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

RELATED TO THE SECOND 10-YEAR INSERVICE TESTING PROGRAM

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNIT NOS. 1, 2, AND 3

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

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. 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 its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements determined acceptable to the staff. Further guidance was given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 second 10-year IST interval program was submitted in a letter dated January 13, 1998. The second 10-year IST interval began on January 15, 1998, and ends January 14, 2008. As a result of a conference call held on September 17, 1998, revised relief requests (VRR-12, VRR-13, PRR-07, and PRR-08) were submitted on December 10, 1998. In addition, the licensee revised the second 10-year interval IST program for pumps and valves by letter dated November 23, 1998, superseding the information provided in the January 13, 1998, letter. Further conference calls were held on February 9, 16, and 26, 1999. Subsequently, three relief requests (PRR-05, PRR-06, and PRR-11) were revised and submitted in a letter dated March 16, 1999. The IST program was developed in accordance with the 1989 Edition of the Code which incorporates Operations and Maintenance (OM) Standards Part 1, Part 6, and Part 10 (OM-1, OM-6, and OM-10) for IST of safety and relief devices, pumps, and valves, respectively.

The NRC's findings with respect to authorizing alternatives and granting or denying the IST program relief requests are given below.

ENCLOSURE

2.0 EVALUATION OF PUMP RELIEF REQUESTS

2.1 Relief Request No. 1 (PRR-01)

The licensee requests relief from the requirements of OM-6 paragraph 5.2 for the essential auxiliary feedwater pumps. The Code requires that each pump be tested quarterly and the measured flow rate be compared with its reference value. The licensee proposes to test the pumps quarterly at minimum flow conditions, and at design flow conditions during cold shutdown.

2.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> 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 auxiliary feedwater 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 could cause undesirable reactivity variations and power fluctuations.
>
> AFA-P01 and AFB-P01 are standby pumps. Little degradation is expected during plant power operation when the pumps are idle except for testing. Testing the pumps at design flow on a Cold Shutdown frequency will provide additional information regarding the condition of the pumps. This information compensates for not measuring flow rate during the quarterly test.

2.1.2 Alternative Testing

The licensee proposes:

> AFA-P01 and AFB-P01 will be tested at mini-flow conditions during plant operation, but flow rate will not be measured. AFA-P01 and AFB-P01 will be tested at design flow on a Cold Shutdown frequency, with all Code-required parameters measured.

2.1.3 Evaluation

The essential auxiliary feedwater pumps supply water to the steam generators during an accident. They also function to supply feedwater to the steam generators during plant startup and shutdown. The Code requires that an inservice test be performed every 3 months and the flow rate be measured and compared with its reference value. The licensee proposes to test the pumps at minimum flow conditions during plant operations, but not measure the flow rate.

During cold shutdowns, they propose to test the pumps at design flow and measure all the Code-required parameters.

Measuring the auxiliary feedwater pumps' flow rate while operating on the minimum flow recirculation line is not as meaningful a test for pump operability as a full flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. Testing the pumps by utilizing injection during power operation is not practical because this could result in steam generator thermal shock and subsequent fatigue failure of the steam generator feed nozzles.

Position 9 of GL 89-04 addresses the issue of pump testing where flow can be established only through a non-instrumented minimum-flow path during quarterly pump testing and a path exists at cold shutdowns or refueling outages to perform a test of the pump under full or substantial flow conditions. The staff has determined that the increased interval is an acceptable alternative to the Code requirements provided that pump differential pressure, flow rate, and bearing vibration measurements are taken during this testing and that quarterly testing measure, as a minimum, pump differential pressure and vibration. The licensee's proposed alternative is consistent with Position 9 of GL 89-04 and will provide reasonable assurance of the pumps' operational readiness.

2.1.4 Conclusion

Relief from the requirements of OM-6 paragraph 5.2(c) for the essential auxiliary feedwater pumps is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness.

2.2 Relief Request No. 3 (PRR-03)

The licensee requests relief from OM-6 paragraph 4.6.1.2(a) for the reactor coolant charging pumps CHA-P01, CHB-P01, and CHE-P01. The Code states that the full-scale range of each pump's analog flow instrument shall not be greater than 3 times the reference value. The licensee proposes to use the installed instrumentation.

2.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> Each charging pump is a constant-speed, positive displacement pump with a typical flow rate reference value of 43 gpm [gallons per minute]. The analog charging flow indicator CHB-FI-212 is located in the common discharge line of the three pumps. The full-scale range of CHB-FI-212 is 150 gpm, which exceeds the range requirements of 4.6.1.2(a).
>
> The combined requirements of OM-6 Table 1... and para. 4.6.1.2(a)... result in a measurement within 6% of the reference value. 6% is also the guideline for instrument acceptability provided in NUREG-1482, Paragraph 5.5.1.

The loop accuracy of CHB-FI-212 (based on the square root of the sum of the squares of the inaccuracies of each instrument or component in the loop) is ± 1.32% of full-scale. When combined with the 150 gpm range of the instrument, which is 3.49 times the reference value, the accuracy of the CHB FI 212 instrument loop is within 4.7% of the reference value. Therefore, flow indicator CHB-FI-212 meets the combined requirement for measurement accuracy within 6% of the reference value. This accuracy is sufficient to provide an acceptable level of quality and safety.

2.2.2 Alternative Testing

The licensee has proposed to perform the surveillance testing using the existing installed charging flow indicator, CHB-FI-212, calibrated to its normal range (0-150 gpm).

2.2.3 Evaluation

The charging pumps provide makeup water to the reactor coolant system (RCS) for chemistry and volume control. They also provide auxiliary spray to the pressurizer. The Code requires that instrumentation used for measuring charging pump flow rate have a specified accuracy and full-scale range. The licensee proposes to use the installed instrumentation which does not meet Code requirements for full-scale range.

OM-6 Table 1 requires that flow instrumentation accuracy be within 2 percent of full-scale, while OM-6 paragraph 4.6.1.2(a) requires the full-scale range of each instrument be no greater than 3 times the reference value. The combination of these two requirements results in an effective accuracy requirement of ±6 percent of the reference value.

The loop accuracy for the charging pump flow indicator, CHB-FI-212, is 1.32 percent and its full-scale range is 3.49 times the reference value. The flow indicator, therefore, has an effective reference value accuracy of within 4.6 percent. This instrument yields a reading at least equivalent to the reading achieved from instruments that meet Code requirements (i.e., up to ±6 percent) and, thus, meets the guidelines of NUREG-1482 paragraph 5.5.1.

The licensee's proposal to use the installed instrumentation does not meet the Code full-scale requirements. However, the accuracy of the flow indicator is better than that required by the Code. The higher accuracy of the indicator, in effect, provides an acceptable means of measuring pump flow.

2.2.4 Conclusion

The proposed alternative to the Code instrument range requirement of OM-6 paragraph 4.6.1.2(a) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

2.3 Relief Request No. 5 (PRR-05)

The licensee requests relief from the requirements of OM-6 paragraph 5.2(c) for the low pressure safety injection pumps (LPSI). When the system resistance cannot be varied, the Code requires that flow rate and pressure be determined quarterly and compared with the

reference values. The licensee proposes to test the pumps at minimum flow conditions quarterly and at design flow on a cold shutdown frequency.

2.3.1 Licensee's Basis for Requesting Relief

The licensee states:

> During normal power operation, the LPSI pumps cannot develop sufficient discharge pressure to overcome RCS pressure and allow flow through the safety injection headers. Thus, during quarterly testing, LPSI flow is routed through a minimum flow recirculation line to the refueling water tanks. The minimum flow recirculation flowpath is a fixed resistance circuit containing a flow-limiting orifice capable of passing only a small fraction of the design flow. The installed flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited capability, and its accuracy is not sufficient to meet OM-6 accuracy requirements. A larger recirculation flowpath is available; however, it uses the same flow instrument as the minimum-recirculation line.
>
> During cold shutdowns, the shutdown cooling flowpath is available for LPSI pump testing. The shutdown cooling flowpath includes an orifice-type flow meter that complies with the range and accuracy requirements of OM-6 para. 4.6.1.1 and 4.6.1.2 respectively. This flow meter will be used to measure flow during the design flow test.
>
> The LPSI pumps 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 power operation. Thus, the alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

2.3.2 Alternative Testing

The licensee proposes:

> LPSI pumps SIA-P01 and SIB-P01 will be tested at mini-flow conditions during plant operation per OM-6 para. 5.2(c), but flow rate will not be measured. SIA-P01 and SIB-P01 will be tested at design flow on a Cold Shutdown frequency. During design flow testing, the flow rate will be measured using instruments whose range and accuracy meet Code requirements, and the Code-required parameters will be measured and evaluated per OM-6 para. 5.2(d).

2.3.3 Evaluation

LPSI pumps SIA-P01 and SIB-P01 provide low-pressure coolant injection of borated water into the RCS under accident conditions. They also provide shutdown cooling flow post accident and during normal reactor startup and shutdown. The Code requires that an inservice test be performed every 3 months and the flow rate and pressure be measured and compared with reference values. The licensee proposes to test the pumps at minimum flow conditions during plant operations, but not measure the flow rate. During cold shutdowns, they propose to test the pumps at design flow and measure all the Code-required parameters per OM-6 paragraph 5.2(d).

Measuring the LPSI pumps' flow rate while operating on the minimum-flow recirculation line is not as meaningful a test for pump operability as a full-flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. Testing these pumps by utilizing injection during power operation is not practical because the LPSI pumps cannot develop sufficient head to inject into the normal operating RCS pressure.

Position 9 of GL 89-04 addresses the issue of pump testing where flow can be established only through a non-instrumented minimum-flow path during quarterly pump testing and a path exists at cold shutdowns or refueling outages to perform a test of the pump under full or substantial flow conditions. The staff has determined that the increased interval is an acceptable alternative to the Code requirements provided that pump differential pressure, flow rate, and bearing vibration measurements are taken during this testing and that quarterly testing measure, as a minimum, pump differential pressure and vibration. The licensee's proposed alternative is consistent with Position 9 of GL 89-04 and will provide reasonable assurance of the pumps' operational readiness.

2.3.4 <u>Conclusion</u>

Relief from the requirements of OM-6 paragraph 5.2(c) for the LPSI pumps is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness.

2.4 <u>Relief Request No. 6 (PRR-06)</u>

The licensee requests relief from the requirements of OM-6 paragraph 5.2(c) for the high pressure safety injection pumps (HPSI). When the system resistance cannot be varied, the Code requires that flow rate and pressure be determined quarterly and compared with the reference values. The licensee proposes to test the pumps at minimum flow conditions quarterly and at design flow during refueling outages.

2.4.1 <u>Licensee's Basis for Requesting Relief</u>

The licensee states:

> During normal power operation, the HPSI pumps cannot develop sufficient discharge pressure to overcome RCS pressure and allow flow through the safety injection headers. Thus, during quarterly testing, HPSI flow is routed through a minimum flow recirculation line to the refueling water tanks. The minimum-flow recirculation flowpath is a fixed resistance circuit containing a flow-limiting orifice capable of passing only a small fraction of the design flow. The installed flow instrumentation (permanently mounted ultrasonic flowmeter) has only limited

capability, and its accuracy is not sufficient to meet OM-6 accuracy requirements.

During cold shutdown conditions, full flow operation of the HPSI pumps to the RCS is restricted to preclude RCS pressure transients that could result in exceeding Technical Specification pressure-temperature limits (LTOP).

During refueling outages, the RCS injection flowpath is available for HPSI pump testing. The RCS injection flowpath includes orifice-type flow meters that comply with the range and accuracy requirements of OM-6 para. 4.6.1.1 and 4.6.1.2 respectively. These flow meters will be used to measure flow during the design flow test.

The HPSI pumps are standby pumps. SIB-P02 is used only occasionally to recharge the safety injection tanks. Little degradation is expected during power operation. Thus, the alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

2.4.2 Alternative Testing

The licensee proposes:

> HPSI pumps SIA-P02 and SIB-P02 will be tested at mini-flow conditions during plant operation per OM-6 para. 5.2(c), but flow rate will not be measured. SIA-P02 and SIB-P02 will be tested at design flow on a Refueling frequency. During design flow testing, the flow rate will be measured using instruments whose range and accuracy meet Code requirements, and the Code-required parameters will be measured and evaluated per OM-6 para. 5.2(d).

2.4.3 Evaluation

The HPSI pumps provide high-pressure coolant injection of borated water into the RCS under accident conditions. They also provide flow for long-term cooling and flusning to prevent boron precipitation. The Code requires that an inservice test be performed every 3 months and the flow rate and pressure be measured and compared with reference values. The licensee proposes to test the pumps at minimum flow conditions during plant operations, but not measure the flow rate. During refueling outages, they propose to test the pumps at design flow and measure all the Code-required parameters per OM-6 paragraph 5.2(d).

Measuring the HPSI pumps' flow rate while operating on the minimum-flow recirculation line is not as meaningful a test for pump operability as a full-flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. Testing these pumps by utilizing injection during power operation is not practical because the HPSI pumps cannot develop sufficient head to inject into the normal operating RCS pressure. The pumps also cannot be tested during cold shutdown because the RCS has insufficient volume to contain the necessary injection flow.

Position 9 of GL 89-04 addresses the issue of pump testing where flow can be established only through a non-instrumented minimum-flow path during quarterly pump testing and a path exists at cold shutdowns or refueling outages to perform a test of the pump under full or substantial flow conditions. The staff has determined that the increased interval is an acceptable alternative to the Code requirements provided that pump differential pressure, flow rate, and bearing vibration measurements are taken during this testing and that quarterly testing measure, as a minimum, pump differential pressure and vibration. The licensee's proposed alternative is consistent with Position 9 of GL 89-04 and will provide reasonable assurance of the pumps' operational readiness.

2.4.4 Conclusion

Relief from the requirements of OM-6 paragraph 5.2(c) for the HPSI pumps is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness.

2.5 Relief Request No. 7 (PRR-07)

The licensee requests relief from Code requirements involving charging pump vibration measurements for pumps CHA-P01, CHB-P01, and CHE-P01. The requirements of OM-6 paragraph 4.6.1.6 state that the frequency response range of the vibration measuring transducers and their readout system shall be from one-third minimum pump rotational speed to at least 1000 hertz (Hz). The licensee proposes to use instrumentation that it currently possesses.

