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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE THIRD INTERVAL INSERVICE TESTING PROGRAM

POWER AUTHORITY OF THE STATE OF NEW YORK

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NUMBER 50-333

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 Sections (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. Guidance related to the development and implementation of inservice testing (IST) programs is given in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," issued April 3, 1989, GL 89-04, Supplement 1, issued April 4, 1995, NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," and NUREG/CR-6396, "Examples, Clarifications, and Guidance on Preparing Requests for Relief from Pump and Valve Inservice Testing Requirements."

The 1989 Edition of the ASME Code is the latest edition incorporated by reference in 10 CFR 50.55a(b). Subsection IWV of the 1989 Edition, which gives the requirements for IST of valves, references Part 10 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-10) as the rules for IST of valves. OM-10 replaces specific requirements in previous editions of Section XI, Subsection IWV, of the ASME Code. Subsection IWP of the 1989 Edition, which gives the requirements for IST of pumps, references Part 6 of the American National Standards Institute/ASME *Operations and Maintenance Standards* (OM-6) as the rules for IST of pumps. OM-6 replaces specific requirements in previous editions of Section XI, Subsection IWP, of the ASME Code.

In a letter dated October 21, 1997, the Power Authority of the State of New York (also known as the New York Power Authority), the licensee for the James A. FitzPatrick (JAF) Nuclear Power Plant, submitted the third 10-year interval inservice testing (IST) Program for Pumps and Valves. Included in this submittal were 11 relief requests. On April 30, 1998, the NRC issued a request for additional information. The licensee responded to this request in a letter dated July 30, 1998. The NRC staff's findings with respect to authorizing alternatives and granting or not granting the relief requested as part of the licensee's IST program are discussed below.

Enclosure

2.0 SCOPE

The JAF IST program for the third 10-year interval that began on October 1, 1997 was developed to the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code. The 1989 edition of the Code specifies that the rules for the inservice testing of pumps and valves are stated in the ASME/ANSI Operations and Maintenance (OM) Standards, Part 6, "Inservice Testing of Pumps in Light-Water Reactor Power Plants," and Part 10, "Inservice Testing of Valves in Light-Water Reactor Power Plants." References in the JAF IST program to OM-1, OM-6, and OM-10 correspond to the 1987 ASME/ANSI OM Standard Parts 1, 6, and 10, respectively. For OM-6 and OM-10, the applicable edition includes the 1988 OMa addenda.

The scope of the JAF IST program should include pumps and valves that are ASME Code Class 1, 2, or 3 or are required to perform a specific function in shutting down the reactor to cold shutdown condition, maintaining the cold shutdown condition, or necessary to mitigate the consequences of an accident. The pressure relief devices covered are those for protecting systems or portions of systems which perform a required function as mentioned above.

The staff reviewed the licensee's IST program scope using 10 CFR 50.55a and the guidance contained in Supplement 1 to GL 89-04 (NUREG-1482) Section 2.2. The standby liquid control (SLC), core spray (CS), and high pressure coolant injection (HPCI) systems were reviewed in detail. The staff believes that it may be appropriate to include the closure function of the core spray pump discharge piping keep-fill check valves (14-CSP-63A and 14-CSP-63B) in the scope of the licensee's IST program. The staff did not identify any other possible IST program scope issues as a result of its limited review.

3.0 PUMP TESTING PROGRAM

3.1 Generic Relief Request PRR-01

The licensee requests relief from the requirements of OM-6 Section 4.6.2.1 which states:

> Gage Lines. If the presence or absence of liquid in a gage line could produce a difference of more than 0.25% in the indicated value of the measured pressure, means shall be provided to assure or determine the presence or absence of liquid as required for the static correction used.

3.1.1 Licensee's Basis for Request

The licensee provided the following basis:

> In accordance with OM-6 Section 4.6.2.2, the pump differential pressure may be determined by the difference in the pressure at a point in the inlet pipe (suction pressure) and the pressure at a point in the discharge pipe (discharge pressure). When the requirements of OM-6 Section 4.6.2.1 are applied to the measurement of the pump suction pressure, the 0.25% limit is overly restrictive since the pump suction pressures are typically at relatively low levels. Compliance with this requirement could complicate venting procedures and introduce unnecessary health physics risks associated with handling and disposing of radioactive

contaminate eater [sic] with no commensurate gain or improvement of test reliability.

