Table ISTB-3000-1 shall be determined and recorded as required by ISTB-5122.

ISTB-5122(b) requires that the differential pressure or flow rate shall be determined and compared to its reference value.

3.1.2 Licensee's Basis for Requesting Relief

The licensee states:

> The [ASME OM] Code requirements to establish the Group B reference point flow rate at the highest practical flow rate and operate the pump at a specified reference point (i.e., fix the flow to a specified value) are impractical since this is a fixed resistance recirculation path with no flow instrumentation provided. When the pump operates on a minimum flow recirculation (approximately 260 gallons per minute [gpm]) the specified reference point is essentially achieved by the recirculation line's fixed resistance. To establish the fixed resistance, the minimum flow recirculation line contains an administratively controlled locked-throttled drag valve and a locked open manual isolation valve. The use of an ultrasonic flowmeter was evaluated and determined impractical due to the difficulty in establishing an application-specific 2% calibration on the AF mini-flow

piping. Allowing the flow to remained fixed by the locked-in resistance increases the potential for repeatable test results and degradation monitoring rather than changing the resistance based on ultrasonic flowmeter readout fluctuations. With this understanding, there is little value added in installing flow instrumentation to measure and record the flow with instrumentation that meets ISTB-3510 requirements. The fixed resistance methodology is repeatable from test to test and accomplishes the same result as if flow were being measured and recorded.

To comply with the Code there are only two practical flow paths available for testing AFA-P01 and AFB-P01. The primary flow path is into the main feedwater lines to the steam generators. The other flow path is the minimum flow recirculation line that recirculates back to the condensate storage tank. The flow path to the steam generators is equipped with flow instrumentation, but the recirculation line is a fixed-resistance circuit with no provisions for flow indication.

Use of the primary flow path at power would inject cold AF into the main feedwater lines. The resulting temperature perturbations could lead to thermal shock/fatigue damage to the feedwater piping and steam generators, and the cooldown of the reactor coolant system (RCS) could cause undesirable reactivity variations and power fluctuations.

Modifying the minimum flow recirculation line to provide flow indication to meet the ± 2% accuracy requirement as specified in Table ISTB-3500-1 adds little value, since the flow is fixed at approximately 260 gpm and differential pressure is used to monitor degradation. Use of an ultrasonic flowmeter and possible adjustment of the fixed resistance introduces the potential for less accurate degradation monitoring than currently employed.

3.1.3 Licensee's Proposed Alternative Testing

The licensee states:

During plant operation, quarterly Group B pump testing for pumps AFA-P01 and AFB-P01 shall be conducted at mini-flow conditions using the minimum flow recirculation line fixed resistance to establish the specified reference point. ISTB-5100(b)(2) allows the use of the bypass test loops to be used for Group B tests. The PVNGS [Palo Verde Nuclear Generating Station] minimum flow recirculation line is designed to meet the pump manufacturer's operating specifications of approximately 260 gpm. Flow rate will not be measured or recorded. To monitor for degradation, pump differential pressure shall be determined and compared to its reference value and the associated range as specified in Table ISTB-5100-1.

Pumps AFA-P01 and AFB-P01 will be comprehensively tested in accordance with ISTB-5123, "Comprehensive Test Procedure," on a biennial (2-year) frequency as specified in Table ISTB-3400-1.

Pumps AFA-P01 and AFB-P01 are standby pumps. Little degradation is expected during plant operation when the pumps are idle except for testing. Testing the pumps within ± 20% of design flow on a 2-year frequency provides additional information regarding the condition of the pumps.

3.1.4 Evaluation

AF pumps AFA-P01 and AFB-P01 are classified as Group B pumps in accordance with the requirements in ISTB-1400 and ISTB-2000. Table ISTB-3400-1 requires that Group B pumps be tested quarterly and biennially. Requirements for the quarterly test are less rigorous than the requirements for the comprehensive test. Quarterly Group B AF pump tests are normally performed when the plant is operating. Comprehensive AF pump tests are performed biennially during an outage, shutdown, or startup. Paragraph ISTB-5122 and Table ISTB-3000-1 state that quarterly tests shall be conducted with the pumps operating at a specified reference point.

The recirculation flow path used for AF pumps AFA-P01 and AFB-P01 is a fixed resistance flow path. There is no flow instrumentation installed in the flow path. The NRC staff considers the installation of flow instrumentation to be an undue burden when compared to the limited benefits gained by the results of the specified quarterly pump tests. During the performance of the quarterly pump testing, pump differential pressure will be measured and trended. This provides a reference value for differential pressure that can be duplicated during subsequent tests. Pump flow rate will not be varied, measured, or recorded during the performance of the quarterly AF pump tests. This methodology provides for the acquisition of repeatable differential pressure during AF pump Group B quarterly testing, which is an adequate means of providing reasonable assurance of the operational readiness of the pumps. The performance of pump tests using a noninstrumented recirculation flow path is an acceptable alternative per Position 9 of GL 89-04, provided that comprehensive pump testing is also performed biennially. Biennial comprehensive testing requires that AF pump differential pressure and flow rate be measured and evaluated together to determine pump hydraulic performance.