2.5.1 Licensee's Basis for Requesting Relief

The licensee states:

> The charging pumps are positive-displacement pumps with a constant running speed of 199 rpm [revolutions per minute] (equivalent to 3.3 Hz). Compliance with paragraph 4.6.1.6 would require using vibration instrumentation with a frequency response range of 1.1 Hz to at least 1000 Hz.
>
> Two different vibration probes are used at PVNGS, one with a frequency response range of 4.9 Hz to 1000 Hz, and a special low-speed probe with a frequency response range of 1.6 Hz to 100 Hz. The low-speed probe was purchased specifically for charging pump testing when the IST requirement for frequency response was one-half pump speed to at least pump shaft rotational speed. This probe does not meet the lower bound or the upper bound of the Code-required frequency response range.
>
> The charging pump bearings are oil-lubricated, sleeve type journal bearings. Because of the high reciprocating loads, the charging pump bearings are not susceptible to oil whirl, which is the primary failure mode that causes vibration below pump shaft rotational speed. There are no other failure mechanisms that

manifest themselves with elevated vibration levels in the range of one-third to one-half pump shaft rotational frequency; all the remaining failure modes cause vibration at or above the pump speed. Experience with these pumps confirms this fact. Therefore, vibration instrumentation with a frequency response range above 1.6 Hz is acceptable for monitoring vibration of the charging pumps.

The low-speed probe is sensitive to vibration frequencies up to 30 times the running speed of the charging pumps. This is sufficient to identify bearing degradation, mechanical rubs, and other pump problems producing high-frequency vibrations. These pumps are not susceptible to degradation mechanisms that would manifest themselves in the 100-1000 Hz range but not in the vibration range being monitored (1.6-100 Hz). Therefore, use of the higher frequency vibration probe provides no benefit. The charging pumps are monitored for other symptoms of degradation under the PVNGS Predictive Maintenance Program (see PRR-08 for a description of the PVNGS Predictive Maintenance Program). Therefore, use of this probe during charging pump inservice testing will provide an acceptable level of quality and safety.

2.5.2 Alternative Testing

The licensee proposes to measure charging pump vibration with existing instrumentation that has a frequency response range from 1.6 Hz to 100 Hz.

2.5.3 Evaluation

The charging pumps provide makeup water to the RCS for chemistry and volume control. They also provide auxiliary spray to the pressurizer. Paragraph 4.6.1.6 of OM-6 requires vibration instrumentation to have a frequency response range of the readout system from one-third of the minimum pump shaft rotational speed (1.1 Hz) to at least 1000 Hz. The licensee proposes to use instrumentation with a frequency response range from 1.6 Hz to 100 Hz.

The frequency spectrum of the signals generated is characteristic of each pump and constitutes a unique pattern. Analysis of the pattern allows identification of vibration sources, and monitoring of the change over time permits evaluation of the mechanical condition of the pump. In order to identify sources of noise and vibration, the licensee correlates the peaks of the measured frequency spectra with data pertaining to the possible vibration source components in the pump. For reciprocating pumps, the sources of vibration from unbalance forces generally give rise to vibrations at the running speed or higher (greater than 3.3 Hz). Vibrations below pump shaft rotational speed may indicate oil whip in journal bearings. This is the primary failure mode that causes vibration at speeds below shaft rotational speed. The licensee has indicated that because of the high reciprocating loads, the charging pump bearings are not susceptible to oil whip and this failure mode.

It is the licensee's experience that the possible failure modes, such as bearing degradation and mechanical rubs, cause vibration at or above the pump speed. However, the pump is not susceptible to degradation mechanisms that would manifest themselves in the unmonitored range (100-1000 Hz) but not in the monitored range (1.6-100 Hz). Therefore, the licensee's current instrumentation is sufficient to identify pump problems that produce high frequency vibrations.

In addition to Code-required testing, the charging pumps are monitored for other symptoms of degradation under the licensee's Predictive Maintenance Program. The vibration of the driver bearings, as well as the vibration at the pump bearings, are collected and trended. Analyzed parameters and methods include vibration velocity, bearing acceleration, bearing high frequency detection, and spectral analysis. A spectral analysis provides the entire spectrum of vibration frequencies as compared to the vibration data required by the Code. This allows for monitoring potential failure modes at different frequencies. The proposed alternative provides an adequate level of assurance of the operational readiness of the charging pumps.

Imposition of the Code requirements for the vibration instrumentation would be of little to no benefit for assuring operational readiness of the charging pumps. It would create a hardship on the licensee by requiring that a different type of vibration monitoring instrumentation be procured, maintained, and operated.

2.5.4 Conclusion

The alternative of utilizing the existing vibration monitoring instrumentation for the charging pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). This is based on the hardship that would be created, without a compensating increase in the level of quality and safety, if the Code requirements of OM-6 paragraph 4.6.1.6 were imposed.

2.6 Relief Request No. 8 (PRR-08)

The licensee requests relief from the test frequency and acceptance criteria requirements of OM-6, paragraphs 5.1 and 6.1, respectively, from the pumps listed below. The licensee has also requested relief from the reference value requirements of paragraph 4.3. The licensee has proposed for pumps listed below that have vibration parameter reference values of less than 0.05 inch per second (ips) be considered smooth-running with an alert range from 0.125 to 0.3 ips and a required action level of greater than 3 ips. The licensee would also commit to include pumps with vibration parameters considered smooth-running in its predictive maintenance program.

AFA-P01 Essential Auxiliary Feedwater Pump (Turbine-Driven)
AFB-P01 Essential Auxiliary Feedwater Pump (Motor-Driven)
AFN-P01 Non-Class Auxiliary Feedwater Pump (Motor-Driven)
CTA-P01 Condensate Transfer Pump
CTB-P01 Condensate Transfer Pump
ECA-P01 Essential Chilled Water Circulation Pump
ECB-P01 Essential Chilled Water Circulation Pump
EWA-P01 Essential Cooling Water Pump
EWB-P01 Essential Cooling Water Pump
PCA-P01 Spent Fuel Pool Cooling Pump
PCB-P01 Spent Fuel Pool Cooling Pump
SIA-P01 Low Pressure Safety Injection (LPSI) Pump
SIB-P01 Low Pressure Safety Injection (LPSI) Pump
SIA-P02 High Pressure Safety Injection (HPSI) Pump
SIB-P02 High Pressure Safety Injection (HPSI) Pump
SIA-P03 Containment Spray Pump
SIB-P03 Containment Spray Pump

SPA-P01 Essential Spray Pond Pump
SPB-P01 Essential Spray Pond Pump

2.6.1 Licensee's Basis for Requesting Relief

The licensee states:

> The repeatability of pump vibration readings at PVNGS is in the range of 0.05 ips due to hydraulic flow noise in this amplitude range and the repeatability of the vibration instruments. When vibration velocities are less than 0.05 ips, changes have been shown to be non-significant.
>
> At vibration velocities less than 0.05 ips, flow noise and instrument repeatability can significantly affect reference values. Candidates for "smooth-running" status will be analyzed per OM-6 paragraph 4.3 to verify that use of this relief request will not prevent the detection of significant pump degradation.
>
> For displacement reference values less than 0.5 mils, it is noted that the Section XI code in effect for the first interval IST Program (1980 Edition, Winter Addenda) sets the Alert Range at >1.0 mil and the Required Action Range at >1.5 mil. This implies a minimum reference value of 0.5 mils, which is equivalent to 0.047 ips for 1800 rpm pumps and 0.094 ips for 3600 rpm pumps. The effective reference values proposed for smooth-running pumps are roughly equal to the implied Section XI reference values for 1800 rpm pumps and more conservative than the implied reference values for 3600 rpm pumps. Without this relief request, the Alert Ranges for some smooth running pumps will be reduced by a factor of 10.
>
> The PVNGS Predictive Maintenance (PdM) Program is part of the Preventive Maintenance (PM) Program described in UFSAR [Updated Final Safety Analysis Report] section 17.2.3.11.1.6. The PM Program was developed using RCM, NPRDS, EPRI, and INPO guidelines as well as factoring in PVNGS site-specific experience and regulatory requirements. The PM Program and PdM activities are controlled by plant procedures. Each of these pumps has a maintenance plan documented in the PM Program which describes the PM and PdM activities performed on that pump. The performance of the system associated with each of these pumps is monitored and compared to performance criteria under the PVNGS Maintenance Rule Program. This ensures the continued effectiveness of the PM program to minimize component failures and maintain or improve system performance (balance availability and reliability).
>
> The PVNGS Predictive Maintenance Program uses vibration analysis, lubricant analysis, and infrared thermographic analysis as appropriate, to predict the need for maintenance so that equipment can be reworked prior to failure. The components included in this program include those considered important to safe and reliable plant operation, including all the pumps in the IST Program. The intervals for monitoring are based on manufacturer's recommendations, maintenance history, cost effectiveness, and experience. Although the monitoring, analyses, database, and software used in the Predictive

Maintenance Program do not fall under the PVNGS Quality Program, the Predictive Maintenance Program still provides valuable information for assuring the operational readiness of smooth-running pumps.

The vibration analysis program monitors the vibration of rotating machinery. In addition to the vibration at pump bearings, the vibration of the driver (turbine or motor) bearings are also collected and trended. Analyzed parameters and methods include vibration velocity, bearing acceleration, bearing high frequency detection, and spectral analysis.

The lubricant analysis program samples lubricants and analyzes them to identify degradation or negative trends. Most testing is performed at the on-site lubrication laboratory, where capabilities include wear debris, chemical composition, and lubrication cleanliness analysis.

In both the vibration monitoring and lubricant analysis programs, recently acquired data is compared with previous data to detect any indicated degradation of equipment condition. If degradation indicates the reliability of operating equipment may be negatively affected, or if acceptance criteria is no longer being met, appropriate corrective action is taken. Corrective action may include: continuing trending of the degraded condition, if the condition is not considered to be immediately threatening to the equipment and can be corrected during a time window convenient to plant operation; additional testing or monitoring to confirm the suspected degraded condition; inspection and repair of the equipment as necessary; changes to preventive maintenance procedures or schedules; or design changes.

The PVNGS licensee expends considerable resources on preventive and predictive maintenance. One result of these efforts are pumps that run very smoothly. For example, many pumps in the PVNGS IST Program would currently be candidates for "smooth-running" status under PRR-08, as shown in the table below. To continue to impose Code-mandated Alert and Required Action values on smooth-running pumps unnecessarily penalizes PVNGS for achieving this high level of performance.

Pump	Typical Vibration Reference Values (ips)
Auxiliary Feedwater	0.12-0.21
Condensate Transfer*	0.0044-0.0556
Essential Chilled Water*	0.0075-0.0496
Essential Cooling Water*	0.00295-0.0931
Low Pressure Safety Injection*	0.0343-0.319
High Pressure Safety Injection	0.0667-0.296
Containment Spray	0.086-0.141
Spent Fuel Pool Cooling*	0.0295-0.11
Essential Spray Pond*	0.0018-0.0316

*Candidates for "smooth-running" status under PRR-08

2.6.2 Alternative Testing

The licensee proposes:

Vibration parameters that would have reference values $\leq$ 0.05 ips may be considered "smooth-running." The Alert and Required Action values for these parameters will be determined as if their reference value is 0.05 ips; that is, the Alert Range will be > 0.125 ips to 0.3 ips, and the Required Action Range will be >0.3 ips.

In addition to the Code-mandated monitoring, these pumps are monitored under the PVNGS Predictive Maintenance Program. This program includes the following:

Spectrum band monitoring

Bearing acceleration monitoring (on ball and roller bearings only)

Bearing oil analysis (for oil lubricated bearings)

Motor Current Signature analysis (for all but the smallest motors)

If any of these parameters are outside normally expected ranges, an evaluation will be performed and appropriate corrective actions will be taken.

Before being treated as "smooth-running" under this relief request, each candidate pump will be evaluated to verify that testing performed under the provisions of this relief request will not prevent the detection of significant pump degradation.

2.6.3 Evaluation

Overall vibration measurements are required by OM-6 to be taken on all safety-related pumps. Measurements of each pump bearing shall be taken in two orthogonal directions. In addition, vibration in the axial direction shall be taken on each pump thrust bearing. In practice, at least five overall vibration measurement points are performed to comply with the IST on each horizontally mounted safety-related pump. These points are then compared with the Code vibration acceptance criteria to determine if the measured values are acceptable.

Table 3a of OM-6 specifies that if, during an inservice test, the vibration measurement of a particular pump in a particular direction exceeds 2.5 times its reference value established previously, the pump will be considered in the alert range and the frequency of testing will be doubled in accord with paragraph 6.1 until the condition is corrected and the vibration level returns below the alert range. For pumps whose vibration measurement is recorded to be 6 times the reference value, the pump is considered in the required action range and shall be declared inoperable. The vibration reference values are required by the Code to be determined when the pump is in good operating condition.

For pumps where the absolute magnitude of vibration is an order of magnitude below the absolute vibration limits in Table 3a, relatively small increases in vibration magnitude may cause the pump to enter the alert or required action range. These instances may be attributed to variations in flow, instrument accuracy, or other noise sources that would not be associated with degradation of the pump. Pumps that operate in the region are referred to as "smooth-running."

The ASME OM Code Working Group on Pumps has tried numerous times to implement a Code change to establish test requirements for a class of pumps that are defined as smooth-running. These requirements centered on selecting a minimum vibration reference value. All vibration reference values below the minimum vibration specified in the proposed Code change would be assigned the minimum reference value. The Code committees have not reached a consensus on the appropriate minimum reference value and on whether this approach would be sufficient to determine degradation in safety-related pumps. In addition, there has been significant discussion on what other types of pump monitoring activities should be included as compensatory requirements for testing of smooth-running pumps.

Previously, at least one plant has been authorized to use the smooth-running pump methodology similar to the concept described above. The minimum reference value was 0.1 ips. However, this plant experienced significant degradation in a pump bearing that was below the minimum reference value approved in their proposed alternative. Had the current Code requirements been in place, the bearing vibration level would have exceeded the alert range for this pump. The degradation was discovered during vibration monitoring as part of a predictive maintenance program. After this discovery, it was clear to the staff that the simple minimum reference value method alone would not be sufficient to determine pump degradation for smooth-running pumps.

The ASME Code requirements represent the minimum monitoring requirements for safety-related pumps. The staff recognizes that licensees perform a litany of performance monitoring and maintenance activities on rotating machinery at their sites. The staff agrees with the licensee's statement in its basis for requesting relief that plants should not be penalized for maintaining their equipment in excellent mechanical condition. The OM Code committees have attempted to incorporate performance monitoring activities with the minimum reference value concept for smooth-running pumps but could not come to a consensus on the requirements. Some committee members suggested that performance monitoring did not lend itself to be codified.

The licensee's proposal combines both the minimum reference value concept with a commitment to monitor pumps classified as smooth-running in its predictive monitoring program. It states that pumps with vibration reference values below 0.05 ips may be considered smooth-running. The licensee's proposed alert and required action range limits of 0.125 and 0.30 ips, respectively, are consistent with applying the Code vibration multipliers of 2.5 for the alert range and 6.0 for the required action range to the proposed minimum reference value.