In most cases, the pump discharge pressure exceeds the suction pressure by at least a factor of five (5). This being the case, a 0.25% error introduced into the suction pressure measurement results in an error of 0.0625% in the differential pressure calculation. This is insignificant in light of the potential 6% error (2% full scale accuracy and full scale range of three times the reference value) allowance applied to both the suction and discharge pressure measurement in OM-6 Section 4.6.

3.1.2 Proposed Alternate Testing

The licensee proposed the following:

If the presence or absence of liquid in a gauge line used for sensing pump suction pressure could produce a difference of more than 0.25% in the calculated value of the pump differential pressure, means shall be provided to ensure or determine the presence or absence of liquid as required for the static correction used.

3.1.3 Evaluation

The proposed relief would only be applicable to the pressure gage lines on the suction side of pumps in the licensee's IST program (and only to pumps that are not equipped with installed differential pressure detectors). Unlike pump discharge pressure, pump suction pressure is not an IST test parameter. The relevant IST test parameter from Table 2 of OM-6 is pump differential pressure. For pumps with a large discharge-pressure-to-suction-pressure ratio (high head pumps), variations (of the magnitude specified in Section 4.6.2.1) in the pump suction pressure will have a relatively insignificant effect on the calculated pump differential pressure. That is, a 0.25% variation in pump suction pressure is very small relative to pump discharge pressure and thus will only have a small effect on the calculated differential pressure. Moreover, the acceptable instrument accuracy for pump differential pressure specified in Table 1 of OM-6 is 2%, approximately an order of magnitude greater than the 0.25% gage line limit in Section 4.6.2.1.

As noted by the licensee, compliance with this requirement could complicate venting procedures and introduce unnecessary health physics risks associated with handling and disposing of radioactive fluid with no commensurate gain or improvement of test reliability. While venting might be needed to comply with the subject Code requirement (to evaluate the line contents) this procedure unnecessarily exposes plant personnel to ionizing radiation and thus constitutes a hardship on the licensee. The hardship of meeting this requirement would not be offset by a compensating increase in safety.

The licensee proposes to perform the procedure of OM-6 Section 4.6.2.1 if the presence or absence of liquid in the gage line could cause a difference of greater than 0.25% in the calculated value of the pump differential pressure. This proposal allows an adequate assessment of pump operational readiness and provides a reasonable alternative to the Code requirement.

3.1.4 Conclusion

Based on the determination that the proposal provides reasonable assurance of operational readiness and that compliance with the Code would result in hardship without a compensating increase in the level of quality and safety, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3.2 Standby Liquid Control (SLC) System

The Standby Liquid Control System pumps (11P-2A and 11P-2B) are ASME Code Class 2 pumps that inject borated water into the reactor vessel as an alternate means for negative reactivity addition and reactor shutdown.

3.2.1 Relief Request PRR-02R1

For the standby liquid control pumps (11P-2A and 11P-2B), the licensee requests relief from the requirements of OM-6, Section 4.6.5, which specifics the use of a rate or quantity meter installed in the pump test circuit when measuring flow rate and Section 4.6.1.1 which specifies that the instruments used for flow-rate measurement must be accurate to within ±2% of full scale reading on the instrument.

3.2.1.1 Licensee's Basis for Request

The licensee provided the following basis:

> The SLC test loop is not equipped with flow instrumentation and the only practical means of determining flow rate is to monitor the change of level in a test tank to which water is being pumped. The installed tank has a capacity of only 210 gallons and is capable of accommodating less than 5 minutes of pump operation at rated conditions (≥ 50 gpm).
>
> Due to limitations of pumping time and human factors related to measuring the change in test tank water level, the accuracy of flow rate determination cannot be verified to be within ±2% as required by the Code. Historically, the calculated flow rates are within 0.95 to 1.10 of reference flow rate (54.5 gpm).

3.2.1.2 Proposed Alternate Testing

The licensee proposed the following:

> The flow rate of the SLC pumps will be determined by measuring the change in water level in the test tank during a period of pump operation at the reference discharge pressure over a period of at least two (2) minutes. The level change will be converted to flow rate and evaluated in accordance with analysis and evaluation criteria specified in OM-6, Section 6, as applicable.