3.1.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternatives to the Code testing requirements for the AF pumps AFA-P01 and AFB-P01 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii), on the basis that complying with the specified ASME OM Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the pumps. The alternative is authorized for the third 10-year IST program interval.

3.2 Pump Relief Request PRR-02

3.2.1 Code Requirements

The licensee requested relief for the diesel generator fuel oil transfer pumps DFA-P01 and DFB-P01 from the requirements of ISTB-3510(a), "Accuracy," and Table ISTB-3500-1, "Required Instrument Accuracy." The pumps are classified as Group B pumps for IST.

ISTB-3510(a) requires that instrument accuracy shall be within the limits of Table ISTB-3500-1.

Table ISTB-3500-1 requires that for the comprehensive test, pressure instruments shall have an accuracy of ± 0.5 percent.

3.2.2 Licensee's Basis for Requesting Relief

The licensee states:

> There are no inlet pressure gauges installed for this pump configuration. Specifically, the pumps are horizontal, centrifugal type with an integral motor. They operate submerged in the diesel fuel oil storage tank. The pump and drive motor are completely housed in an enclosed steel casing with no shaft penetrations requiring seals or packing. The casing has a hermetically sealed compartment for the stator windings of the motor to prevent entrance of pumped liquid or vapor. Pump bearings are cooled by recirculation of pumped fluid. The entire assembly is suspended from a cover plate, which is bolted to a nozzle on the tank.
>
> The diesel generator fuel oil storage tank is equipped with level instrumentation (DFN-LI-33 and DFN-LI-34) having a calculated loop accuracy of ± 1.5%. The instrument reads out in percent of tank level which is converted to suction pressure during the quarterly pump surveillance test. The calibrated instrument range results in a suction pressure span of 0.2 psig [pounds per square inch gauge] to 4.4 psig. This instrument accuracy is acceptable for use during Group B pump testing, but does not meet the ± 0.5% accuracy as required by Table ISTB-3500-1 for Comprehensive Pump Testing performed every 2 years.
>
> Technical Specification [TS] 3.8.3.1 requires that the diesel generator fuel oil storage tank be maintained at $\geq$80%, which is verified every 31 days to assure sufficient supply for 7 days of full load operation. The difference between minimum allowable tank level and top of the tank is only 26.4 inches. Due to strict controls placed on the fuel oil level, the suction pressure cannot vary by more than 0.7 psig. Review of test history shows that the maximum variance recorded is approximately 0.5 psig. The suction pressure is essentially fixed by the TS level requirements, allowing for very little variation in suction pressure. There is no value added in providing more precise suction pressure instrumentation for monitoring pump degradation.
>
> The following test history shows the essentially constant suction pressure:

Unit	Pump ID	Date	Suction Pressure (psig)
1	1MDFAP01	6/6/2006	3.8
	1MDFAP01	8/24/2006	4
	1MDFAP01	11/15/2006	4
	1MDFAP01	2/8/2007	4
	1MDFAP01	5/3/2007	3.9
	1MDFBP01	5/18/2006	4.3
	1MDFBP01	8/10/2006	3.9
	1MDFBP01	11/2/2006	3.6
	1MDFBP01	1/25/2007	3.8
	1MDFBP01	4/19/2007	3.85

Unit	Pump ID	Date	Suction Pressure (psig)
2	2MDFAP01	4/20/2006	3.7
	2MDFAP01	5/4/2004	3.6
	2MDFAP01	7/25/2006	4
	2MDFAP01	1/10/2007	4
	2MDFAP01	4/5/2007	3.9
	2MDFBP01	2/9/2006	3.9
	2MDFBP01	7/13/2006	3.8
	2MDFBP01	10/15/2006	3.8
	2MDFBP01	12/27/2006	3.7
	2MDFBP01	3/21/2007	3.7
3	3MDFAP01	4/30/2006	4.1
	3MDFAP01	6/28/2006	3.7
	3MDFAP01	9/19/2006	4.1
	3MDFAP01	12/15/2006	3.7
	3MDFAP01	3/6/2007	3.9
	3MDFBP01	4/18/2006	3.4
	3MDFBP01	6/13/2006	3.9
	3MDFBP01	9/5/2006	4
	3MDFBP01	11/28/2006	3.9
	3MDFBP01	2/22/2007	3.8

Using the installed instrument (DFN-LI-33 and DFN-LI-34) for Group B and Comprehensive Pump Testing (CPT) provides an acceptable level of quality and safety since the instrument used yields a reading that is at least equivalent to that achieved using an instrument that meets the Code requirements as described in Table ISTB-3500-1.