The licensee's proposal also describes the predictive monitoring program that is applied to all rotating machinery considered important to safe and reliable plant operation, including all pumps in the IST program. This predictive maintenance program specifies testing activities and test frequencies for each of these pumps. These activities include vibration analysis (i.e.,

spectral analysis), bearing acceleration monitoring, lubricant analysis, and infrared thermographic analysis. Test activities for many pumps also include the pump driver which, in most circumstances, is not currently required by the Code. Test results are documented and trended in controlled plant procedures implementing the predictive maintenance program. Corrective action will be assessed for each test activity performed and would vary from continued monitoring to repair of the problem depending on the degradation trend and if the parameter being measured exceeds an established acceptance criteria.

The licensee did not directly discuss two significant issues related the classification of smooth-running pumps in its proposed alternative. The first issue concerns the actual pump bearing measured directions and whether all directions measured must be below 0.05 ips for a pump to be considered smooth-running. In a phone conversation with the licensee on February 16, 1999, the licensee clarified that its proposed alternative addresses individual pump vibration parameters that are below 0.05 ips. Parameters below this threshold may be considered smooth-running. The staff questioned the technical basis to allow one or more parameters to be classified smooth-running while other pump vibration parameters may have overall vibration parameters well above 0.05 ips. The licensee stated that the design of the entire structure, including pump, pad and baseplate, as well as the supports and piping, may result in one or more directions being significantly stiffer than the other. In addition, vibration sources, such as misalignment, may be prevalent in only one direction. Therefore, the combination of stiffness and vibration contributors may result in one or more measured vibration directions having a significantly less overall vibration measurement than other measured directions on the pump. The staff has noted in its inspection of IST programs at select plants that overall vibration levels may not necessarily be uniform over all measured vibration parameters. Because the purpose of IST is to determine degradation in safety-related components, the proposed alternative should not prohibit the detection of pump degradation. The licensee stated in its proposed alternative testing that the provisions of this relief request will not prevent the detection of significant pump degradation.

The second issue concerns the overall vibration level at which the pump would not be considered smooth-running. The alert and required action limits specified in the relief request sufficiently address acute problems with the pump that were not previously detected. The staff assumes that the intention of the licensee's predictive maintenance program is that problems involving the mechanical condition of the pump would be detected long before the pump reached its overall vibration alert limit. If the pump overall vibration is allowed to degrade such that the vibration level is maintained above 0.05 ips for a significant period of time, although the pump is clearly still operable, the classification of such pump as smooth-running is clearly called into question. In the February 16, 1999, phone conversation, the licensee stated that each parameter would be assessed on an individual basis. However, for vibration parameters above 0.05 ips, that particular parameter would no longer be considered smooth-running. During the February 9, 1999, phone call with the staff, the licensee stated that it would document its approach to both of the staff's concerns in its IST program. A revision of the proposed alternative to include this information will not require additional review by the staff.

The licensee has established reasonable overall vibration levels to consider individual pump parameters as smooth-running. Each pump that has a parameter that is classified as smooth-running will be required to be included in a predictive maintenance program which is controlled, tracked, and trended by plant procedures. All parameters for a pump that is smooth-running will be evaluated in the licensee's predictive maintenance program, whether they are smooth-

running or in excess of the 0.05 ips threshold. Data from the predictive maintenance program will be used to determine degradation and corrective action for smooth-running pumps. The licensee's proposed alternative testing to the Code test frequency requirements of paragraph 5.3 provides a reasonable assurance of operational readiness for the reasons stated above.

The licensee has not provided a basis for relief or proposed alternative testing for establishing reference value requirements of OM-6, paragraph 4.3. Reference values established in accordance with the licensee's proposed alternative would not violate the requirements of paragraph 4.3, as the licensee implies in its basis for relief. When questioned about this aspect of the relief request in the February 16, 1999, phone call, the licensee stated that it had not intended to propose an alternative to the requirements of OM-6, paragraph 4.3. Therefore, the licensee's request for relief from the requirements of paragraph 4.3 is denied.

2.6.4 Conclusion

The proposed alternative from the test frequency and acceptance criteria requirements of OM-6, paragraphs 5.1 and 6.1, respectively, from the pumps listed above is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. The licensee's request for relief from the reference value requirements of paragraph 4.3 is denied.

2.7 Relief Request No. 9 (PRR-09)

The licensee requests relief from the acceptance criteria stated in OM-6, paragraph 6.1 for all pumps in the IST program. The licensee proposes to use the action range requirements of ASME OM Code ISTB-1995, paragraph 6.2.2, "Action Range."

2.7.1 Licensee's Basis for Requesting Relief

The licensee states:

> The 1995 Edition of ASME OM Code provides an alternate concept of corrective action should a pump's performance enter the action required range. Specifically, Paragraph ISTB 6.2.2 permits an analysis of the pump and establishment of new reference values. This can avoid premature maintenance of a pump that is subject to expected continual and gradual deterioration over time while operating at a level where it is fully capable of reliably performing its designated safety function.
>
> By using the test requirements of the 1995 Code edition, PVNGS can reduce the frequency of unnecessary pump maintenance with essentially no adverse [effect] on plant safety since the new Code requirements are equivalent to (or better than) the requirements of the 1988 addenda.
>
> In addition, by expanding this capability to pumps that are in the alert range, frequent and unnecessary testing can be avoided. Note that more frequent testing of pumps is a degrading mechanism for these pumps. This also is

required to avoid unnecessary plant shutdown for pumps that are tested at cold shutdown should a pump enter the alert range during such testing.

2.7.2 Alternative Testing

The licensee proposes:

> In cases where a pump's test parameters fall within either the alert or action required ranges and the pump's continued use at the changed values is supported by an analysis, a new set of reference values may be established. The supporting analysis will include verification of the pump's operational readiness and an evaluation of test data that verifies that the subject pump is not expected to fall below the minimum required performance level in the periods between testing. The analysis will include both pump and system level operational readiness evaluations, description of the cause of the change in pump performance, and an evaluation of the trends indicated by the available test and maintenance data. The results of this analysis will be documented in the record of tests.

2.7.3 Evaluation

The corrective action requirements of ASME Section XI, paragraph IWP-3230(c), allows licensees to perform an analysis to demonstrate that the mechanical or hydraulic performance levels of a pump do not impair pump operability; that is, the pump would still perform its safety function even though test results indicate that degradation is occurring. Further, Section XI allows licensees to establish new reference values after the analysis was performed. OM Part 6 was revised to address the concern that repeated establishment of new reference values would allow the pump to operate in a significantly degraded condition from the original pump reference values, even though it might meet the design-basis flow and pressure requirements of the system. In addition, there were concerns as to the ability of a licensee to perform an analysis of the pump to demonstrate that the pump was operating acceptably, though degraded. This issue is further discussed in NUREG-1482, Section 5.6.

OM-6, paragraph 6.1, "Acceptance Criteria," specifies actions required if any of the measured pump parameters fall within the required action ranges. Entry into a required action range forces the licensee to declare the pump inoperable until the cause of the deviation is determined and the condition corrected. The 1995 Edition of the ASME OM Code, Subsection ISTB 6.2.2, "Action Range," which is not yet endorsed by the NRC, states that "[i]f the measured test parameter values fall within the required action range of ISTB 5.2.1.1, Table ISTB 5.2.1-2, Table ISTB 5.2.2-1, or Table ISTB 5.2.3-1, as applicable, the pump shall be declared inoperable until either the cause of the deviation has been determined and the condition is corrected, or an analysis of the pump is performed and new reference values are established in accordance with Paragraph ISTB 4.6." This allows a pump to be returned to service by establishing new reference values, if the licensee can demonstrate by analysis that the pump is still capable of performing its safety function. The provision recognizes that there are pumps that may have significant margin over the safety requirements and have degraded from their initial performance, but are within the margin of the safety function for flow and differential pressure. Pumps without extra margin could not be returned to service without repairs or replacement. The analysis must justify that the degradation mechanism will not

cause further degradation such that, before the next pump test or before repairs can be performed, the pump would no longer be capable of performing its safety function. This alternative will provide an acceptable level of quality and safety for monitoring the pumps and assuring that the pumps are capable of performing their safety function for flow and differential pressure.

2.7.4 <u>Conclusion</u>

The alternative to use the 1995 Edition of the ASME Code, Section ISTB 6.2.2, for pumps in the required action range is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the acceptable level of quality and safety that will be provided by the alternative.

2.8 <u>Relief Request No. 10 (PRR-10)</u>

The licensee requests relief from the requirements IWA-2400, IWA-2110(a), and IWA-2110(c) and proposes to eliminate all involvement of the Authorized Nuclear Inservice Inspector (ANII) in the development and implementation of the IST Program.

2.8.1 <u>Licensee's Basis for Requesting Relief</u>

The licensee states:

> In the nuclear industry, the Authorized Nuclear Inservice Inspectors (ANIIs) have historically been involved primarily with the development and implementation of the Inservice *Inspection* Program. Involvement with the Inservice Testing Program has been minimal. This is consistent with the experience and training of the individual inspectors, who are well schooled in the areas of plant construction and repair. Recognizing this, ASME recently published the OMb-1997 addenda to the ASME/ANSI OM Code, which includes a change that eliminates all involvement of the ANII in the development and implementation of the Inservice Testing Program.
>
> Each revision of the PVNGS IST Program is subjected to a comprehensive review process including technical reviews, management reviews, and a review under 10 CFR 50.59. In addition, quality assurance evaluations and self-assessments periodically monitor the implementation of the IST Program. These measures, along with the constant attention by highly qualified individuals tasked with program implementation ensure that the previous duties of the inspector are routinely and adequately performed and the intent of the ASME Code is maintained. Thus the proposed alternative testing provides an acceptable level of quality and safety.

2.8.2 <u>Alternative Testing</u>

The licensee proposes:

> The PVNGS Pump and Valve IST Program will be developed and implemented in accordance with applicable regulations, codes, quality assurance requirements, plant procedures, and Authorized Inspection Agency

requirements. ANII involvement with the Pump and Valve IST Program will not be required.

2.8.3 Evaluation

The OM Code requires that test activities be verified by an ANII. It is their duty to verify that the inservice tests required on pumps, valves, and component supports have been completed and the results recorded. ANSI Part N626.1 describes the qualifications and duties for ANIIs that are applicable to Section XI. This part specifically addresses the duties to verify nondestructive tests, welding, heat treatment, and repairs and replacements; but is silent on the responsibilities concerning IST. The licensee proposes to eliminate the involvement of the ANII in the IST Program, stating that the Program is subject to a comprehensive licensee review process and the involvement of the ANII is minimal.

Utilities have a multi-layered review process that performs the same function as the ANII. ANIIs generally do not have the training or background experience to make determinations of the safety function of components in order to verify the scope of the plan, or assess the operational readiness of components based on test results. In the 1997 ASME OMb Code, the requirement for ANII involvement in IST programs has been removed.

The licensee's own review process for the IST Program provides an equivalent, or greater, level of quality and safety as the Code requirements for ANII involvement. Therefore, the staff finds the proposed alternative to be acceptable.

2.8.4 Conclusion

The alternative to develop and implement the PVNGS Pump and Valve IST Program without the involvement of an ANII is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on an acceptable level of quality and safety that will be provided by the alternative.

2.9 Relief Request No. 11 (PRR-11)

The licensee requests relief from the requirements of OM-6 paragraph 5.2(c) for the containment spray (CS) pumps. This section of the Code states that when the system resistance cannot be varied, flow rate and pressure shall be determined and compared to their respective reference value. The licensee proposes to test the pumps at minimum flow conditions during plant operations but not measure the flow rate. During cold shutdown periods, the pumps would be tested at their design flow.

2.9.1 Licensee's Basis for Requesting Relief

The licensee states:

> The containment spray pumps are single stage, vertical pumps normally lined up to the containment spray headers. The "rumble range" of the pumps, where operation is unstable due to flow oscillations, is approximately 1800-2800 gpm. Each CS pump has two possible recirculation flowpaths: a minimum-flow recirculation flowpath with a flow-limiting orifice capable of passing only a small fraction of the design flow, and a larger flowpath used mainly for RWT mixing.

All the flowpaths pass through the flowmeter just downstream of the CS pump discharge. The recirculation flowpaths also pass through a common recirculation line flowmeter. The CS pump discharge flowmeter is an orifice-type analog flowmeter with a range of 0-5000 gpm. The common recirculation line flowmeter is a permanently-mounted ultrasonic flowmeter which has only limited capability. The accuracy of the ultrasonic flowmeter is not sufficient to meet OM-6 accuracy requirements or to be relied upon for determining pump operability.

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 power operation because the CS pumps are unable to develop sufficient discharge pressure to overcome RCS pressure.

The flow rate through the pump discharge flowmeter must be at least 1634 gpm to satisfy the full-scale range requirement of OM-6 para. 4.6.1.2(a). The flow capacity of the minimum-flow recirculation line is well below 1634 gpm. The larger recirculation flowpath is capable of carrying more than 1634 gpm, but routine surveillance testing at flow rates above this 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.

During cold shutdowns, the shutdown cooling flowpath is available for CS pump testing. At design flow, the CS pump discharge flowmeter meets the range requirements of OM-6 para. 4.6.1.1. It also meets the accuracy requirements of OM-6 para. 4.6.1.2. This flowmeter will be used to measure flow during the design flow test.

The CS pumps are standby pumps. Little degradation is expected during power operation. The alternate testing will adequately monitor these pumps to ensure continued operability and availability for accident mitigation.

2.9.2 <u>Alternative Testing</u>

The licensee proposes:

> CS pumps SIA-P03 and SIB-P03 will be tested at mini-flow conditions during plant operation per OM-6 para. 5.2(c), but flow rate will not be measured. SIA-P03 and SIB-P03 will be tested at design flow on a Cold Shutdown frequency. During design flow testing, the flow rate will be measured using instruments whose range and accuracy meet Code requirements, and the Code-required parameters will be measured and evaluated per OM-6 para. 5.2(d).

2.9.3 Evaluation

The CS pumps SIA-P03 and SIB-P03 deliver borated water to the containment spray headers, providing containment cooling and pressure control during accident conditions. The CS pumps can also be lined up to provide flow for shutdown cooling. The Code requires that an inservice test be performed every 3 months and the flow rate and pressure be measured and compared with reference values. The licensee proposes to test the pumps at minimum flow conditions during plant operations, but not measure the flow rate. During refueling outages, they propose to test the pumps at design flow and measure all the Code-required parameters per OM-6 paragraph 5.2(d).

Measuring the CS pumps' flow rate while operating on the minimum-flow recirculation line is not as meaningful a test for pump operability as a full-flow test because the low flow rate may cause excess turbulence and cavitation within the pump and may not provide accurate repeatable information for evaluation of pump degradation. Testing these pumps by utilizing the reactor coolant system (RCS) injection portion of the shutdown cooling flowpath during power operation is not practical because the CS pumps cannot develop sufficient head to inject into the normal operating RCS pressure. The normal containment spray flow path also cannot be used for testing without spraying down the inside of the containment building.