3.2.1.3 Evaluation

These positive displacement pumps inject a borated solution into the reactor coolant system (RCS) for emergency shutdown. Direct measurement of pump flow rate is not feasible because the test flow path does not have installed instrumentation. Installation of permanent instruments to meet the Code would require modification of the system. The licensee proposes to calculate flow rate based on a timed change in the test tank level. The licensee stated that the flow rate accuracy could not be verified to be within ±2% because of limitations of pumping time and human factors related to measuring the change in test tank water level. The licensee also indicated that, historically, the calculated flow rates have been within 0.95 to 1.10 of the reference flow rate (54.5 gpm). However, the licensee's statement does not address flow rate measurement accuracy.

In the staff's December 26, 1991 safety evaluation for this relief request for the licensee's second 10-year interval, the staff stated:

> The licensee proposes to calculate flow rate based on a timed change in the test tank level. The accuracy of this technique is not described, but might exceed that required by the Code (±2%)...
>
> The licensee should determine the accuracy obtained from the proposed technique. If changes are made to the test methodology that allow complying with the Code accuracy, then relief should be granted to calculate flow rate. However, if the flow rate calculation is not within the Code accuracy the licensee must show that the accuracy achieved is adequate to assess pump operational readiness and that it provides a reasonable alternative to the Code. If this cannot be done, the licensee should either comply with the Code by installing an instrument to measure flow rate directly or develop and justify another method of evaluating the hydraulic performance of these pumps.

Contrary to the guidance provided by the staff in the December 26, 1991 safety evaluation, and contrary to a request for additional information that directly addressed this specific issue, the licensee failed to adequately address flow rate measurement accuracy in its proposed relief request. It is not sufficient to say that "Due to limitations of pumping time and human factors related to measuring the change in test tank water level, the accuracy of flow rate determination cannot be verified to be within ±2% as required by the Code." The staff has provided guidance to licensees on the use of tank level to calculate pump differential pressure in Section 5.5.3 of NUREG-1482 and Section 3.2 of NUREG/CR-6396. The staff's guidance has consistently maintained that where flow rate measurement cannot be met, the use of tank level to calculate flow rate is an acceptable alternative to the Code, provided the calculated results meet the accuracy requirements of OM-6. In NUREG-1482 Appendix A, Response to Question Group 105, the staff stated that in determining what is "practical within the limitations of design, geometry, and materials of construction of the component," the staff considers modifications such as the installation of instrumentation to be practical as used in 10 CFR 50.55a(f)(4). Therefore, the licensee should either comply with the Code or develop and justify another method of evaluating the hydraulic performance of these pumps.

3.2.1.4 Conclusion

The proposed alternative is authorized for an interim period of 1 year pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that immediate compliance with the requirements would result in a hardship without a compensating increase in the level of quality and safety. This interim period will provide the licensee sufficient time to adequately address flow rate measurement accuracy. The licensee should either

1. Resubmit this relief request with a more detailed description of how pumping time and human factors considerations preclude meeting the Code flow rate accuracy requirement (e.g., limitations associated with the sight glass design, graduation, orientation, or temporary test tank level instrumentation) and provide an indication of the flow rate accuracy that can reasonably be achieved with the installed system configuration, or

2. Install a flow rate instrument that directly measures the pump flow rate to the level of accuracy required by the Code.

3.2.2 Relief Request PRR-03

For the standby liquid control pumps (11P-2A and 11P-2B), the licensee requests relief from the requirements of OM-6, Section 4.6.1.6, which specifies that the frequency response range of the vibration measuring transducers and their readout system shall be from one-third minimum pump shaft rotational speed to at least 1,000 Hz.

3.2.2.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> The nominal speed of the SLC pumps is 520 RPM, which correlates to a rotational frequency of 8.67 Hz. OM-6 Section 4.6.1.6 requires the frequency response range of the vibration measuring transducers and their readout system to be accurate to +5% full scale over the range of 2.89 - 1000 Hz.
>
> [The licensee] has instruments for use during surveillance testing with certified accuracy of ±5% full scale over a range of 5-2000 Hz. Calibration is verified accurate using a system test methodology over a range of 10-1000 Hz in units of displacement (mils p-p) and 6.5-1000 Hz in units of velocity (ips peak). The system test verification is limited by the capability of the calibration shaker system to accurately sustain vibration at meaningful amplitudes outside the tested frequencies. The certified calibration ±5% range is arrived at through addition of individual transducer and meter inaccuracies over the stated frequency range.
>
> The instrument lower frequency response limits are a result of high-pass filters installed to eliminate low frequency elements associated with the input signal from entering the process of single and double integration. These filters prevent low frequency electronic noise from distorting reading in the resultant units (ips, mile). As a side effect, any actual vibration occurring at low frequencies is filtered out. This is a necessary trade-off, as 1 mv [millivolt] of electronic noise at 2.5 Hz

translates to approximately 62.6 mils p-p with the accelerometer used with these instruments, at a nominal sensitivity of 50 mv/g.