3.2.3 Licensee's Proposed Alternative Testing

The licensee states:

The installed instrumentation converts to a full-scale range of 4.4 psig, which only slightly exceeds the pump suction reference value of 3.8 psig (full scale equals 1.15 times reference).

Considering the existing 1.5% accuracy of the level instrument, the reading could be as high as 3.85 psig or as low as 3.74 psig. This results in less than a 0.06 psig difference in the readings and is considered insignificant when monitoring for degradation. The existing accuracy is equivalent to the 1.5% minimum accuracy allowed by the combination of instrument full-scale range and accuracy as specified in ISTB-3510 for comprehensive pump testing. This accuracy provides adequate assurance of operability.

The current instrumentation provides sufficient repeatability to allow for an evaluation of the pump hydraulic condition and detect pump degradation.

Use of the existing diesel generator fuel oil storage tank instrumentation should be considered an acceptable alternate to the accuracy requirements of Table ISTB-3500-1.

3.2.4 Evaluation

Diesel generator fuel oil transfer pumps DFA-P01 and DFB-P01 are classified as Group B pumps in accordance with the requirements in ISTB-1400 and ISTB-2000. ISTB-3510(a) and Table ISTB-3500-1 require that for the comprehensive pump test, the pressure instrumentation has an accuracy of ± 0.5 percent.

The pumps are located in the diesel generator fuel oil storage tank and there are no inlet pressure gauges installed for this pump configuration. The system configuration and design make it impractical to install such gauges for the purpose of conducting IST.

The diesel generator fuel oil storage tank is equipped with level instrumentation (DFN-LI-33 and DFN-LI-34) having a calculated loop accuracy of ± 1.5 percent. The instrument reads out in percent of tank level which is converted to suction pressure during the quarterly pump surveillance test. The calibrated instrument range results in a suction pressure span of 0.2 psig to 4.4 psig. This instrument accuracy does not meet the ± 0.5% accuracy as required by Table ISTB-3500-1 for comprehensive pump testing.

The licensee's TS 3.8.3.1 requires that the diesel generator fuel oil storage tank be maintained at $\geq$80% capacity, which is verified every 31 days to assure sufficient supply for 7 days of full load operation. The difference between minimum allowable tank level and top of the tank is 26.4 inches. Due to strict controls placed on the fuel oil level, the pumps' suction pressure cannot vary by more than 0.7 psig. The licensee's review of test history shows that the maximum variance recorded is approximately 0.5 psig. The suction pressure is essentially fixed by the TS level requirements, allowing for very little variation in suction pressure. The installed instrumentation converts to a full-scale range of 4.4 psig, which only slightly exceeds the pump suction reference value of 3.8 psig (full scale equals 1.15 times reference).

Considering the existing 1.5 percent accuracy of the level instrument, the reading could be as high as 3.85 psig or as low as 3.74 psig. This results in less than a 0.06 psig difference in the readings and is considered insignificant when monitoring for degradation. The existing accuracy is equivalent to the 1.5 percent minimum accuracy allowed by the combination of instrument full-scale range and accuracy as specified in the ASME OM Code, for comprehensive pump testing. This accuracy provides adequate assurance of operability. Also, the licensee's TS restrict the variance in the pumps' suction pressure to no more than 0.7 psig. The current instrumentation provides sufficient repeatability to allow for an evaluation of the pump hydraulic condition and detect pump degradation.

3.2.5 Conclusion

Based on the above evaluation that determined that compliance with the Code requirements is impractical for pump testing, and considering the burden on the licensee if the Code requirements are imposed, relief is granted from the Code requirements and the alternative is

imposed, pursuant to 10 CFR 50.55a(f)(6)(i). The relief granted is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. This alternative is authorized for the third 10-year IST program interval.

3.3 Pump Relief Request PRR-03

3.3.1 Code Requirements

The licensee requested relief for the low pressure safety injection (LPSI) pumps SIA-P01 and SIB-P01 from the requirements of ISTB-3300(e)(2), "Reference Values," and ISTB-5121, "Group A Test Procedure." The pumps are classified as Group A pumps for IST.

ISTB-3300(e)(2) requires that reference values shall be established within ± 20 percent of pump design flow for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

ISTB-5121 requires that Group A tests shall be conducted with the pump operating at a specified reference point. The test parameters valued identified in Table ISTB-3000-1 shall be determined and recorded as required by ISTB-5121.

ISTB-5121(b) requires that the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

ISTB-5121(c) states that where it is not practical to vary system resistance, flow rate and pressure shall be determined and compared to their respective reference values.