Position 9 of GL 89-04 addresses the issue of pump testing where flow can be established only through a non-instrumented minimum-flow path during quarterly pump testing and a path exists at cold shutdowns or refueling outages to perform a test of the pump under full or substantial flow conditions. The staff has determined that the increased interval is an acceptable alternative to the Code requirements provided that pump differential pressure, flow rate, and bearing vibration measurements are taken during this testing and that quarterly testing measure, as a minimum, pump differential pressure and vibration. The licensee's proposed alternative is consistent with Position 9 of GL 89-04 and will provide reasonable assurance of the pumps' operational readiness.

The licensee also requests relief from the instrument full-scale range requirements of OM-6 paragraph 4.6.1.2(a). However, the licensee states in its basis for requesting relief that during design flow testing, the CS pump discharge flowmeter meets the range requirements of OM-6 paragraph 4.6.1.2(a). Also, in the proposed alternative testing, the licensee states that during design flow testing, the flow rate will be measured using instruments whose range and accuracy meet Code requirements. Therefore, relief from this Code requirement is not needed.

2.9.4 Conclusion

Relief from the requirements of OM-6 paragraph 5.2(c) for the CS pumps is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness. Relief from OM-6 paragraph 4.6.1.2(a) is not needed for the reasons stated above.

3.0 EVALUATION OF VALVE RELIEF REQUESTS

3.1 Relief Request No. 1 (VRR-01)

The licensee requests relief from the exercising and test frequency requirements of OM-10, paragraph 4.3.2, for six check valves in the emergency diesel generator (EDG) system. The licensee proposes to test these valves as part of the EDG skid.

3.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> These check valves were purchased as part of the EDG skid and are mounted on the skid. They are simple check valves with no external means of exercising or for determining disc position. Thus, testing these valves in the open direction requires establishing maximum required accident condition flow through the valve and verifying, by measurement, that the required flow is attained. Due to system design there is no flowpath available with suitable installed instrumentation capable of measuring flow through these valves.
>
> Current plant Technical Specifications require test starting the EDG every 31 days. During testing, each redundant starting subsystem is tested on a rotating basis to ensure that a failure in one starting subsystem is not masked by operation of the other starting subsystem. The EDG must start and attain proper speed, frequency, and voltage within 10 seconds to be considered a successful test. Valve malfunction or degradation will reduce EDG starting and running capability. Therefore testing the EDG is adequate since EDG testing adequately tests these skid-mounted valves.
>
> The provisions of this relief request are consistent with NUREG-1482 section 3.4, and para. ISTC 1.2(c) of OMa-1996.

3.1.2 Alternative Proposed

The licensee proposes:

> These check valves will be tested during periodic EDG testing performed in accordance with plant Technical Specifications. All valves will be tested at least once per quarter. Acceptable valve operation will be verified by successfully meeting the starting and running [Technical Specification] acceptance criteria for the EDG.

3.1.3 Evaluation

The following check valves are on the EDG skid: DGAV317, DGAV318, DGAV364, DGBV417, DGBV418, and DGBV464. These valves open for jacket water and lube oil flow when the EDG is starting or running. The Code requires that these valves be exercised nominally every 3 months to verify obturator travel to the position required to fulfil its safety function. The

licensee proposes to indirectly verify acceptable valve operation by successfully meeting the starting and running acceptance criteria for the EDG.

Often, valves procured as part of larger component subassemblies are not designed to meet the test requirements intended for individual ASME Code Class 1, 2, and 3 components. Such is the case with these valves. Because of this, conformance with the Code-required testing method is impractical.

Section 3.4 of NUREG-1482 addresses the issue of skid-mounted components. The staff has determined that the testing of the major component is an acceptable means for verifying the operational readiness of the skid-mounted and component subassemblies if the licensee documents this approach in the IST Program. The licensee's proposed alternative is consistent with the staff's guidance in NUREG-1482 and provides a reasonable assurance of operational readiness.

3.1.4 Conclusion

Relief from the requirements of OM-10 paragraph 4.3.2 for the six check valves on the EDG skid is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness.

3.2 Relief Request No. 2 (VRR-02)

The licensee requests relief from the power-operated valve stroke testing requirements of OM-10 paragraphs 4.2.1.4(a) and 4.2.1.4(b) for four valves located in the atmospheric dump valve (ADV) actuation system. It is proposed that the operational readiness of these component subassembly valves be verified by the acceptable exercising of the ADV.

3.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> Each ADV has a nitrogen backup system that can be used to actuate the ADV if instrument air is not available. The solenoid valves are simple solenoid-operated valves that automatically open to enable the nitrogen backup system when low pressure is sensed in the instrument air header. There are no hand switches for manual operation of the valves, and no means of visually determining valve position. Stroke timing these valves is not possible without lifting leads or using other intrusive testing equipment, which would render the ADV inoperable for the duration of the test. Therefore, stroke timing these valves is not considered practical.
>
> The solenoid valves have no specific time in which they must actuate to fulfill their safety function. Solenoid valve malfunction or degradation will reduce ADV stroking capability. The ADV must stroke properly within the required

stroke time to be considered a successful test. Testing the ADV is adequate to verify the operational readiness of the solenoid valves.

The provisions of this relief request are consistent with the guidance provided in NUREG-1482, section 3.4 on testing component subassemblies, and with Paragraph ISTC 1.2(c) of OMa-1996.

3.2.2 Alternative Testing

The licensee proposes:

> The ADV nitrogen solenoid valves will be exercised during quarterly testing of the associated ADV nitrogen backup system. The ADV nitrogen solenoid valves will not be individually stroke time tested. Operational readiness of the solenoid valves will be verified by acceptable exercising and stroke timing of the ADV when actuated by the nitrogen backup system.

3.2.3 Evaluation

The valves SGBPV0306A, SGBPV0306B, SGAPV0313A, and SGAPV0313B are normally closed to isolate the normal ADV actuation system (instrument air) from the nitrogen backup system. They open on low instrument air header pressure to supply nitrogen from the accumulators to the ADV. The Code requires that the stroke time of these valves be measured to at least the nearest second. The licensee proposes to indirectly verify operational readiness of these solenoid valves by verifying acceptable exercising and stroke timing of the ADV when actuated by the nitrogen backup system. If the solenoid valves malfunctioned or were degraded, the ADV stroking capability would be reduced. The ADV must stroke properly within the required stroke time for completion of a successful test. This indirect testing of the solenoid valves is adequate to verify their operational readiness.

Often, valves procured as part of larger component subassemblies are not designed to meet the test requirements intended for individual ASME Code Class 1, 2, and 3 components. Such is the case with these valves. Because of this, conformance with the Code-required testing method is impractical.

Section 3.4 of NUREG-1482 addresses the issue of skid-mounted components and component subassemblies. The staff has determined that the testing of the major component is an acceptable means for verifying the operational readiness of the skid-mounted and component subassemblies if the licensee documents this approach in the IST Program. The licensee's proposed alternative is consistent with the staff's guidance in NUREG-1482 and provides a reasonable assurance of operational readiness.

3.2.4 Conclusion

Relief from the requirements of OM-10 paragraph 4.2.1.4 for the ADV nitrogen solenoid valves is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative testing provides reasonable assurance of operational readiness.

3.3 Relief Request No. 3 (VRR-03)

The licensee requests relief from the testing requirements of OM-10 paragraph 4.3.2 for the two nitrogen supply check valves to the essential chilled water expansion tank. The Code requires that each check valve be disassembled every refueling outage. The licensee proposes to disassemble and inspect one of the two nitrogen supply check valves every refueling outage.

3.3.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with the same manufacturer, size, model, materials, orientation, and service conditions. There is no external means of exercising or for determining disc position. It is not practical to verify these valves closed by performing a reverse-flow test, because each of these check valves is installed in series immediately downstream of another check valve The check valve pair has no intermediate test connections or other provisions for verifying that the valve being tested is closed.
>
> Disassembling and inspecting each valve every refueling outage is burdensome because the valve cannot be isolated from the associated EC [essential chilled water] expansion tank. The expansion tank must be depressurized and vented to disassemble the valve, which renders the entire train of EC inoperable for an extended period of time. The EC system provides cooling for the LPSI pump rooms, and other cooling functions which are required during refueling outages. Extended outages of both EC trains during every refueling outage would be a hardship because refueling outages are scheduled on a train basis, i.e. one safety train is out of service for most of the outage and the work done on the other train is minimized. The outage train is alternated from one outage to the next. Inspecting the check valve on the non-outage train would have a major impact on scheduling that could extend the duration of the outage. One inspection each refueling outage will allow the ECAV043 to be inspected during "A-train" outages and ECBV064 to be inspected during "B-train" outages.

3.3.2 Alternative Testing

The licensee proposes:

> During each reactor refueling outage, at least one of these valves will be disassembled, inspected, and manually exercised closed on a rotating schedule. If the disassembled valve is not capable of closing or there is binding or failure of valve internals, the other valve in that group will also be disassembled, inspected, and manually full-stroke exercised during the same outage.

3.3.3 Evaluation

The valves for which relief is requested, ECAV043 and ECBV064, open to provide flowpaths from the plant service nitrogen header to the associated essential chilled water expansion tank. They close to ensure that inventory is preserved and overpressure is maintained in the EC expansion tank. OM-10 paragraph 4.3.2 requires that the check valves be exercised nominally every 3 months. As an alternative to the testing, the Code allows disassembly every refueling outage to determine operability of the valves (OM-10 paragraph 4.3.2.4(c)). Instead, the licensee proposes to disassemble, inspect, and manually exercise one of two valves every refueling outage. The valve to be examined will alternate every refueling outage.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. This approach is appropriate for instances where the licensee has determined that it is burdensome to disassemble and inspect all applicable valves each refueling outage.

As stated in the licensee's basis for relief, disassembling and inspecting each valve every refueling outage is burdensome because the valve cannot be isolated from the associated EC expansion tank. Testing in accordance with the Code would render the entire train of EC inoperable for an extended period of time. The EC system is necessary for cooling the low pressure safety injection pump room and other cooling functions which are required during refueling outages.

The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions including valve orientation. Additionally, at each disassembly the licensee must verify that the disassembled valve is capable of full-stroking and that the internals of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The licensee's proposed alternative is consistent with the guidelines provided in Appendix A of NUREG-1482 and therefore provides an acceptable level of quality and safety.

3.3.4 Conclusion

The proposed alternative to the requirements of OM-10 paragraphs 4.3.2 and 4.3.2.4(c) is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

3.4 Relief Request No. 4 (VRR-04)

The licensee requests relief from the testing requirements of OM-10 paragraphs 4.3.2.2 and 4.3.2.4(c) for the six safety injection room floor drain check valves. The Code requires that each check valve be disassembled every refueling outage. The licensee proposes to disassemble and inspect three of the six check valves every fuel cycle.

3.4.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external provision for exercising or for determining disc position. The only method of exercising open and closed are by flow testing, or by disassembly and inspection. Due to the system configuration, forward and reverse flow testing measurements are impractical.
>
> All six of these valves are identical with respect to manufacturer, size, model, orientation, and service conditions. Numerous previous inspections have not found any evidence of valve degradation that would affect their ability to open or close.
>
> Since the frequency for disassembling and inspecting these valves in the floor drain system is not determined by refueling outages, inspection may be performed on a schedule that does not conform to a refueling outage schedule, such as during power operation. This is allowed as discussed in NUREG 1482, Appendix A, Question Group 14, under "Current Considerations."
>
> GL 89-04 Position 2 allows a sample disassembly and inspection plan to be implemented where the licensee determines that it is burdensome to disassemble and inspect all applicable valves during each refueling outage. Although these valves are not especially difficult to access, disassemble or inspect, inspecting every valve in the group each fuel cycle is burdensome in that it creates a hardship without a compensating increase in the level of quality and safety.
>
> The proposed sample disassembly schedule results in each valve being disassembled and inspected every 3 years. It is noted that this is half of the maximum inspection interval of 6 years recommended under Position 2. The proposed inspection frequency is adequate for assuring continued reliability and operational readiness of these valves.

3.4.2 Alternative Testing

The licensee proposes:

> Each fuel cycle, at least 3 of these valves (on a rotating schedule) will be disassembled, inspected, and manually full-stroke exercised. If, during inspection, it is discovered that a valve is incapable of performing its required functions, then the remaining valves will be disassembled, inspected, and

manually full-stroke exercised during the same refueling outage (if the inspection is performed during a refueling outage) or within 96 hours after the subject valve is returned to service (if the inspection is performed at other times).

3.4.3 Evaluation

The check valves for which relief is requested are associated with either the CS pump, HPSI pump, or LPSI pump room floor drain system. The valves open to allow floor drain flow from the respective pump room to the associated engineered safety feature sump. They close to prevent back-flooding from the sump to the pump rooms. The Code requires that each valve be examined in a manner that verifies obturator travel to the position required to fulfill its safety function (OM-10 paragraph 4.3.2.2). As an alternative, the Code allows disassembly of check valves every refueling outage to verify operability (OM-10 paragraph 4.3.2.4(c)). Instead, the licensee proposes to disassemble, inspect, and manually full-stroke exercise at least three of the six valves each fuel cycle.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. This approach is appropriate for instances where the licensee has determined that it is burdensome to disassemble and inspect all applicable valves each refueling outage.

The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions including valve orientation. Additionally, at each disassembly the licensee must verify that the disassembled valve is capable of full-stroking and that the internals of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The licensee has determined that it is practical to disassemble and inspect the valves at a frequency independent from refueling outages. As stated in NUREG-1482, Appendix A, Question Group 14, the staff finds this to be acceptable.

The licensee's proposed alternative is consistent with the guidelines provided in Appendix A of NUREG-1482 and therefore provides an acceptable level of quality and safety.

3.4.4 Conclusion

The proposed alternative to the requirements of OM-10 paragraphs 4.3.2.2 and 4.3.2.4(c) is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

3.5 Relief Request No. 5 (VRR-05)

The licensee requests relief from the testing requirements of OM-10 paragraph 4.3.2.2(a) for the downcomer feedwater check valves to the steam generators (SGEV642, SGEV652, SGEV653, and SGEV693). The Code requires that each check valve be exercised in a way that verifies obturator travel to its required position. The licensee proposes to verify closure of the valves by performing a reverse-flow test on the series combination of valves at cold shutdown.