[The licensee] has extensively researched this issue concerning Code compliance and intent, and strongly feels that, for these pumps, procurement of equipment capable of meeting the Code required accuracy is impractical with little or no benefit. Instrumentation capable of meeting the Code for these pumps is cumbersome, difficult to operate, prone to human error, costly to purchase and extensive to calibrate. The number of vendors that supply instrumentation accurate at these frequencies is limited, and there are even fewer vendors capable of performing the required calibration services. Most standard qualified calibration laboratories provide calibration services only to a minimum of 10 Hz.

In addition to the impracticality of procuring the instruments, [the licensee] feels that the instruments presently used are adequate to assess the condition of these pumps. The manufacturer of these pumps, Union Pump Company, Battle Creek, Michigan, has stated that these pumps, being of a simplified reciprocating design, have no failure mechanism that would be revealed at frequencies less than shaft speed. Union Pump has stated that all failure modes of this pump resulting in increasing vibration will be manifested at shaft speed frequency or harmonics thereof. In light of the information provided by Union Pump, monitoring sub-synchronous vibration for these pumps is not needed, but super-synchronous readings will provide meaningful information in the detection of imminent machinery faults.

A search of the INPO [Institute for Nuclear Power Operations] NPRDS [Nuclear Power Reliability Data Service] database has revealed only one failure reported for pumps of this or similar design whose discovery mentioned increased vibration levels. The cited cause of the failure was improper end play set leading to gearing failure. Failures of this type would normally be detected at running (shaft) speed frequency, harmonics thereof, or non-harmonic super-synchronous bearing defect frequencies. It should also be noted that these are standby pumps which are normally operated only during pump and valve testing. In the unlikely event this system is required to fulfill its design function, only one of the two redundant pumps need operate for a period of 23 to 125 minutes.

In addition to vibration monitoring performed for the IST program, these pumps are included in [the licensee]'s Rotating Equipment Monitoring Program. Vibration spectral data is periodically collected and analyzed for the pump and gear motors in addition to those required by the Code. The equipment used by the Rotating Equipment Program is certified accurate to ± 5% over a frequency range of 5-2000 Hz and is also limited by high-pass integrating filters, but allows for discrete frequency analysis and trending using FFTs [Fourier Fast Transform analyzers]. Vendor specifications state that this equipment should provide fairly accurate data down to 2 Hz in units of acceleration (g peak) by using the raw transducer signal, negating the need for integration. Study of low frequency spectra taken in g peak with these instruments has revealed no distinct sub-synchronous peaks above the noise floor acceleration signal.

> In light of their rigorous testing and limited design run time, it is not likely that a minor mechanical fault would prevent these pumps from fulfilling their design function and unlikely that development of a major fault would go unnoticed.
>
> In conclusion, [the licensee] feels that the use of high quality, commercially available vibration monitoring equipment calibrated to be at least accurate to ±5% full scale over a range of 6 Hz to 500 Hz (nominal shaft speed - 8.67 Hz) is an appropriate method of monitoring the mechanical condition of the SLC pumps. Such instruments will provide meaningful and useful measurements over the frequency range in which the pump faults will develop and manifest. This meets the intent of the Code and certainly will neither adversely impact system reliability nor the health and safety of the general public. In addition, it relieves [the licensee] of the burden and expense involved in the procurement, calibration, training[,] and certification associated with obtaining new equipment which is simply not needed to adequately assess the condition of the SLC pumps.

On April 30, 1998, the NRC asked the licensee to provide documentation that demonstrates that the standby liquid control pumps are not susceptible to looseness of the bearings, misalignment, rubbing, oil whip, and impacts from rolling element bearing cage defects. The NRC staff asserted that these degradation mechanisms could result in abnormal vibration levels at frequencies near and below the pump rotational speed frequency. In its letter of July 30, 1998, the licensee stated that the SLC pumps are not susceptible to these degradation mechanisms because the SLC pump motors operate at 1780 rpm through a gear reducer to operate the pumps at 520 rpm (8.67 Hz). The motors are equipped with ball bearings and the pumps utilize tapered roller bearings at each end of the crankshaft. The licensee addressed each specific degradation mechanism as follows:

- Bearing looseness is normally a failure mechanism for sleeve bearings -- not roller or ball bearings. Roller and ball bearing defects cause high-frequency, non-synchronous vibration.