3.3.2 Licensee's Basis for Requesting Relief

The licensee states:

> The Code requires the Group A reference point flow rate to be established at the highest practical flow rate and operate the pump at a specified reference point (i.e., fix the flow to a specified value). It is impractical to meet this requirement since this is a fixed resistance recirculation path of approximately 180 gpm with limited capability permanent plant flow instrumentation. The installed instrumentation is a 0-5000 gpm ultrasonic flowmeter with ± 5% accuracy and does not meet the 2% instrument requirements of Table ISTB-3500-1 for pump testing. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined impractical due to the difficulty in establishing an application-specific 2% calibration on the SI [safety injection] mini-flow piping. To establish the fixed resistance the minimum flow recirculation line contains a flow orifice and a normally open motor-operated valve and solenoid isolation valve. Allowing the flow to remain fixed by the orifice resistance increases the potential for repeatable test results and degradation monitoring rather than attempting to change the resistance based on ultrasonic flowmeter readout fluctuations. When the pump operates on minimum flow recirculation, the specified reference point is essentially achieved by the

fixed resistance. With this understanding, there is little value added in replacing the existing 0-5000 gpm, ± 5% ultrasonic flowmeter, or adding instrumentation that meets ISTB-3510 requirements. The fixed resistance methodology is repeatable from test to test and accomplishes the same result as if flow were being measured and recorded.

During normal plant operation, the LPSI pumps cannot develop sufficient discharge pressure to overcome RCS [reactor coolant system] pressure and allow flow through the SI headers. Thus, during quarterly testing, LPSI flow is routed through a minimum flow recirculation line to the refueling water tanks. The minimum flow recirculation flow path is a fixed resistance circuit containing a flow-limiting orifice capable of passing only a small fraction (approximately 180 gpm) of the design flow (4200 gpm). The permanent plant 0-5000 gpm, ± 5% accuracy, flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited capability, and its accuracy does not meet Table ISTB-3500-1 flow rate 2% accuracy requirements. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined to be impractical due to the difficulty in establishing an application-specific 2% calibration on the SI mini-flow piping.

The LPSI pumps are categorized as Group A since they are normally used to provide shutdown cooling flow during shutdown operations, and occasionally for recirculating the refueling water tank when the unit is at power. Little degradation is expected during plant operation. Thus, the alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

Modifying the minimum flow recirculation line to provide flow indication to meet the ± 2% accuracy requirement as specified in Table ISTB-3500-1 adds little value since the flow is fixed and differential pressure is used to monitor degradation.

3.3.3 Licensee's Proposed Alternative Testing

The licensee states:

During plant operation, quarterly Group A pump testing for pumps SIA-P01 and SIB-P01 shall be conducted at mini-flow conditions using the minimum flow recirculation line fixed resistance of approximately 180 gpm to establish the specified reference point. ISTB-5100(b)(1) allows the use of the bypass test loops to be used for Group A tests. The flow rate through the loop is established at the highest practical flow rate of approximately 180 gpm in accordance with ISTB-3300(e)(2). Flow rate will not be measured or recorded. To monitor for degradation, pump differential pressure shall be determined and compared to its reference value and the associated range as specified in Table ISTB-5100-1.

Pumps SIA-P01 and SIB-P01 will be comprehensively tested in accordance with ISTB-5123, "Comprehensive Test Procedure," on a biennial (2-year) frequency as specified in Table ISTB-3400-1.

Pumps SIA-P01 and SIB-P01 are infrequently used pumps. Little degradation is expected during plant power operation when the pumps are idle except for limited operations and testing. Testing the pumps within ± 20% of design flow on a 2-year frequency provides additional information regarding the condition of the pumps.

Vibration measurements will be performed quarterly in accordance with ISTB-3540.

3.3.4 Evaluation

LPSI pumps SIA-P01 and SIB-P01 are classified as Group A pumps in accordance with the requirements in ISTB-1400 and ISTB-2000. Table ISTB-3400-1 requires that Group A pumps be tested quarterly and biennially. Requirements for the quarterly test are less rigorous than the requirements for the comprehensive test. Quarterly Group A LPSI pump tests are normally performed when the plant is operating. Comprehensive LPSI pump tests are performed biennially during an outage, shutdown, or startup. Paragraph ISTB-5122 and Table ISTB-3000-1 state that quarterly tests shall be conducted with the pumps operating at a specified reference point.

The recirculation flow path used for LPSI pumps SIA-P01 and SIB-P01 is a fixed resistance flow path. There is limited capability flow instrumentation installed in the flow path. The NRC staff considers the installation of flow instrumentation to be an undue burden when compared to the limited benefits gained by the results of the specified quarterly pump tests. During the performance of the quarterly pump testing, pump differential pressure will be measured and trended. This provides a reference value for differential pressure that can be duplicated during subsequent tests. Pump flow rate will not be varied, measured, or recorded during the performance of the quarterly LPSI pump tests. This methodology provides for the acquisition of repeatable differential pressure during LPSI pump Group A quarterly testing, which is an adequate means of providing reasonable assurance of the operational readiness of the pumps. The performance of pump tests using a noninstrumented recirculation flow path is an acceptable alternative per Position 9 of GL 89-04, provided that comprehensive pump testing is also performed biennially. Biennial comprehensive testing requires that LPSI pump differential pressure and flow rate be measured and evaluated together to determine pump hydraulic performance.