3.5.1 Licensee's Basis for Requesting Relief

The licensee states:

> In order to test these valves to the closed position, flow through the associated feedwater header must be secured. During power operations, isolation of a feedwater header would require a significant power reduction and could result in unacceptable steam generator level transients with the potential for a plant trip.
>
> These are simple check valves with no external means of exercising nor for determining disk position. Attempts to verify closure by non-intrusive testing have been inconsistent. Consequently, the only practical method for determining disk position is by performing a reverse-flow test, however, these check valves are installed with each pair in series with no intermediate test connections or other provisions for verifying that each individual valve is closed.
>
> Both valves are designated as ISI Class 2, and are subject to the same ISI and quality assurance requirements. Note that only one of these valves needs to close to provide the required isolation function.

3.5.2 Alternative Testing

The licensee proposes:

> These valves will be verified to close by performing a reverse-flow test on the series combination of valves at cold shutdown. In the event that both valves fail to close, the combination will be declared inoperable and corrective actions will be taken for both valves, as necessary.

3.5.3 Evaluation

The valves in question are downcomer feedwater inboard and outboard check valves to the steam generators. These valves are normally open during power operation to provide flow paths for feedwater flow to the steam generators. Their safety function is to close to isolate and maintain the integrity of the steam generators and to prevent diversion of auxiliary feedwater flow from the associated steam generator to the nonsafety-grade main feedwater system.

OM-10 paragraph 4.3.2.2(a) requires that during plant operation, each check valve shall be exercised or examined in a manner that verifies obturator travel to the closed, full-open, or partially open position required to fulfill its function. However, these check valves are in series

and the licensee has no practical means for verifying the ability of each valve in the series to close. They are simple check valves with no external means of exercising nor for determining disc position.

A reverse-flow test on the series combination of valves is proposed as an alternative to the Code. Performing a test to demonstrate that the pair of valves is capable of closing complies with the guidance contained in NUREG-1482, paragraph 4.1.1, since only one of the valves in series needs to close to perform its safety function.

The Code also requires that the test be performed during power operation. However, in order to test these valves, flow through the associated feedwater header must be secured. Doing this would require a significant power reduction and could result in steam generator level transients with the potential for a plant trip. The Code allows testing that is impractical at power operation to be deferred to cold shutdown. Performing the reverse-flow test on the series combination of valves at cold shutdown provides a reasonable assurance of operational readiness.

3.5.4 Conclusion

Relief is granted from the requirements of OM-10 paragraph 4.3.2.2(a) for SGEV642, SGEV652, SGEV653, and SGEV693, pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative method of reverse-flow testing the check valves provides reasonable assurance of operational readiness.

3.6 Relief Request No. 6 (VRR-06)

The licensee requests relief from the testing requirements of OM-10 paragraph 4.3.2.4(c) for check valves SIAV164 and SIBV165, which open to provide flowpaths from the CS pump discharge headers to the containment spray headers. The Code requires that each check valve be dissembled every refueling outage to determine operability. The licensee proposes to disassemble one of the two CS check valves every refueling outage.

3.6.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external means of exercising or determining disc position. The only method for exercising to the full open position requires establishing accident flow through each valve. Since no recirculation flowpath exists downstream of these valves, the only flowpath available for such a test would result in injecting radioactive-contaminated borated water into the containment spray headers and into the containment building via the spray nozzles. Dousing personnel and equipment in this manner is clearly undesirable.
>
> Since these are simple check valves, they can only be verified closed by developing a differential pressure across the valves['] disc and measuring

reverse flow. To perform such a test requires entry into the primary containment, installation of a closure flange and performance of a local leakrate test. This evolution is beyond the scope of work performed during typical cold shutdown (non-refueling) outages. Note also that with the implementation of Appendix J Option B, these valves may be leak tested at intervals exceeding two years and each fuel cycle.

Per NUREG-1482, Appendix A, Question Group 24, closure testing of these valves requires each valve be opened and then confirmed to close. As discussed above, exercising in the open direction is not practical except by disassembly. In these cases these valves will be verified to be closed, however the testing will not include prior opening.

Each of these valves has been disassembled and inspected at least twice in the past and they have not displayed any indication of degradation that would impede their capability to perform their safety functions to open or close. These valves are identical with the same manufacturer, size, model designation, orientation, and service conditions.

3.6.2 Alternative Testing

The licensee proposes:

During each reactor refueling outage at least one of these valves will be disassembled, inspected, and manually exercised on a sequential and rotating schedule. If, in the course of this inspection a valve is found to be inoperable with respect to its function to fully open, then the other valve will be inspected during the same outage.

Each of these valves will be leakrate tested

- Following re-assembly after inspection, and
- On a schedule consistent with the Appendix J Containment Leak Rate Testing Program.

3.6.3 Evaluation

The valves for which relief is requested, SIAV164 and SIBV165, open to provide flowpaths from the CS pump discharge headers to the CS headers. They close for containment isolation. The Code requires that each valve be exercised nominally every 3 months (OM-10 paragraph 4.3.2). As an alternative, the Code allows disassembly of check valves every refueling outage to verify operability (OM-10 paragraph 4.3.2.4(c)). Instead, the licensee proposes to disassemble, inspect, and manually full-stroke exercise one of the two valves on a sequential and rotating refueling outage schedule.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. This approach is appropriate for instances where the licensee has determined that it is burdensome to disassemble and inspect all applicable valves each refueling outage. The licensee has

disassembled and inspected each of these valves at least twice in the past and there has been no indication of degradation that would impede their capability to perform their safety functions. It is burdensome for the licensee to inspect all valves in this group every refueling outage in that it creates a hardship without a compensating increase in the level of quality and safety.

The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions including valve orientation. Additionally, at each disassembly the licensee must verify that the disassembled valve is capable of full-stroking and that the internals of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The licensee's proposed alternative is consistent with the guidelines provided in Appendix A of NUREG-1482 and therefore provides an acceptable level of quality.

3.6.4 Conclusion

The proposed alternative to the requirements of OM-10 paragraph 4.3.2.4(c) is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements of this section would result in hardship or unusual difficulty without an a compensating increase in the level of quality and safety.

3.7 Relief Request No. 7 (VRR-07)

The licensee requests relief from the testing requirements of OM-10 paragraph 4.3.2.4(c) for the two containment sump discharge check valves. The Code requires disassembly of the check valves every refueling outage to determine operability. The licensee proposes to inspect one valve during an outage, the other valve during the next outage, and then skip two outages before the cycle is repeated.

3.7.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are 24" simple check valves with no external means of exercising or determining obturator position. The valves are identical with the same manufacturer, size, model designation, orientation, and service conditions.
>
> Exercising with system flow is not practical since there is no water inventory available in the containment sump. Flooding the sump for such a test is undesirable and impractical since it would have the potential for upsetting the

chemistry of the RCS by introducing contaminants into the safety injection system.

Partial stroking of the valves could be achieved at any plant condition (at power or shutdown) by pressurizing the upstream piping with air or nitrogen via the air test connection. This is not considered practical because of the potential for creating an airborne contamination personnel hazard in the auxiliary and containment buildings. Note also that such a test would be of little value in verifying valve operational readiness.

Disassembly of these large valves is difficult and consumes a considerable amount of plant resources. Therefore, these valves were placed in a rotating disassembly and inspection program during the first IST interval, where a different valve was inspected during each refueling outage. Now that experience has been gained with these valves, sufficient justification exists to extend the inspection interval.

The new inspection schedule would inspect one valve during an outage, the other valve during the next outage, and then skip two outages before the cycle is repeated. Under the proposed schedule, each valve would be inspected once every 6 years, same as if the interval were simply doubled so that one valve were inspected every other refueling outage. Doubling the interval is not practical because refueling outages are scheduled on a train basis, i.e. one safety train is out of service for most of the outage and the work done on the other train is minimized. The outage train is alternated from one outage to the next. Inspecting one valve every other refueling outage would result in performing all the inspections either in "A" train outages or "B" train outages. Performing this inspection on the non-outage train would have a major impact on scheduling that could extend the duration of the outage.

The proposed schedule is acceptable for the following reasons:

- All 6 valves (2 in each unit) have been disassembled and inspected at least twice during the first IST interval. The condition of each valve and the valve's capability to be full-stroked is documented in detail in the applicable surveillance test packages and work orders. All the inspections satisfactorily demonstrated the ability of the valves to stroke fully. Only one inspection found any kind of abnormality: When 3SIAV205 was inspected in 1994, a brown rust-like coating was found on the swing arm. Although this coating did not interfere with the operation of the valve, it did inhibit a complete visual inspection of the swing arm as required by site procedures. After evaluation the foreign material was removed and the inspection was completed.

- Industry experience, including a number of NPRDS reports, were reviewed to determine if there were any known check valve failures for similar applications. The review identified 7 cases of

bonnet gasket leakage, but no material or functional failures affecting the ability of the check valve to function.

- The installation of the valves has been reviewed as part of the PVNGS check valve program, which was developed in response to INPO SOER 86-03. Although the location of the valves does not meet the EPRI criteria regarding upstream flow disturbances, i.e. elbows and tees within 5 pipe diameters or pumps and valve within 10 pipe diameters, the evaluation determined that these criteria are not applicable because these valves are normally not subjected to flow.

- Stress corrosion cracking of the swing arm or hinge pin are not significant concerns because these parts have been heat treated to reduce their susceptibility to these phenomena.

- The proposed test schedule retains the benefits of a sampling inspection program, even though the intervals between inspections are not equal. As stated above, all the containment sump check valves have been inspected at least twice, and no problem or defect affecting operational readiness has ever been found. The valves are not exercised except during testing or an emergency, so excessive wear between inspections is not a concern. The valves are installed in a clean system, so silting or excessive corrosion from sitting idle during the test interval are not concerns either. Because of the reliability of the valves, both predicted and demonstrated, it is unlikely that the benefits of continuing to perform a sample disassembly every refueling outage would ever be realized. Therefore it is concluded that the loss of benefits of sampling is minimal.

- In order to assess the impact on plant safety of implementing the proposed inspection schedule, the change was evaluated from a probabilistic risk perspective. This study determined that the increase in core damage frequency is on the order of 9.0E-08/yr, representing a 0.190% increase. However, this study did not account for fewer inspections decreasing the chance of the valve being reassembled incorrectly. The aggregate effect of the schedule change is very little, if any, impact on plant safety.

- The radiation exposure received during disassembly and inspection of one of these valves is approximately 0.5 man-rem. With 3 units on the proposed inspection schedule, PVNGS would save an average of 0.5 man-rem per year. Although a small percentage of the annual site exposure, it is still a significant dose savings.

- It costs approximately $10,000 to disassemble and inspect one of these valves. Again, although a $10,000 savings per year is not a major impact on the site budget, it is still a significant amount.

This justification shows that the proposed schedule for disassembly and inspection meets all the criteria given in NUREG-1482 Appendix A Position 2 for extending the interval. The proposed disassembly and inspection schedule provides an acceptable level of quality and safety.

3.7.2 Alternative Testing

The licensee proposes:

> One valve will be disassembled, inspected, and full-stroke exercised during a refueling outage, and the other valve during the next refueling outage. If both inspections are satisfactory, no inspections will be performed during the following two outages. The inspection cycle will then be repeated, starting with the first valve inspected.
>
> If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the other valve will also be disassembled, inspected, and full-stroke exercised during the same outage. The inspection intervals will be evaluated and reduced as necessary to ensure continued operational readiness of all valves in the group.

3.7.3 Evaluation

The containment sump discharge check valves, SIAV205 and SIBV206, open to provide flowpaths from the containment sump to the containment spray and safety injection pumps during post-accident recirculation cooling. OM-10 requires that they be exercised every 3 months, except as provided by paragraphs 4.3.2.2, 4.3.2.3, 4.3.2.4, and 4.3.2.5. As an alternative to quarterly testing, the Code allows disassembly every refueling outage to determine operability (OM-10 paragraph 4.3.2.4(c)).

NUREG-1482, Appendix A, Position 2, states that where a licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed. A different valve in each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. Once this is completed, the sequence of disassembly must be repeated. Extension of the valve disassembly and inspection interval should be considered only in cases of extreme hardship.

Examples of extreme hardship are provided in Question Group 19 in Appendix A of NUREG-1482. They include the need to offload the reactor core or to operate at mid-level of the reactor coolant loop. The basis for relief given by the licensee does not provide sufficient justification for extreme hardship. Therefore, relief is denied.

3.7.4 Conclusion

The alternative proposed in VRR-07 is denied since the licensee has not shown that relief is warranted pursuant to 10 CFR 50.55a(f)(6)(i), or otherwise proposed an acceptable alternative pursuant to 50.55a(a)(3)(i) or (a)(3)(ii).

3.8 Relief Request No. 8 VRR-08

The licensee requests relief from the requirements of OM-10 paragraph 4.3.2 for 16 safety injection check valves. The Code requires that check valves be exercised nominally every 3 months with several exceptions. The licensee proposes to perform leak-rate testing in accordance with the Technical Specifications (TSs).

3.8.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external means of exercising nor for determining disc position. The only practical means of verifying closure is by performing a leakage or back flow test. This typically involves a considerable effort with the test connections and valves required for the test alignment in radiation areas with inconvenient access provisions.
>
> Leak testing to verify the closure capability of these valves is primarily for the purpose of confirming their capability of preventing over-pressurization of the related safety injection piping and components. In this regard, the Palo Verde Technical Specifications address the valve test frequency in a manner appropriate for these valves. Technical Specifications (SR 3.4.15.1) requires verifying that the leakage of each valve is within its limit at least once per 18 months, and prior to entering MODE 2 whenever the plant has been in MODE 5 for 7 days or more, if leakage testing has not been performed in the previous 9 months, except for SDC PIVs, and within 24 hours following valve actuation due to automatic or manual action or flow through the valve, except for SDC PIVs. Performing leak testing as prescribed in the Technical Specifications is adequate to ensure proper and reliable closure of these valves.

3.8.2 Alternative Testing

The licensee proposes to demonstrate the closure capability of these check valves by performing leak-rate testing in accordance with applicable TS requirements.

3.8.3 Evaluation

The licensee has requested relief from OM-10 paragraph 4.3.2 for 16 check valves in the safety injection system. The valves include four safety injection tank discharge check valves, four safety injection check valves, four safety injection header check valves, and four high pressure safety injection long-term recirculation check valves. The Code requires that these valves be exercised every 3 months, except where it is impractical to exercise at power operation or cold shutdown. In these cases, the Code allows full-stroke exercising or disassembly during

refueling outages. The licensee's proposed alternative is to verify closure of the valves by performing leak-rate testing in accordance with TS Surveillance Requirement 3.4.15.1. As stated during the conference call held on February 26, 1999, relief is requested only for the performance of closure testing. Open exercising of the valves will be performed in accordance with Code requirements.