- Misalignment is normally detected at vibration frequency 1X the rpm. It may also be detected at 2X and 3X rpm, if severe.

- Rubbing normally generates vibration at 1X, 2X rpm and higher frequencies. Rubbing is normally a symptom not a cause, the causes such as bent shaft or broken parts are detected at 1X or higher frequencies.

- Oil whip/whirl is normally associated with sleeve-type bearings on machines equipped with pressure lubricated systems. Oil whip is detected at frequencies slightly less than 2X rpm. JAF's SLC pumps do not contain a pressure-lubricated system and utilize ball and roller bearings that are not susceptible to this phenomenon.

- Cage defects on motor bearings do not occur at even multiples of shaft rpm, but are functions of the bearing dimension and running speed. Cage defects on the motor bearings would be detected at approximately 12 Hz.

- Cage defects on pump bearings also do not occur at even multiples of shaft rpm but are a function of the bearing dimension and running speed.

- Cage defects on the pump's tapered roller bearings would exhibit peaks typically at 0.35X to 0.45X rpm (or 3.9 Hz). As stated by the pump manufacturer, bearing defects would most likely be detected at multiples of running speed due to the three pumping actions that occur for each crank revolution. [The licensee provided a letter from the pump manufacturer, Union Pump Company, dated September 2, 1992, to support this latter assertion.]

The licensee indicated that these degradation mechanisms can be detected using the vibration monitoring techniques currently employed at JAF during the quarterly pump operability test.

3.2.2.2 Proposed Alternate Testing

The licensee proposed the following:

> The vibration measurements will be taken using instrumentation accurate to ±5% full scale over a frequency response range of 6 Hz to 500 Hz. The data will be evaluated per OM-6 Section 6.

3.2.2.3 Evaluation

Section 4.6.1.6 of OM-6 requires vibration instrumentation to have a frequency response range of the readout system from one-third minimum pump shaft rotational speed to at least 1,000 Hz. The Code requirements are general in order to cover the various types of pumps installed in safety-related applications in nuclear power plants. The Code vibration monitoring requirements apply most generally to pumps operating above 600 rpm and may be either too prescriptive or not prescriptive enough for other specific pump applications. Moreover, the frequency spectrum of the complex signals generated by machines is characteristic of each machine or each pump, constituting a unique pattern, referred to as the "machine signature." Analysis of the signature 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 peaks of the measured frequency spectra are correlated with data pertaining to the possible vibration source components in the machine. For reciprocating pumps, the sources of vibration from unbalanced forces will generally give rise to vibrations at the running speed or higher order multiples of the running speed. Vibrations at one-half or lower of running speed may indicate "oil whip" in journal bearings, or looseness in bearings. The licensee has contacted the pump manufacturer who indicates that these pumps have no failure mechanisms that would be revealed at frequencies less than shaft speed. Therefore, for the SLC pumps, the Code requirements for the subharmonic vibrations would provide no useful information about the condition of the pumps.

The licensee indicates that the instrumentation used for inservice testing vibration monitoring has an accuracy of ±5% full scale over a range of 5 to 2000 Hz. Evidently, for the remaining pumps other than SLC pumps, the instrumentation meets the Code requirements based on the running speed of the pumps. The relief request indicates that accelerometers are used. The most widely used vibration sensing instruments are accelerometers. Accelerometers have a frequency response range of ideal operation, with amplitude distortions at low frequencies. While other types of transducers may provide more accurate signals in a lower frequency response range, the advantages of accelerometers (light-weight, rugged, wide frequency response, good temperature resistance, moderate pricing, availability) in monitoring the remaining pumps would outweigh the advantage of having instrumentation that would meet the Code requirements for the

SLC pumps ("cumbersome, difficult to operate, prone to human error, costly to purchase, and expensive to calibrate"). Additionally, the licensee indicates that the SLC pumps will be monitored as part of the Rotating Equipment Monitoring Program by periodically collecting and analyzing vibration spectral data/frequency analysis using Fourier Fast Transform (FFT) analyzers. A spectral analysis provides the entire spectrum of vibration frequencies as compared to the vibration data required by the Code (mils peak-to-peak for displacement) and will allow for monitoring potential failure modes at different frequencies. Therefore, the proposed alternative provides an adequate level of assurance of the operational readiness of the SLC pumps.