3.3.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternatives to the Code testing requirements for the LPSI pumps SIA-P01 and SIB-P01 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii), on the basis that complying with the specified ASME OM Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the pumps. The alternative is authorized for the third 10-year IST program interval.

3.4 Pump Relief Request PRR-04

3.4.1 Code Requirements

The licensee requested relief for the high pressure safety injection (HPSI) pumps SIA-P02 and SIB-P02 from the requirements of ISTB-3300(e)(2), "Reference Values," and ISTB-5222, "Group B Test Procedure." The pumps are classified as Group B pumps for IST.

ISTB-3300(e)(2) requires that reference values shall be established within ± 20 percent of pump design flow for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

ISTB-5122 requires that Group B tests shall be conducted with the pump operating at a specified reference point. The test parameter valued identified in Table ISTB-3000-1 shall be determined and recorded as required by ISTB-5122.

ISTB-5122(b) requires that the differential pressure or flow rate shall be determined and compared to its reference value.

3.4.2 Licensee's Basis for Requesting Relief

The licensee states:

> The Code requirements to establish the Group B reference point flow rate at the highest practical flow rate and operate the pump at a specified reference point (i.e., fix the flow to a specified value) is impractical since this is a fixed resistance recirculation path of approximately 170 gpm which is measured by limited capability permanent plant flow instrumentation. The installed instrumentation is a 0-5000 gpm ultrasonic flowmeter with ± 5% accuracy and does not meet the 2% instrument requirements of Table ISTB-3500-1 for pump testing. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined to be impractical due to the difficulty in establishing an application specific 2% calibration on the SI mini-flow piping. To establish the fixed resistance the minimum flow recirculation line contains a flow orifice and a normally open motor-operated valve and solenoid isolation valve. Allowing the flow to remain fixed by the orifice resistance increases the potential for repeatable test results and degradation monitoring rather than attempting to change the resistance based on ultrasonic flowmeter readout fluctuations. When the pump operates on minimum flow recirculation, the specified reference point is essentially achieved by the fixed resistance. With this understanding, there is little value added in replacing the existing 0-5000 gpm, ± 5% ultrasonic flowmeter, or adding instrumentation that meets ISTB-3510 requirements. The fixed resistance methodology is repeatable from test to test and accomplishes the same result as if flow were being measured and recorded.
>
> During normal plant operation, the HPSI pumps cannot develop sufficient discharge pressure to overcome RCS pressure and allow flow through the SI headers. Thus, during quarterly testing, HPSI flow is routed through a minimum flow recirculation line to the refueling water tanks. The minimum-flow recirculation flow path is a fixed resistance circuit containing a flow-limiting orifice capable of passing only a small fraction (approximately 170 gpm) of the design flow (815 gpm). The permanent plant 0-5000 gpm, ± 5% accuracy, flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited capability, and its accuracy does not meet Table ISTB-3500-1 flow rate 2% accuracy requirements. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined to be impractical due to the difficulty in establishing an application-specific 2% calibration on the SI mini-flow piping.
>
> The HPSI pumps are categorized as Group B. Pump SIB-P02 is used only occasionally to recharge the safety injection tanks. Little degradation is expected during plant

operation. Thus, the alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

Modifying the minimum flow recirculation line to provide flow indication to meet the ± 2% accuracy requirement as specified in Table ISTB-3500-1 adds little value since the flow is fixed and differential pressure is used to monitor degradation.

3.4.3 Licensee's Proposed Alternative Testing

The licensee states:

> During plant operation, quarterly Group B pump testing for pumps SIA-P02 and SIB-P02 shall be conducted at mini-flow conditions using the minimum flow recirculation line fixed resistance of approximately 170 gpm to establish the specified reference point. ISTB-5100(b)(2) allows the use of the bypass test loops to be used for Group B tests. The PVNGS minimum flow recirculation line is designed to meet the pump manufacturer's operating specifications. The flow rate through the loop is established at the highest practical flow rate of approximately 170 gpm in accordance with ISTB-3300(e)(2). Flow rate will not be measured or recorded. To monitor for degradation, pump differential pressure shall be determined and compared to its reference value and the associated range as specified in Table ISTB-5100-1.
>
> Pumps SIA-P02 and SIB-P02 will be comprehensively tested in accordance with ISTB-5123, "Comprehensive Test Procedure," on a biennial (2-year) frequency as specified in Table ISTB-3400-1.
>
> Pumps SIA-P02 and SIB-P02 are infrequently used pumps. Little degradation is expected during plant power operation when the pumps are idle except for limited operations and testing. Testing the pumps within ± 20% of design flow on a 2-year frequency provides additional information regarding the condition of the pumps.