Position 4 of GL 89-04 discusses concerns with the adequacy of testing pressure isolation valves and states that TS leak-rate testing meets the intent of OM-10 paragraph 4.2.2.3 if each pressure isolation valve is individually leak tested (or the measured leakage adjusted) in accordance with the differential pressure requirements of the Code. If the TSs are not detailed enough to ensure individual valve leak testing, the licensee is responsible to ensure that the test procedures are themselves adequate for individual valve leak testing. The staff has reviewed the applicable section of the PVNGS TSs and concludes that each check valve will be individually tested.

Since the valves have no external means of exercising or a way to determine disc position, the only practical means of verifying closure is by performing a leakage or back flow test. As stated in NUREG-1482 Section 4.1.4, leak-rate testing generally necessitates that certain systems needed for plant operation be taken out of service for extended periods. Because of this, and also the installation and removal of test equipment, the staff has determined that it is impractical to perform leak-rate testing quarterly. The licensee's alternative of performing leak-rate testing on the valves in accordance with TS requirements provides a reasonable assurance of the valves' operational readiness.

3.8.4 Conclusion

Relief from the requirements of OM-10 paragraph 4.3.2 for 16 check valves in the safety injection system is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticality of complying with the Code. The relief 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 alternative method of performing leak-rate testing on the valves in accordance with TS requirements provides reasonable assurance of the valves' operational readiness.

3.9 Relief Request No. 9 (VRR-09)

The licensee requests relief from the temperature stability requirements of OM-1 paragraphs 8.1.2.4 and 8.1.3.4 for all safety and relief valves that are tested under ambient conditions using a test medium at ambient conditions.

3.9.1 Licensee's Basis for Requesting Relief

The licensee states:

> This is a generic request for relief for all safety and relief valves tested under ambient conditions using a test medium at ambient conditions. For valves tested under normal prevailing ambient conditions with test medium at approximately the same temperature, the requirements for verifying temperature stability is

inappropriate and of no value. There is little or no consequence of minor variations in ambient temperature.

This issue has been identified by the ASME OM Code Committees and is reflected in the 1995 version of the Code, Paragraphs I 8.1.2(d) and I 8.1.3(d).

3.9.2 Alternative Testing

The licensee proposes:

For safety and relief valves tested under ambient conditions using a test medium at ambient conditions, the valve body temperature will be measured and recorded prior to each series of tests (which may consist of multiple lifts) but there will be no verification of attaining thermal equilibrium.

3.9.3 Evaluation

The safety and relief valves function to provide overpressure protection to their associated systems. The Code, OM-1 paragraphs 8.1.2.4 and 8.1.3.4, requires that temperature stability be achieved prior to starting set pressure testing. It states that the test method shall be such that the temperature of the valve body shall be known and stabilized before commencing set pressure testing, with no change in measured temperature of more than 10°F in 30 minutes.

In the 1995 Edition of the OM Code, paragraphs I.8.1.2(d) and I.8.1.3(d), there are modifications to the requirement that say that verification of thermal equilibrium is not required for valves that are tested at ambient temperatures using a test medium at ambient temperatures. In the licensee's proposed alternative, there would be no verification of attaining thermal equilibrium prior to commencing set testing. As discussed in a conference call on September 17, 1998, the valve manufacturer provided the licensee a correlation for valves at higher than ambient temperature service.

This alternative test method is consistent with the 1995 Code requirements and will provide an acceptable level of quality and safety. The staff finds this method to be acceptable in that it offers equivalent protection as provided by OM-1 paragraphs 8.1.2.4 and 8.1.3.4.

3.9.4 Conclusion

Use of the 1995 Edition of ASME OM Code, paragraphs I.8.1.2(d) and I.8.1.3(d), for all safety and relief valves that are tested under ambient conditions using a test medium at ambient conditions, is authorized pursuant to 10 CFR 50.55a(a)(3)(i). This alternative provides an acceptable level of quality and safety.

3.10 Relief Request No. 10 (VRR-10)

The licensee requests relief from the accumulator volume requirements of OM-1, paragraph 8.1.2.2 for all Class 2 and 3 safety and relief valves used for compressible fluid services other than steam. The proposed alternative is to use the 1995 OM Code, Appendix I, paragraph 8.1.2 requirements.

3.10.1 <u>Licensee's Basis for Requesting Relief</u>

The licensee states:

> This is a generic request for relief for all Class 2 and 3 safety and relief valves used for compressible fluid services other than steam. The accumulator volume required by OM-1 para. 8.1.2.2 is not needed for determination of the set pressure for these valves. This has been recognized by the ASME Code Committee and reflected in more recent versions of the OM Code.

3.10.2 <u>Alternative Testing</u>

The licensee proposes:

> The volume of the accumulator drum and the pressure source flow rate shall be sufficient to determine the valve set-pressure. (Ref. ASME OM Code-1995, para. I 8.1.2)

3.10.3 <u>Evaluation</u>

This is a general relief request for all Class 2 and Class 3 safety and relief valves used for compressible fluid services other than steam. The function of safety and relief valves is to provide overpressure protection to the systems to which they are associated. The Code, OM-1 paragraph 8.1.2.2, requires that a minimum accumulator volume, below the valve inlet, be calculated by multiplying the valve capacity by the time needed to open and dividing by 10.

More recent editions of the Code eliminate the need to calculate a minimum accumulator volume. ASME OM Code-1995, Appendix I, paragraph 8.1.2(b), states that the volume of the accumulator drum and pressure source flow rate shall be sufficient to determine the valve set pressure. The licensee proposes to use this alternative testing method.

As long as the setpoint is successfully determined in a manner that does not damage the valve, it is not necessary to specify a minimum size accumulator volume. Therefore, the staff finds this alternative method to be acceptable because it provides an adequate method to establish the setpoint of the relief valve that is equivalent to that provided by ASME OM-1 Code-1987, paragraph 8.1.2.2. The proposed alternative provides an acceptable level of quality and safety.

3.10.4 <u>Conclusion</u>

Use of the 1995 Edition of ASME OM Appendix I, paragraph 8.1.2(b), for all Class 2 and 3 safety and relief valves used for compressible fluid service, other than steam, is authorized pursuant to 10 CFR 50.55a(a)(3)(i). This alternative method provides an acceptable level of quality and safety.

3.11 <u>Relief Request No. 11 (VRR-11)</u>

The licensee requests relief from the requirements IWA-2400, IWA-2110(a), and IWA-2110(c) and proposes to eliminate all involvement of the Authorized Nuclear Inservice Inspector (ANII) in the development and implementation of the IST Program.

3.11.1 Licensee's Basis for Requesting Relief

The licensee states:

> In the nuclear industry, the Authorized Nuclear Inservice Inspectors (ANIIs) have historically been involved primarily with the development and implementation of the Inservice *Inspection* Program. Involvement with the Inservice Testing Program has been minimal. This is consistent with the experience and training of the individual inspectors, who are well schooled in the areas of plant construction and repair. Recognizing this, ASME recently published the OMb-1997 addenda to the ASME/ANSI OM Code, which includes a change that eliminates all involvement of the ANII in the development and implementation of the Inservice Testing Program.
>
> Each revision of the PVNGS IST Program is subjected to a comprehensive review process including technical reviews, management reviews, and a review under 10 CFR 50.59. In addition, quality assurance evaluations and self-assessments periodically monitor the implementation of the IST Program. These measures, along with the constant attention by highly-qualified individuals tasked with program implementation ensure that the previous duties of the inspector are routinely and adequately performed and the intent of the ASME Code is maintained. Thus the proposed alternative testing provides an acceptable level of quality and safety.

3.11.2 Alternative Testing

The licensee proposes:

> The PVNGS Pump and Valve IST Program will be developed and implemented in accordance with applicable regulations, codes, quality assurance requirements, plant procedures, and Authorized Inspection Agency requirements. ANII involvement with the Pump and Valve IST Program will not be required.

3.11.3 Evaluation

The OM Code requires that test activities be verified by an ANII. It is their duty to verify that the inservice tests required on pumps, valves, and component supports have been completed and the results recorded. ANSI Part N626.1 describes the qualifications and duties for ANIIs which are applicable to Section XI. This part specifically addresses the duties to verify nondestructive tests, welding, heat treatment, and repairs and replacements; but is silent on the responsibilities concerning IST. The licensee proposes to eliminate the involvement of the ANII in the IST Program, stating that the program is subject to a comprehensive licensee review process and the involvement of the ANII is minimal.

Utilities have a multi-layered review process that performs the same function as the ANII. ANIIs generally do not have the training or background experience to make determinations of the safety function of components in order to verify the scope of the plan, or assess the operational

readiness of components based on test results. In the 1997 ASME OMb Code, the requirement for ANII involvement in IST programs has been removed.

The licensee's own review process for the IST Program provides an equivalent, or greater, level of quality and safety as the Code requirements for ANII involvement. Therefore, the staff finds the proposed alternative to be acceptable.

3.11.4 Conclusion

The alternative to develop and implement the PVNGS Pump and Valve IST Program without the involvement of an ANII is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on an acceptable level of quality and safety that will be provided by the alternative.

3.12 Valve Relief Request No. 12 (VRR-12)

The licensee requests relief from the test requirements of OM-10 paragraphs 4.1 and 4.2.1 for motor-operated valves (MOVs) in its IST program. The licensee proposes as an alternative to use the program described in ASME Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants, OM Code-1995, Subsection ISTC," with certain limitations, exceptions, and clarifications.

3.12.1 Licensee's Basis for Requesting Relief

The licensee provided the following basis for the relief request:

> The industry has long recognized the limitations of using stroke-time testing as a means of monitoring the operational readiness of MOVs. After nuclear power plant experience, valve performance problems, and MOV research revealed that the focus of the ASME Code on stroke time and leak-rate testing for MOVs was not sufficient, the NRC issued Generic Letters 89-10 and 96-05. GL 89-10 requested licensees to ensure the capability of MOVs in safety-related systems to perform their intended functions by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and trending MOV problems. GL 96-05 requested licensees to establish a program, or to ensure the effectiveness of their current programs, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions.
>
> The PVNGS MOV Program was developed as part of the response to GLs 89-10 and 96-05. This program, which includes both periodic testing and preventive maintenance elements, complies with the [recommendations] of GL 89-10. The [recommendations] of GL 96-05 are being implemented as described in the response to GL 96-05.
>
> All MOVs in the PVNGS IST Program are included in the PVNGS MOV Program. The periodic verification and preventive maintenance activities performed under the PVNGS MOV Program, together with the other testing performed on these

valves in the IST Program, provide adequate assurance of MOV operational readiness. The additional assurance of operational readiness provided by continuing traditional IST exercising and stroke time testing is negligible. Thus, the testing proposed by this relief request provides an acceptable level of quality and safety.

3.12.2 Alternative Testing

The licensee proposes the following alternative testing:

Motor-operator valve (MOV) testing may be conducted in accordance with requirements of ASME OM Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants, OM Code-1995 Edition, Subsection ISTC," with the following limitations:

1. The potential benefits (such as identification of decreased thrust output and increased thrust requirements) and potential adverse effects (such as accelerated aging or valve damage) will be considered when determining the appropriate testing for each MOV.

2. Where the selected test interval extends beyond 6 years or 4 refueling outages (whichever is longer), performance and test experience will be evaluated to justify the periodic verification interval. Test intervals will not exceed 10 years.

In addition the following exceptions/clarifications are necessary:

3. In order to maintain consistency and compatibility with the Joint Owners Group (JOG) MOV Periodic Verification Program, "functional margin" will be redefined as follows to agree with the definition of "margin" as used in Topical Report MPR-1807 (Joint BWR, Westinghouse, and Combustion Engineering Owners' Group Program on Motor-Operated Valve Periodic Verification, Topical Report MPR-1807, Revision 2, July 1997).

$$\text{Margin} = \frac{\text{(Adjusted Actuator Output Thrust/Torque)} - \text{(Adjusted Required Thrust/Torque)}}{\text{Adjusted Required Thrust/Torque}}$$

The terms "functional margin" and "margin" are used synonymously in the PVNGS MOV Program.

4. OMN-1 section 3.3(b) states that inservice tests will be conducted in the as-found condition. At PVNGS, as-found testing will be performed prior to preventive maintenance (PM) when scheduled during the same refueling outage. Regularly scheduled PM activities, such as for stem lubrication, will continue to be performed on a periodic basis to ensure that the MOV is maintained in optimum working condition.

In some cases, as-found testing may be waived if a modification or some other circumstance creates the condition where MOV trending will be re-baselined and the results of the as-found testing will no longer apply to future operation of the MOV. In all cases, the technical justification is documented with the appropriate management approvals in accordance with station procedures.

Section (c) states that the inservice testing program consists of a mix of static and dynamic testing. PVNGS is participating in the Joint Owners Group (JOG) MOV Periodic Verification Program, and the results of this program will be used to determine the need for and frequency of continued dynamic testing. For MOVs at PVNGS not included in the scope of the JOG program, site specific information will be used to justify the necessity for and frequency of continued dynamic testing. Station Procedures currently contain the requirements to determine when Dynamic testing is required following valve modifications and this guidance is in accordance with Generic Letter 89-10 [recommendations].

3.12.3 Evaluation

The Code specifies the performance of stroke-time testing of MOVs at quarterly intervals as part of the requirements for IST programs established under 10 CFR 50.55a. In response to concerns regarding MOV performance in nuclear power plants, the NRC staff issued GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," in June 1989 to request that licensees verify the design-basis capability of their safety-related MOVs by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design-basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and trending MOV problems. In GL 89-10, the NRC staff noted the benefits of stroke-time testing of MOVs (such as valve exercising and providing a limited measure of on-demand reliability) but stated that such testing alone is not sufficient to provide assurance of MOV operability under design-basis conditions.

With recognition of the weakness in information provided by quarterly MOV stroke-time testing, the ASME developed Code Case OMN-1 as an acceptable alternative program of exercising and diagnostic testing to provide continuing assurance of the capability of MOVs to perform their safety functions. In particular, OMN-1 specifies exercising of MOVs at least once a year or every refueling cycle (whichever is longer) to verify electrical continuity and to provide internal lubrication. Further, OMN-1 specifies periodic diagnostic testing of MOVs (including a mix of static and dynamic tests) to obtain sufficient information to determine the rate of degradation of MOV performance in terms of the potential increase in required thrust and torque, and the potential decrease in actuator output. From this information, licensees can establish periodic diagnostic test intervals that may extend up to 10 years, if there is assurance that the MOV will remain capable of performing its safety function throughout the interval. The NRC is evaluating OMN-1 for possible endorsement through rulemaking or by a regulatory guide.