The staff has addressed the frequency response range of vibration monitoring equipment used to monitor Union Pump Company Model No. TD-60 triplex reciprocating positive displacement pumps with several boiling water reactor licensees. There is a consensus among these licensees and experts from the Union Pump Company that vibration analysis below pump running speed would not provide any additional insights regarding pump degradation. Specifically, Union Pump Company stated that it is doubtful that the energy generated by rubs (at the connecting rod bushings or plunger seals) would be sufficient to provide indications at frequencies less than running speed because of the slow speed of the SLC pumps. There are no other known pump degradation mechanisms that would be detected at frequencies less than running speed for the SLC pumps. Since these pumps do not have journal bearings, oil whip (which would be indicated at slightly less than ½X running speed) need not be considered.

In its letter of July 30, 1998, the licensee indicated that cage defects on the pump's tapered roller bearings would exhibit vibration peaks at 0.35X to 0.45X rpm (or 3.9) Hz. While this would suggest the need for vibration monitoring equipment with a frequency response below that proposed by the licensee (i.e., below 6 Hz), the staff is otherwise not aware of any specific degradation mechanisms that would manifest itself at frequencies below normal pump running speed. Moreover, the staff is not aware of any operational data (e.g., NPRDS data or information from licensee event reports made pursuant to 10 CFR 50.72 or 10 CFR 50.73) that would suggest the need to monitor the vibration produced by these pumps below their normal running speed.

Because the pumps have no known subsynchronous failure modes, imposition of the Code requirements for the vibration instrumentation would be of little to no benefit for assuring operational readiness of the SLC pumps. Imposition would create a hardship on the licensee by requiring that a different type of vibration monitoring instrumentation be procured, maintained, and operated, solely for the standby liquid control pumps.

3.2.2.4 Conclusion

The proposed alternative to use the existing vibration monitoring instrumentation for the standby liquid control pumps pursuant to 10 CFR 50.55a(a)(3)(ii) based on the hardship that would be created without a compensating increase in the level of quality and safety of the operation of the pumps if the Code requirements were imposed.

3.3 Core Spray (CS) System

3.3.1 Relief Request PRR-04

For the core spray pumps (14P-1A and 14P-1B), the licensee requests relief from the requirements of OM-6 Section 4.6.1.2(a), which specifies that the full scale-range of each analog instrument shall be not greater than three times the reference value. These pumps deliver cooling water from the suppression pool to the reactor in the event of a LOCA.

3.3.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> The differential pressure for the Core Spray pumps is calculated using the installed suction and discharge pressure gauges. The suction pressure gauge is designed to provide adequate suction pressure indication during all expected operating conditions. The full-scale range, 60 psig, is sufficient for a post-accident condition when the torus is at the maximum accident pressure. This, however, exceeds the range limit for the suction pressure under the test condition (approximately 5 psig).
>
> The installed suction pressure gauge and discharge pressure instrumentation loop are calibrated to within ± 2% full scale accuracy. The full-scale range of the pump discharge pressure instrumentation loop is 500 psig. Pump discharge pressure during testing is typically 300 psig. Thus[,] the maximum variation due to inaccuracy in measured suction pressure is ± 1.2 psi and in measured discharge pressure is ± 10 psi. Thus, the differential pressure would be 295 ± 11.2 psi or an inaccuracy of 3.8%. If the full scale range of the suction pressure gauge was within the Code allowable of 3 times the reference value or 15 psig, the resulting differential pressure measurement would be 295 ± 10.3 psi or an inaccuracy of 3.5%. Thus the increase in inaccuracy of 0.3% is insignificant and does not warrant the additional manpower and exposure required to change the suction pressure gauge for test purposes.
>
> In addition, the Code would allow a full-scale range for the discharge pressure measurement of 900 psig. This would translate into a differential pressure measurement of 295 ± 18.3 psig or an inaccuracy of 6.2%. The existing measurement is significantly better than the maximum Code allowable inaccuracy.

3.3.1.2 Proposed Alternate Testing

The licensee proposed the following:

> The existing installed plant suction pressure gauges will be used to determine the pump differential pressure for testing of the Core Spray pumps.