3.4.5 Evaluation

HPSI pumps SIA-P02 and SIB-P02 are classified as Group B pumps in accordance with the requirements in ISTB-1400 and ISTB-2000. Table ISTB-3400-1 requires that Group B pumps be tested quarterly and biennially. Requirements for the quarterly test are less rigorous than the requirements for the comprehensive test. Quarterly Group B HPSI pump tests are normally performed when the plant is operating. Comprehensive HPSI pump tests are performed biennially during an outage, shutdown, or startup. Paragraph ISTB-5122 and Table ISTB-3000-1 state that quarterly tests shall be conducted with the pumps operating at a specified reference point.

The recirculation flow path used for HPSI pumps SIA-P02 and SIB-P02 is a fixed resistance flow path. There is limited capability flow instrumentation installed in the flow path. The NRC staff considers the installation of flow instrumentation to be an undue burden when compared to the limited benefits gained by the results of the specified quarterly pump tests. During the performance of the quarterly pump testing, pump differential pressure will be measured and trended. This provides a reference value for differential pressure that can be duplicated during subsequent tests. Pump flow rate will not be varied, measured, or recorded during the

performance of the quarterly HPSI pump tests. This methodology provides for the acquisition of repeatable differential pressure during HPSI pump Group B quarterly testing, which is an adequate means of providing reasonable assurance of the operational readiness of the pumps. The performance of pump tests using a noninstrumented recirculation flow path is an acceptable alternative per Position 9 of GL 89-04, provided that comprehensive pump testing is also performed biennially. Biennial comprehensive testing requires that HPSI pump differential pressure and flow rate be measured and evaluated together to determine pump hydraulic performance.

3.4.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternatives to the Code testing requirements for the HPSI pumps SIA-P02 and SIB-P02 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii), on the basis that complying with the specified ASME OM Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the pumps. The alternative is authorized for the third 10-year IST program interval.

3.5 Pump Relief Request PRR-05

3.5.1 Code Requirements

The licensee requested relief for the containment spray (CS) pumps SIA-P03 and SIB-P03 from the requirements of ISTB-3300(e)(2), "Reference Values," and ISTB-5121, "Group A Test Procedure." The pumps are classified as Group A pumps for IST.

ISTB-3300(e)(2) requires that reference values shall be established within ± 20 percent of pump design flow for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate.

ISTB-5121 requires that Group A tests shall be conducted with the pump operating at a specified reference point. The test parameters valued identified in Table ISTB-3000-1 shall be determined and recorded as required by ISTB-5121.

ISTB-5121(b) requires that the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

ISTB-5121(c) states that where it is not practical to vary system resistance, flow rate and pressure shall be determined and compared to their respective reference values.

3.5.2 Licensee's Basis for Requesting Relief

The licensee states:

> The Code requires the Group A reference point flow rate to be established at the highest practical flow rate and operate the pump at a specified reference point (i.e., fix the flow to

a specified value). It is impractical to meet this requirement since this is a fixed resistance recirculation path of approximately 190 gpm with limited capability permanent plant flow instrumentation. The installed instrumentation is a 0-5000 gpm ultrasonic flowmeter with ± 5% accuracy and does not meet the 2% instrument requirements of Table ISTB-3500-1 for pump testing. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined impractical due to the difficulty in establishing an application-specific 2% calibration on the SI mini-flow piping. To establish the fixed resistance the minimum flow recirculation line contains a flow orifice and a normally open motor-operated valve and solenoid isolation valve. Allowing the flow to remain fixed by the orifice resistance increases the potential for repeatable test results and degradation monitoring rather than attempting to change the resistance based on ultrasonic flowmeter readout fluctuations. When the pump operates on minimum flow recirculation, the specified reference point is essentially achieved by the fixed resistance. With this understanding, there is little value added in replacing the existing 0-5000 gpm, ± 5% ultrasonic flowmeter, or adding instrumentation that meets ISTB-3510 requirements. The fixed resistance methodology is repeatable from test to test and accomplishes the same result as if flow were being measured and recorded.

Modifying the minimum flow recirculation line to provide flow indication to meet the ± 2% accuracy requirement as specified in Table ISTB-3500-1 adds little value since the flow is fixed at approximately 190 gpm and differential pressure is used to monitor degradation. The permanent plant 0-5000 gpm, ± 5% accuracy, flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited capability, and its accuracy does not meet Table ISTB-3500-1 flow rate 2% accuracy requirements. The use of an ultrasonic flowmeter with 2% accuracy was evaluated and determined impractical due to the difficulty in establishing an application-specific 2% calibration on the SI mini-flow piping.