As additional information on MOV performance became available, the NRC staff issued GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated

Valves," in September 1996 to request that licensees establish a program, or to ensure the effectiveness of their current program, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions within the current licensing bases of the facility. GL 96-05 supersedes GL 89-10 with respect to periodic verification of MOV design-basis capability. In GL 96-05, the NRC staff stated that, with certain limitations, the method described in ASME Code Case OMN-1 is considered to meet the intent of GL 96-05 to verify the design-basis capability of safety-related MOVs on a periodic basis. The limitations identified by the NRC staff in GL 96-05 on the use of OMN-1 to meet the intent of the generic letter were (1) a precaution regarding consideration of benefits and potential adverse effects when determining appropriate MOV testing, (2) a provision for the evaluation of applicable MOV test information before extending test intervals beyond 5 years or three refueling outages (whichever is longer), and (3) a provision for licensees participating in the industry pilot effort for IST programs considering risk insights to address the relationship of OMN-1 to their pilot initiative.

In VRR-12, the licensee requests relief from the test requirements of OM-10 paragraphs 4.1 and 4.2.1 for MOVs in its IST program. As an alternative in accordance with 10 CFR 50.55a(a)(3), the licensee proposes to use the program described in ASME Code Case OMN-1 with certain limitations and exceptions/clarifications. Until its proposed alternative is granted, the licensee states that MOVs in its IST program will continue to be exercised and stroke-time tested in accordance with OM-10 and as described in the PVNGS IST program.

In its relief request, the licensee has addressed the two applicable limitations discussed by the NRC in GL 96-05 on the application of ASME Code Case OMN-1. The other limitation on the application of OMN-1 in GL 96-05 is not applicable to PVNGS because the licensee is not currently proposing to implement a risk-informed IST pilot program. The licensee has also taken two exceptions/clarifications to the provisions of OMN-1 for the implementation of the Code case at PVNGS. The NRC staff discusses its evaluation of the licensee's proposed use of OMN-1 in the following paragraphs.

As a limitation to its implementation of ASME Code Case OMN-1, the licensee states that potential benefits and potential adverse effects will be considered when determining the appropriate testing for each MOV. This limitation is consistent with the guidance provided in GL 96-05 regarding the use of OMN-1.

The other limitation specified by the licensee regarding its application of ASME Code Case OMN-1 at PVNGS is that, where a selected test interval for an MOV extends beyond 6 years or four refueling outages (whichever is longer), performance and test experience will be evaluated to justify the longer periodic verification interval. The licensee indicates that the test interval will not exceed 10 years. The NRC recommended in GL 96-05 that, in applying OMN-1 in response to the GL, licensees should evaluate test information in the first 5-year or three-refueling-outage time period to validate assumptions made in justifying a longer test interval. The NRC staff does not object to the licensee's proposed interval for evaluating test information although it is slightly longer than the interval recommended in GL 96-05. Any adverse test information detected during the 6-year or four-refueling-outage time period will be promptly evaluated to ensure that MOVs with longer test intervals are capable of proper operation.

An exception/clarification to ASME Code Case OMN-1 by the licensee involves the calculation of MOV "functional margin" described in paragraph 6.4.3 of OMN-1. At PVNGS, the licensee

indicates that "functional margin" will be redefined to agree with the definition of "margin" as applied in the JOG Program on MOV Periodic Verification. The NRC staff does not object to the licensee establishing compatible MOV programs to implement the provisions of OMN-1 and the JOG topical report in response to GL 96-05. However, OMN-1 specifies that the functional margin of an MOV must be sufficient to satisfy the uncertainties in the acceptance criteria (such as data measurement uncertainty and equipment repeatability) while the JOG program calculates margin using thrust (or torque) values that have been adjusted for uncertainties. The licensee will ensure that uncertainties are properly considered in its implementation of OMN-1, such as when calculating an allowable test interval and when applying uncertainties to actuator output or valve required thrust (or torque) as appropriate.

The other exception/clarification to ASME Code Case OMN-1 by the licensee involves the performance of inservice tests of MOVs in the as-found condition. The licensee stated that as-found testing will be performed prior to some PM activities, but other activities will be performed on a periodic basis. In some cases, the licensee might waive as-found testing where MOV trending will be re-baselined. In all cases, the licensee stated that technical justification will be documented with the appropriate management approvals in accordance with station procedures. The NRC staff does not expect the licensee to test its MOVs prior to every PM activity. However, MOV performance will need to be established by sufficient as-found testing to allow periodic PM activities to be conducted without masking unacceptable MOV performance degradation. For example, as-found testing could be performed on a sample of MOVs prior to each of several periodic stem lubrications in order to establish MOV performance over the interval between lubrications and, thus, allow occasional periodic stem lubrication without prior testing.

With respect to static and dynamic testing, the licensee notes that PVNGS is participating in the JOG Program on MOV Periodic Verification, and that the results of this program will be used to determine the need for and frequency of continued dynamic testing. For MOVs at PVNGS not included in the scope of the JOG program, the licensee will use site-specific information to justify the necessity for and frequency of continued dynamic testing. The licensee states that station procedures contain requirements to determine when dynamic testing is appropriate following valve modifications. The NRC staff finds the licensee's plans for IST, including consideration of the as-found condition of the tested MOV, to be capable of identifying degradation in MOV performance for thrust/torque requirements and output. The staff also considers the licensee's participation in the JOG program and plant-specific testing to meet the intent of the ASME Code Case OMN-1 to provide a mixture of static and dynamic testing in implementing the Code case.

Paragraph 3.7 of ASME Code Case OMN-1 discusses the use of risk insights in implementing the provisions of the Code case such as those involving MOV grouping, acceptance criteria, exercising requirements, and testing frequency. For example, paragraph 3.6.2 of OMN-1 states that exercising more frequently than once per refueling cycle shall be considered for MOVs with high risk significance. In applying risk insights, the licensee will need to establish confidence that the modification of the MOV IST program from quarterly stroke-time testing to exercising at least once each refueling cycle with less frequent diagnostic testing does not result in a significant increase in plant risk. In particular, if the exercise intervals of high-risk MOVs are to be extended beyond a quarterly frequency, the licensee will need to ensure that increases in core damage frequency and/or risk associated with the increased exercise interval are small and consistent with the intent of the Commission's Safety Goal Policy Statement. Also,

sufficient information from the specific high-risk MOV, or similar MOVs, could demonstrate that exercising on a refueling outage frequency does not significantly affect component performance. For example, such information may be obtained by grouping similar MOVs and staggering the exercise testing of MOVs in the group equally over the refueling interval.

Finally, the licensee will follow the provisions of ASME Code Case OMN-1, as endorsed by the NRC, in developing procedures to implement the code case at PVNGS. The NRC staff may review those procedures, including the basis for any extension of high-risk MOV exercise intervals and consideration of uncertainties in MOV calculations, during an onsite inspection when they are available.

3.12.4 Conclusion

The NRC staff has determined that the licensee's proposed use of ASME Code Case OMN-1 described in VRR-12, together with the specified conditions herein, provides an acceptable level of quality and safety in assuring the operational readiness of MOVs. Therefore, the NRC staff concludes that the licensee's proposed alternative in VRR-12 to use ASME Code Case OMN-1 at PVNGS with the conditions specified herein is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

The licensee is expected to notify the NRC upon completion of procedures for implementing ASME Code Case OMN-1 at PVNGS. Following such notification, the NRC staff may review the procedures during an onsite inspection prior to implementation of the alternative MOV program.

The NRC is evaluating ASME Code Case OMN-1 for possible endorsement through rulemaking or by a regulatory guide. VRR-12 is approved until such time as the NRC staff's generic position on OMN-1 is issued through rulemaking or some other means. At that time, if the licensee intends to continue to implement this relief request, the licensee is to follow the provisions of OMN-1 with any limitations or conditions specified in the NRC staff endorsement.

3.13 Relief Request No. 13 (VRR-13)

The licensee requests relief from the exercise test frequency requirements of OM-10 paragraph 4.3.2 for various check valves. The proposed alternative would place the valves in a condition monitoring program modeled after OMa-1996 Code, Appendix II, "Check Valve Condition Monitoring Program."

3.13.1 Licensee's Basis for Requesting Relief

The licensee states:

> The purpose of the Condition Monitoring Program is to both improve check valve performance and to optimize testing, examination, and preventive maintenance activities in order to maintain the continued acceptable performance of a select group of check valves. Certain check valves need more attention in order to determine their failure or maintenance patterns. Once these mechanisms have been analyzed, confirmed, and the valve or group of similar valves have had their performance improved, then the same level of attention is no longer needed.

Certain other check valves need less attention as they have continuously exhibited acceptable operation.

After the reasons for their behavior have been analyzed, and confirmed, then the test, examination, and preventive maintenance activities necessary to maintain the continued acceptable performance can be optimized.

These examples demonstrate how the same types of tests and their associated intervals may need to be periodically adjusted based on the valve's performance. The use of ASME OMa-1996 Code, Appendix II provides a process that allows certain flexibility in establishing the types of tests, examination, and preventive maintenance activities and their associated intervals. Use of condition monitoring will:

- Make inservice testing more flexible to adapt to different testing situations or preferences. Different types of analysis techniques can be used. Each valve can be approached in a slightly different manner based on the increasing skill levels of the individuals involved or the resources available.

- Allow for analysis and provide some flexibility for decision making regarding the specification of the type and of the interval of tests, examinations, and preventive maintenance activities.

- Shift emphasis to the problem valves by increasing the scope or interval of testing, monitoring, or examining activities until the cause is determined and the condition is corrected.

- Shift emphasis from the valves that have continuously exhibited acceptable performance by decreasing the scope and frequency of testing, monitoring, or examination activities. Sufficient test, examination and preventive maintenance activity experience is needed before the scope of activities and their interval is adjusted.

- Improve on failure detection capability and on the predictive capability as other activities that are geared to determine the condition of the valve are used. The current IST testing just uses exercising which provides a "snapshot" picture of the valve but gives no clue as to the future performance capability of the valve.

- Increase preventive maintenance activities, not just by creating activities, but because there is a justifiable reason for doing them.

The current check valve testing program as described in OM-10 is extremely rigid and inflexible. Yet for all of the plant resources that go into running this test program, check valve failures still occur. Many of these failures cannot be predicted by OM-10 testing, and studies show that many are not even <u>detected</u> by OM-10 testing.

The ASME OM Committee spent several years developing requirements for a check valve condition-monitoring program that would lead to goals as listed in the bullets above. After review and approval, these requirements were published with the OMa-1996 Addenda to the OM Code. Implementation of these requirements in place of the check valve exercising requirements of OM-10 paragraph 4.3.2 will provide an equivalent level of quality and safety.

After reviewing the relief request and SER for the check valve condition monitoring program at the Wolf Creek Generating Station, and the proposed change to 10 CFR 50 published in Vol. 62, No. 232 of the Federal Register, the following modifications have been made to the alternative testing proposed under this Relief Request:

1. **Condition monitoring activities shall assess the condition of the check valve and confirm acceptable performance.** This modification addresses the underlying basis for bi-directional testing. The rulemaking states that valve opening and closing functions must be demonstrated when flow testing or examination method (non-intrusive, or disassembly and inspection) are used. However, the demonstration of opening and closing functions is only one way to achieve the goal of condition monitoring (i.e., maintaining the continued acceptable performance of check valves). Other methods may be equally effective. If PVNGS devises alternate methods that effectively assess the condition of check valves and confirm acceptable performance, use of such methods should be allowed under the condition monitoring program.

2. **The initial interval for tests and associated examinations shall not exceed two fuel cycles or three years (with 25% margin), which ever is longer.** The 2 fuel cycle / 3 year limit ensures that the intervals are not initially overextended. The 25% margin facilitates scheduling by allowing for plant operating conditions that may not be suitable for conducting condition monitoring activities (e.g., transient conditions or other ongoing surveillance or maintenance activities). The 25% extension does not significantly degrade the reliability that results from performing the condition monitoring activity at its specified interval. This is based on the recognition that the most probable result of any particular condition monitoring activity being performed is that the check valve is in conformance with the acceptance criteria. The 25% margin is not intended to be used repeatedly merely as an operational convenience to extend condition monitoring intervals (other than those consistent with refueling intervals) beyond those specified under this relief request.

3. **The maximum interval shall not exceed 10 years (with 25% margin).** The 10 year limit ensures that interval lengths do not become excessive. The 25% margin facilitates scheduling as described above.

4. **Trending and evaluation of existing data shall be used to reduce or extend the time interval between tests.** Trending and evaluating data provide assurance that the component is capable of performing its intended function over the entire IST interval.

5. **Plant safety shall be considered when extending intervals.** Consideration of plant safety will provide assurance that testing under the condition-monitoring program does not significantly degrade plant safety. Implementation of this modification will draw on the experience gained by PVNGS while participating in the risk-informed IST pilot plant effort.

6. **If the condition-monitoring program is discontinued, the requirements of OM-10 section 4.3.2 shall apply.** This modification is similar to the one in the proposed rulemaking, except that reference is made to the code section applicable to check valve testing in the PVNGS IST Program. This modification was part of the January 13, 1998, "Inservice Testing Second 10 year Program" submittal, but has been reformatted as a modification for consistency and clarity.

3.13.2 Alternative Testing

The licensee proposes:

> As an alternative to the testing or examination requirements of OM-10 paragraphs 4.3.2.1 through 4.3.2.5, check valves may be placed in a condition-monitoring program. The program shall be implemented in accordance with the ASME OMa-1996 Code, Appendix II, Check Valve Condition Monitoring Program, with the following modifications:
>
> 1. Condition monitoring activities shall assess the condition of the check valve and confirm acceptable performance.
>
> 2. The initial interval for tests and associated examinations shall not exceed two fuel cycles or three years (with 25% margin), which ever is longer.
>
> 3. The maximum interval shall not exceed 10 years (with 25% margin).
>
> 4. Trending and evaluation of existing data shall be used to reduce or extend the time interval between tests.
>
> 5. Plant safety shall be considered when extending intervals.
>
> 6. If the condition-monitoring program is discontinued, the requirements of OM-10 section 4.3.2 shall apply.

3.13.3 Evaluation

The licensee has proposed an alternative to the Code requirements of OM-10 paragraphs 4.3.2.1 through 4.3.2.5 for various category C and AC check valves. The valves would be placed in a condition monitoring program which would be implemented in accordance with ASME OMa-1996 Code, Appendix II, with some modifications.

Subsection ISTC 4.5.5, "Condition Monitoring," of ASME OMa-1996 describes the use of a condition monitoring program for check valves as an alternative to the testing or examination requirements of ISTC 4.5.1 through ISTC 4.5.4 of the Code. At this time, the NRC regulations in 10 CFR 50.55a reference the 1989 Edition of Section XI of the ASME Code. Rulemaking to reference a later edition and addenda of the ASME Code is ongoing but will not be completed for some time. Therefore, the licensee must justify relief from the requirements of the latest NRC-endorsed edition of the Code to implement its proposed program for check valves.