3.3.1.3 Evaluation

The licensee proposes to use inlet pressure instruments for the CS pumps with a full-scale range of 0-60 psig and an accuracy as stated. The ranges of these instruments exceeds three times the test reference value for dynamic pump inlet pressure when pressure is low. This prevents over-ranging and damage to the instrument when the pressure is much higher, such as when subjected to post-accident torus pressure conditions. The licensee has not provided a value for reference inlet pressure. However, it must be less than 20 psig or relief would not be needed. Conservatively, assuming a CS pump discharge pressure of 300 psig, the differential pressure is between 300 and 280 psig (0 - 20 psig inlet pressure). This results in an inlet pressure inaccuracy of ±1.2 psig, which represents an error in differential pressure measurement of only about ±0.4% (1.2 psig/290 psig = 0.00414). The proposed method should not have a significant negative impact on the ability to evaluate the condition of these pumps. Therefore, the proposal is essentially equivalent to the Code requirement and provides sufficiently accurate data for assessing pump degradation. This proposal provides an acceptable level of quality.

3.3.1.4 Conclusion

Based on the determination that the proposal provides reasonable assurance of operational readiness and that compliance with the Code would result in hardship (i.e., additional manpower and exposure required to change the suction pressure gauge for test purposes) without a compensating increase in the level of quality and safety, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3.4 Emergency Service Water (ESW) System

3.4.1 Relief Request PRR-05R1

For the emergency service water pumps (46P-2A and 46P-2B), the licensee requests relief from the requirements of OM-6 Section 5.2(b), which specifies that the resistance of the system shall be varied until the flow rate equals the reference value. The pressure shall then be determined and compared to its reference value. Alternatively, the flow rate can be varied until the pressure equals the reference value and the flow rate shall be determined and compared to the reference flow rate value. The emergency service water pumps provide cooling water for safety-related heat loads during a loss-of-coolant design basis accident.

3.4.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> Emergency Service Water (ESW) systems are designed such that the total pump flow cannot be adjusted to one finite value for the purpose of testing without adversely affecting the system flow balance and Technical Specification operability requirements. These pumps must be tested in a manner that the service water loop remains properly flow balanced during and after the testing and each supplied load remains fully operable per Technical Specifications to maintain the required level of plant safety during plant operation.
>
> The ESW water system loops are not designed with a full flow test line with a single throttle valve. The flow therefore cannot be throttled to a fixed reference value every time. Total pump flow rate can only be measured using the total system flow indication installed on the common supply header. Only the flows of the serviced components can be individually throttled. Each load is throttled to a FSAR [Final Safety Analysis Report] required flow range which must be satisfied for the load to be operable. All loads are aligned in parallel, and all receive ESW flow when the associated ESW pump is running, regardless whether the served component is in service or not. During power operation, all loops of ESW are required to be operable per the Technical Specifications. A loop of ESW cannot be taken out of service for testing without entering a Limiting Condition for Operation (LCO). With each loop of ESW balanced a requirement to quarterly adjust ESW loop flow to one specific flow value for inservice testing conflicts with system

design and operability requirements (i.e. flow balance) as required by Technical Specifications.

3.4.1.2 Proposed Alternate Testing

The licensee proposed the following:

As discussed in the basis for relief it is extremely difficult or impossible to return to a specific flow rate or differential pressure for testing these pumps. Multiple reference points could be established according to the Code, but it would be impossible to obtain reference values at every possible point. An alternative to the testing requirements of OM-6 is to base the acceptance criteria on a reference curve. Flow rate and discharge pressure are measured during inservice testing in the as found condition and compared to an established reference curve. The following elements are used in developing and implementing the reference curves.

1) A reference pump curve has been established for each pump from empirical data obtained during tests when these pumps were known to be operating acceptably. These pump curves represent pump performance consistent with the original pump test data.

2) The reference points were [sic] used to develop the pump curves were measured using plant instruments that were calibrated to verify their accuracy prior to performing the tests. In addition to the plant instruments portable[,] UT flow instrumentation was installed during reference testing.

3) The reference pump curves are based upon the manufacturers pump curves that were validated during preoperational testing and in 1990. Performance Engineering report JPEM-91-001 provides the correlation of data developed during the five tests used to establish the reference pump curve.

4) The points utilized were beyond the flat portion of the curve and demonstrated that flow was within the acceptable design limits.