The normal containment spray flow path cannot be used for testing the CS pumps without spraying down the inside of the containment building and risking damage to important equipment. The RCS injection portion of the shutdown cooling flow path cannot be used for testing during plant operation because the CS pumps are unable to develop sufficient discharge pressure to overcome RCS pressure.

The minimum-flow recirculation flow path is a fixed resistance circuit containing a flow-limiting orifice capable of passing only a small fraction ([approximately] 190 gpm) of the design flow (3890 gpm). The permanent plant 0-5000 gpm, ± 5% accuracy, flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited capability, and its accuracy does not meet Table ISTB-3500-1 flow rate 2% accuracy requirements. A larger recirculation flow path is available; however, this requires an alternate lineup and the same limited capability flow instrument exists in this portion of the recirculation line.

The larger recirculation flow path is capable of carrying higher flow, but routine surveillance testing at less than the full flow reference value is not practical because of the pump rumble range (1800-2800 gpm). Testing in or near the rumble range is not practical because of the potential for equipment damage. Testing at flow rates above the rumble range (> 2800 gpm) is not practical because flow velocities in the recirculation piping would exceed the design criteria.

The CS pumps are categorized as Group A since they are normally used to provide shutdown cooling flow during shutdown operations. Little degradation is expected during plant operation. Thus, the alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

3.5.3 Licensee's Proposed Alternative Testing

The licensee states:

> During plant operation, quarterly Group A pump testing for pumps SIA-P03 and SIB-P03 shall be conducted at mini-flow conditions using the minimum flow recirculation line fixed resistance of approximately 190 gpm to establish the specified reference point. ISTB-5100(b)(1) allows the use of the bypass test loops to be used for Group A tests. The flow rate through the loop is established at the highest practical flow rate of approximately 190 gpm in accordance with ISTB-3300(e)(2). Flow rate will not be measured or recorded. To monitor for degradation, pump differential pressure shall be determined and compared to its reference value and the associated range as specified in Table ISTB-5100-1.
>
> Pumps SIA-P03 and SIB-P03 will be comprehensively tested in accordance with ISTB-5123, "Comprehensive Test Procedure," on a biennial (2-year) frequency as specified in Table ISTB-3400-1.
>
> Pumps SIA-P03 and SIB-P03 are infrequently used pumps. Little degradation is expected during plant power operation when the pumps are idle except for limited operations and testing. Testing the pumps within ± 20% of design flow on a 2-year frequency provides additional information regarding the condition of the pumps.
>
> Vibration measurements will be performed quarterly in accordance with ISTB-3540.

3.5.4 Evaluation

CS pumps SIA-P03 and SIB-P03 are classified as Group A pumps in accordance with the requirements in ISTB-1400 and ISTB-2000. Table ISTB-3400-1 requires that Group A pumps be tested quarterly and biennially. Requirements for the quarterly test are less rigorous than the requirements for the comprehensive test. Quarterly Group A CS pump tests are normally performed when the plant is operating. Comprehensive CS pump tests are performed biennially during an outage, shutdown, or startup. Paragraph ISTB-5122 and Table ISTB-3000-1 state that quarterly tests shall be conducted with the pumps operating at a specified reference point. The normal CS flow path cannot be used for testing the CS pumps without spraying down the inside of the containment building and risking damage to important equipment. The RCS injection portion of the shutdown cooling flow path cannot be used for testing during plant operation because the CS pumps are unable to develop sufficient discharge pressure to overcome RCS pressure.

A larger recirculation flow path is available for the CS pumps. However, this flow path requires an alternate lineup and the same limited capability flow instrument exists in this portion of the recirculation line. The larger recirculation flow path is capable of carrying higher flow, but routine surveillance testing at less than the full flow reference value is not desirable because of high

pump vibration that occurs in this flow range (1800-2800 gpm). Testing in or near this flow range is not desirable because of the potential for pump damage due to high vibration. Testing at flow rates above 2800 gpm is not desirable because flow velocities in the recirculation piping would exceed the design criteria.

The minimum flow recirculation flow path used for CS pumps SIA-P03 and SIB-P03 is a fixed resistance flow path. There is limited capability flow instrumentation installed in the flow path. The NRC staff considers the installation of flow instrumentation to be an undue burden when compared to the limited benefits gained by the results of the quarterly pump tests. During the performance of the quarterly pump testing, pump differential pressure will be measured and trended. This provides a reference value for differential pressure that can be duplicated during subsequent tests. Pump flow rate will not be varied, measured, or recorded during the performance of the quarterly CS pump tests. This methodology provides for the acquisition of repeatable differential pressure during CS pump Group A quarterly testing, which is an adequate means of providing reasonable assurance of the operational readiness of the pumps. The performance of pump tests using a noninstrumented recirculation flow path is an acceptable alternative per Position 9 of GL 89-04, provided that comprehensive pump testing is also performed biennially. Biennial comprehensive testing requires that CS pump differential pressure and flow rate be measured and evaluated together to determine pump hydraulic performance.