The licensee proposes to commit to the provisions of Appendix II of ASME OMa-1996 for implementing and maintaining its condition monitoring program. Appendix II specifies that an analysis be performed of the test and maintenance history of a valve or group of valves in order to establish the basis for specifying the IST, examination, and preventive maintenance activities. The analysis includes identification of any common failure or maintenance patterns, and review of these patterns to determine their significance and to identify potential failure mechanisms. If sufficient information is not currently available to complete the required analysis, Appendix II specifies activities to 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 the failure or the maintenance patterns. If sufficient information is available to assess the performance adequacy of the check valve or group of check valves, Appendix II directs that the applicable preventive maintenance, examination, and test activities and appropriate interval be identified for each valve in the group. Appendix II specifies that the results of each activity be reviewed to determine if any changes to the program are required. If corrective maintenance is performed on a check valve, Appendix II specifies that the analysis used to formulate the basis for the program be reviewed to determine if any changes are required. Appendix II directs that the program be documented to include specific information.

In the licensee's basis for relief, limitations on the use of Appendix II are described. These limitations are summarized as follows: (1) condition monitoring activities shall assess the condition of the check valve and confirm acceptable performance, (2) the initial interval for tests and associated examinations shall not exceed two fuel cycles or 3 years (with 25 percent margin), (3) the maximum interval shall not exceed 10 years (with 25 percent margin), (4) trending and evaluation of existing data shall be used to reduce or extend the time interval between tests, (5) plant safety shall be considered when extending intervals, and (6) if the condition monitoring program is discontinued, the requirements of OM-10 paragraph 4.3.2 shall apply.

With one clarification, the provisions of Appendix II of ASME OMa-1996 together with these specified limitations provide a reasonable basis to ensure that potential check valve degradation is adequately identified and addressed, and that the operational readiness of the check valves is assured. The clarification concerns the condition monitoring activities that will be used to confirm the acceptable performance of the check valves. The licensee's basis for relief states that the demonstration of opening and closing functions is only one way to achieve the goal of

condition monitoring. If alternative methods were devised that effectively assess the condition of check valves and confirm acceptable performance, the licensee states that the use of such methods should be allowed. It is the staff's position that use of other methods may be acceptable provided that they demonstrate the valves' capability to both open and close.

The licensee's proposes to use a 25-percent margin associated with the maximum interval. It is the staff's position that the maximum interval be no greater than 10 years. Therefore, the licensee's request to use a 25-percent margin for the maximum interval is denied.

3.13.4 Conclusion

The licensee's proposed development of a condition monitoring program for check valves following the provisions of ASME OMa-1996 Subsection ISTC 4.5 and Appendix II, together with the specified conditions and clarifications, provides an acceptable level of quality and safety in assuring the operational readiness of check valves within the scope of the IST program. Therefore, the staff concludes that the licensee's proposed alternative to the requirements of ASME OM-10 Section 4.3.2 is authorized pursuant to 50.55a(a)(3)(i). However, the licensee's request to use a 25-percent margin to extend the maximum interval past 10 years is denied.

As discussed, the NRC staff is evaluating the ASME guidelines for a condition monitoring program for check valves for possible endorsement through rulemaking. VRR-13 is approved until such time as the NRC staff's generic position on the ASME guidelines for a check valve condition monitoring program is issued through rulemaking or some other means. At that time, if the licensee intends to continue to implement this relief request, the licensee is to follow the ASME guidelines for a check valve condition monitoring program with any limitations or conditions specified in the NRC staff endorsement of those guidelines.

4.0 CONCLUSION

Relief is granted for PRR-01, PRR-05, PRR-06, PRR-11, VRR-01, VRR-02, VRR-05, and VRR-08 pursuant to 10 CFR 50.55a(f)(6)(i). In making this determination, the staff finds that the required testing is impractical for this facility. The staff has determined that the granting of these reliefs is authorized by law, 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 on the licensee if the requirements were imposed on the facility.

The alternatives to the Code requirements as proposed in PRR-03, PRR-09, PRR-10, VRR-09, VRR-10, and VRR-11 will provide an acceptable level of quality and safety and are authorized pursuant to 10 CFR 50.55a(a)(3)(i).

For relief requests PRR-07, VRR-03, VRR-04, and VRR-06, compliance with the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. For this reason, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

The alternative proposed in VRR-07 is denied since the licensee has not shown that relief is warranted pursuant to 10 CFR 50.55a(f)(6)(i), or otherwise proposed an acceptable alternative pursuant to 50.55a(a)(3)(i) or (a)(3)(ii).

Two relief requests are partially authorized. The alternative to the Code requirements of OM-6 paragraphs 5.1, and 6.1, as described in PRR-08, will provide an acceptable level of quality and safety and is authorized pursuant to 10 CFR 50.55a(a)(3)(i). However, relief from the requirements of paragraph 4.3 is denied since the licensee has not shown that relief is warranted pursuant to 10 CFR 50.55a(f)(6)(i), or otherwise proposed an acceptable alternative pursuant to 50.55a(a)(3)(i) or (a)(3)(ii). The alternative to the check valve exercising requirements of OM-10 paragraph 4.3.2 described in VRR-13, will provide an acceptable level of quality and safety and is authorized pursuant to 10 CFR 50.55a(a)(3)(i). However, use of a 25-percent margin to extend the maximum testing interval past 10 years is not authorized. The NRC is evaluating the ASME guidelines for a condition monitoring program for check valves for possible endorsement through rulemaking. VRR-13 is approved until such time as the NRC staff's generic position on the ASME guidelines for a check valve condition monitoring program is issued through rulemaking or some other means. At that time, if the licensee intends to continue to implement this relief request, the licensee is to follow the ASME guidelines for a check valve condition monitoring program with any limitations or conditions specified in the NRC staff endorsement of those guidelines.

The alternative to the Code requirements, as proposed in VRR-12, will provide an acceptable level of quality and safety and is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The licensee is expected to notify the NRC upon completion of procedures for implementing ASME Code Case OMN-1 at PVNGS. Following such notification, the NRC staff may review the procedures during an onsite inspection prior to implementation of the alternative MOV program. The NRC is evaluating ASME Code Case OMN-1 for possible endorsement through rulemaking or by a regulatory guide. VRR-12 is approved until such time as the NRC staff's generic position on OMN-1 is issued through rulemaking or some other means. At that time, if the licensee intends to continue to implement this relief request, the licensee is to follow the provisions of OMN-1 with any limitations or conditions specified in the NRC staff endorsement.

Attachment: Appendix A

Principal Reviewers: M. Kotzalas, J. Colaccino, and T. Scarbrough

Date: July 8, 1999

APPENDIX A

SUMMARY OF SUBMITTED RELIEF REQUESTS

Relief Request Number	SE Section	OM-1988 Paragraph & Requirements	Equipment Identification	Alternative Method of Testing	NRC Action
PRR-01	2.1	OM 6, Paragraph 5.2, Test Procedure	AFA-P01 AFB-P01 Essential Auxiliary Feed-Water Pump	The pumps will be tested at mini-flow conditions during plant operation, but flow-rate will not be measured. The pumps will be tested at design flow at cold shutdown.	Relief Granted (f)(6)(i)
PRR-03	2.2	OM 6, Paragraph 4.6.1.2(a) Range of Instrumentation	CHA-P01 CHB-P01 CHE-P01 Charging Pumps	The installed flow instrument will be used to measure charging pump flow.	Alternative Authorized (a)(3)(i)
PRR-05	2.3	OM 6, Paragraph 5.2(c) Test Procedure	SIA-P01 SIB-P01 Low Pressure Safety Injection Pumps	The pumps will be tested at mini-flow conditions during plant operation, but flow rate will not be measured. The pumps will be tested at design flow at cold shutdown.	Relief Granted (f)(6)(i)
PRR-06	2.4	OM 6 Paragraph 5.2(c) Test Procedure	SIA-P02 SIB-P02 High Pressure Safety Injection Pumps	The pumps will be tested at mini-flow conditions during plant operation, but flow rate will not be measured. The pumps will be tested at design flow at refueling outages.	Relief Granted (f)(6)(i)
PRR-07	2.5	OM 6 Paragraph 4.6.1.6 Frequency Response Range	CHA-P01 CHB-P01 CHE-P01 Charging Pumps	Pump vibration will be measured with instrumentation that does not meet the requirement of having vibration measuring transducers being from one third minimum pump rotational speed to 1000 Hz.	Alternative Authorized (a)(3)(ii)

Relief Request Number	SE Section	OM-1988 Paragraph & Requirements	Equipment Identification	Alternative Method of Testing	NRC Action
PRR-08	2.6	OM 6 Paragraphs 5.1, 6.1. and 4.3	Various Pumps	Pumps that have vibration parameter reference values of less than 0.05 inch per second (ips) will be considered smooth-running with an alert range from 0.125 to 0.3 ips and a required action level of greater than 3 ips.	Alternative to Paras. 5.1, 6.1 Authorized (a)(3)(i) Relief from Para. 4.3 denied
PRR-09	2.7	OM 6 Paragraph 6.1 Vibration Acceptance Criteria	Various Pumps	In cases where a pump's test parameters fall within either the alert or action required ranges and the pump's continued use at the changed values is supported by analysis, a new set of reference values may be established. (1995 Edition, Para. ISTB 6.2.2)	Alternative Authorized (a)(3)(i)
PRR-10	2.8	IWA-2400, IWA-2110(a), and IWA-2110(c) Use of Authorized Nuclear Inservice Inspector (ANII)	IST Pump Program	The IST Program will be developed in accordance with applicable regulations, codes, QA requirements, and procedures. ANII involvement will not be required. (OMb-1997)	Alternative Authorized (a)(3)(i)
PRR-11	2.9	OM 6 Paragraph 5.2.1(c) Test Procedure OM-6 Paragraph 4.6.1.2(a)	SIA-P03 SIB-P03 Containment Spray Pumps	The pumps will be tested at mini-flow conditions during plant operation, but flow rate will not be measured. The pumps will be tested at design flow at refueling outages.	Relief Granted (f)(6)(i) for Para. 5.2.(c) Relief from Para.4.6.1.2(a) not needed
VRR-01	3.1	OM 10, Paragraph 4.3.2 Exercising Tests for Check Valves	DGA-V317 DGA-V318 DGA-V364 DGB-V417 DGB-V418 DGB-V464 EDG Skid-Mounted Check Valves	The check valves will be tested during periodic EDG testing. Acceptable valve operation will be verified by successfully meeting the starting and running acceptance criteria for the EDG.	Relief Granted (f)(6)(i)

Relief Request Number	SE Section	OM-1988 Paragraph & Requirements	Equipment Identification	Alternative Method of Testing	NRC Action
VRR-02	3.2	OM 10 Paragraphs 4.2.1.4(a),(b) Power-Operated Valve Stroke Testing	SGBP-V0306A SGBP-V0306B SGAP-V0313A SGAPV-0313B Atmospheric Dump Valve Nitrogen Solenoid Valves	The valves will be exercised during quarterly testing of the associated ADV nitrogen backup system. Operational readiness of the solenoid valves will be verified by acceptable exercising and stroke timing of the ADV. (OMa-1996, ISTC 1.2(c))	Relief Granted (f)(6)(i)
VRR-03	3.3	OM 10 Paragraph 4.3.2 Exercising Tests for Check Valves	ECA-V043 ECB-V064 Essential Chilled Water Surge Tank Nitrogen Supply Check Valves	During each refueling outage, at least one of these valves will be disassembled, inspected, and manually exercised closed on a rotating schedule.	Alternative Authorized (a)(3)(ii)
VRR-04	3.4	OM 10 Paragraph 4.3.2.2 Exercising Tests for Check Valves	RDA-V020 RDA-V021 RDA-V022 RDB-V040 RDB-V041 RDB-V042 Safety Injection Pump Room Floor Drain Check Valves	Each fuel cycle, at least three of these valves, on a rotating schedule, will be disassembled, inspected, and manually full-stroke exercised.	Alternative Authorized (a)(3)(ii)
VRR-05	3.5	OM 10 Paragraph 4.3.2.2(a) Exercising Tests for Check Valves	SGE-V642 SGE-V652 SGE-V653 SGE-V693 Downcomer Feedwater Check Valves	These valves will be verified to close by performing a reverse-flow test on the series combination of valves at cold shutdown.	Relief Granted (f)(6)(i)
VRR-06	3.6	OM 10 Paragraph 4.3.2.4(c) Valve Obturator Movement	SIA-V164 SIB-V165 Containment Spray Check Valves	During each refueling outage at least one of these valves will be disassembled, inspected, and manually exercised on a sequential and rotating schedule.	Alternative Authorized (a)(3)(ii)
VRR-07	3.7	OM 10 Paragraph 4.3.2.4(c) Valve Obturator Movement	SIAV205 SIAV206 Containment Sump Discharge Check Valves	Sample disassembly with interval extension	Relief Denied

Relief Request Number	SE Section	OM-1988 Paragraph & Requirements	Equipment Identification	Alternative Method of Testing	NRC Action
VRR-08	3.8	OM 10 Paragraph 4.3.2 Exercising tests for check valves	16 check valves in the safety injection system	Leak rate testing per Technical Specification requirements	Relief Granted (f)(6)(i)
VRR-09	3.9	OM 1 Paragraphs 8.1.2.4 and 8.1.3.4 Temperature Stability	All safety and relief valves tested under ambient conditions using a test medium at ambient conditions	For safety and relief valves tested under ambient conditions using a test medium at ambient conditions, verification of thermal equilibrium will attained. (1995 Edition, Para. I 8.1.2 (d), and I 8.1.3(d))	Alternative Authorized (a)(3)(i)
VRR-10	3.10	OM 1 Paragraph 8.1.2.2 Accumulator Volume	All Class 2 and 3 safety and relief valves used for compressible fluid services other than steam.	The volume of the accumulator drum and the pressure source flow rate shall be sufficient to determine the valve set-pressure. (1995 Edition, Para. I 8.1.2)	Alternative Authorized (a)(3)(i)
VRR-11	3.11	IWA-2400, IWA-2110(a), and IWA-2110(c) Use of Authorized Nuclear Inservice Inspector (ANII)	IST Valve Program	The IST Program will be developed in accordance with applicable regulations, codes, QA requirements, and procedures. ANII involvement will not be required. (OMb-1997)	Alternative Authorized (a)(3)(i)
VRR-12	3.12	OM-10 Paragraph 4.1 Valve Position Verification Paragraph 4.2.1 Valve Exercising Test	All MOVs in the IST Program	Use of OMN-1 Code Case	Alternative Authorized (a)(3)(i)
VRR-13	3.13	OM-10 Paragraph 4.3.2 Exercising Tests for Check Valves	Various check valves	Use of Check Valve Condition Monitoring OMa-1996, Appendix II	Alternative Authorized (a)(3)(i) Use of 25% margin not authorized.