3.5.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternatives to the Code testing requirements for the CS pumps SIA-P03 and SIB-P03 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii), on the basis that complying with the specified ASME OM Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the pumps. The alternative is authorized for the third 10-year IST program interval.

3.6 Valve Relief Request VRR-01

3.6.1 Code Requirements

The licensee requested relief to allow the use of Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in LWR [Light-Water Reactor] Power Plants," Revision 0, as an alternative to the Code requirements below.

ISTA-3130(b) requires that code cases be applicable to the edition and addenda specified in the test plan.

ISTC-3100 requires that any motor-operated valve (MOV) that has undergone maintenance that could affect its performance after the preservice test be tested in accordance with ISTC-3310.

ISTC-3310 requires that a new reference value be determined or the previous reference value be reconfirmed by an inservice test after an MOV has been replaced, repaired, or has undergone maintenance that could affect the valve's performance.

ISTC-3510 requires that active Category A and B MOVs be exercised nominally every 3 months.

ISTC-3521 requires that active Category A and B MOVs be exercised during cold shutdowns if it is not practicable to exercise the valves at power or that active Category A and B MOVs be exercised during refueling outages if it not practicable to exercise the valves during cold shutdowns.

ISTC-5120 requires that MOVs be stroke-time tested when exercised in accordance with ISTC-3510.

ISTC-3700 requires that valves with remote position indicators be observed locally at least once every 2 years to verify that valve operation is accurately indicated.

3.6.2 Licensee's Basis for Requesting Relief

NUREG-1482, Revision 1, Section 4.2.5 states in part, "[a]s an alternative to MOV stroke-time testing, ASME developed Code Case OMN-1, which provides periodic exercising and diagnostic testing for use in assessing the operational readiness of MOVs" may be used. Section 4.2.5 recommends that the licensees implement ASME Code Case OMN-1 as accepted by the NRC (with certain conditions) in the regulations, as an alternative to the MOV exercising, stroke-time testing, and remote position verification testing provisions in the ASME OM Code.

3.6.3 Licensee's Proposed Alternative Testing

The licensee proposes to test its MOVs in accordance with Code Case OMN-1 subject to the conditions contained in Table 2 of Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code."

The valve position verification provisions specified in ISTC-3700 will be implemented in conjunction with the MOV diagnostic test frequency in lieu of once every 2 years.

3.6.4 Evaluation

Application of code cases is addressed in 10 CFR 50.55a(b)(6) through references to RG 1.192, which lists acceptable and conditionally acceptable code cases for implementation in IST programs. RG 1.192, Table 2, conditionally approves the use of Code Case OMN-1 and states that the code case is applicable to the 2000 Addenda and earlier editions and addenda of the Code. There is no technical reason for prohibiting the use of Code Case OMN-1 with the 2001 Edition through the 2003 Addenda of the Code. Code Case OMN-1 provides an acceptable level of quality and safety for testing of MOVs and is an acceptable alternative for use in the licensee's IST program. This conclusion is consistent with the staff position in NUREG-1482, Revision 1, and RG 1.192.

The NRC staff considers that activities conducted as part of the implementation of Code Case OMN-1 will achieve valve position verification as intended in ISTC-3700. For example, paragraph 3.6, "MOV Exercising Requirements," in Code Case OMN-1 specifies that MOVs within the scope of the code case are to be exercised on an interval not to exceed 1 year or one refueling cycle (whichever is longer). In particular, paragraph 3.6.3 states that each MOV is to

full-stroke exercised to the position(s) required to fulfill its function(s). Further, item (j) of paragraph 9.1, "Test Information," in Code Case OMN-1 indicates that significant observations, such as abnormal or erratic MOV action noted either during or preceding performance testing, are to be considered.

3.6.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternative to the Code MOV exercising, stroke-time testing, and remote position verification requirements is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the MOVs in the IST program.

4.0 CONCLUSION

The staff has reviewed the licensee's application and determined that the proposed alternatives for relief request VRR-01 would provide an acceptable level of quality and safety. Therefore, VRR-01 is authorized pursuant to 10 CFR 50.55(a)(3)(i) for the third 10-year IST interval.

Pursuant to 10 CFR 50.55a(a)(3)(ii), the alternatives to the Code requirements as proposed in relief requests PRR-01, PRR-03, PRR-04, and PRR-05 are authorized for the third 10-year IST interval on the basis that complying with the specified requirements results in hardship without a compensating increase in the level of quality and safety, and the licensee's proposed alternative provides reasonable assurance of the operational readiness of the components.

Relief request PRR-02 is granted for the third 10-year IST interval based on the determination that it is impractical for the licensee to comply with the specified requirement. Granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the components.

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

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