5) The acceptance criteria bases are documented in calculation JAF 91-96 Rev. 1. The limits established do not conflict with the Technical Specifications or the Final Safety Analysis Report operability criteria.

6) Review of vibration data trend plots indicates that the change[s] in vibration reading do not vary significantly over the narrow range of pump curves being used. Based upon this reference values are uniform and recorded at the upper motor bearing housing location in three directions.

7) After any maintenance or repair that may affect the established reference pump curve, a new reference pump curve shall be determined or the existing pump curve revalidated by an inservice test.

3.4.1.3 Evaluation

The Code requires that either the resistance of the system be varied until the flow rate equals the reference value or the flow rate be varied until the pressure equals the reference value. Then either pressure or flow is recorded and compared with the Code pump acceptance criteria. The licensee has stated that it is impractical to establish repeatable reference values. NUREG-1482, Guidelines for Inservice Testing at Nuclear Power Plants, Section 5.2, states that the use of reference curves is not currently addressed by the Code and relief is required. Section 5.2 provides guidance for the use of variable reference values for flow rate and differential pressure during pump testing (i.e., reference curves). NUREG-1482 states that if the licensee implements this guidance, it must demonstrate the impracticality of achieving reference conditions for IST. The licensee states in its basis for requesting relief that the ESW system loops are not designed with a full flow test line with a single throttle valve. In addition, performing the test in accordance with the Code requirements may affect technical specification operability requirements. Therefore, the testing appears impractical to perform with the existing plant design. It would be a burden on the licensee if the Code requirements were imposed because the system would have to be redesigned to meet the Code requirements.

The licensee has proposed to use pump reference curves to determine compliance with the Code requirements. NUREG-1482 states that to obtain approval to use pump reference curves, the licensee must demonstrate that the acceptance criteria are equivalent to the Code requirements in Table 3b of Part 6 for allowable ranges using reference values. The guidance provides a list of seven elements that the licensee must perform in preparing pump curves for the IST pump relief request. The licensee has committed to these seven elements in their proposed alternative testing[1]. Adherence to this guidance provides assurance that the proposed reference curves satisfy the Code requirements and will detect degradation in the pump over the range of the curve bounded by reference points. Therefore, the proposed alternative provides reasonable assurance of operational readiness of the pump.

3.4.1.4 Conclusion

The staff concludes that because the Code requirements are impractical, relief is granted from the pump test procedure requirements of OMa-1988, Part 6, Paragraph 5.2(b), for the two ESW pumps and the alternative test method imposed, pursuant to 10 CFR 50.55a(f)(6)(i) based on the reasonable assurance of operational readiness provided by the proposed alternative test method, the impracticality of performing testing in accordance with the Code. This relief has been granted

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[1] In describing the instrumentation to be used to measure the pump hydraulic parameters, the licensee stated that these instruments "were calibrated to verify their accuracy prior to performing the tests". The licensee did not explicitly state that the instrumentation used to develop the pump curves is at least as accurate (accuracy and range) as required by Section 4.6.1 of OM Part 6. The licensee should request relief from these Code requirements if necessary.

The licensee also stated that the acceptance criteria do not conflict with the Technical Specifications or the Final Safety Analysis Report operability criteria. In order to be acceptable, the acceptance criteria must also be consistent with the Code requirements in Table 3b of OM-6 for allowable ranges using reference values. The acceptance criteria bases are documented in the licensee's calculation JAF 91-96 Rev.1 and are subject to NRC inspection.

giving due consideration to the burden on the licensee if the Code requirements were imposed on the facility.

4.0 VALVE TESTING PROGRAM

4.1 Automatic Depressurization/Main Steam (ADS/MS) System

4.1.1 Relief Request VRR-01

For valves 02RV-71A, B, C, D, E, F, G, H, J, K, and L, the licensee requests relief from the requirements of Section 4.2.1.4 of OM-10, which specifies that power-operated valves be stroke-time tested. These Code Class 1, Category B/C valves open when actuated by a manual switch to relieve reactor pressure during an accident or transient condition. Valves 02RV-71A, B, C, D, E, G, and H open on receipt of an automatic depressurization system (ADS) actuation signal.

4.1.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> These valves are fast-acting valves and do not have position indication. Therefore, stroke time cannot be effectively measured.
>
> When testing these valves, a reactor pressure of at least 50 psig is needed for opening by the pilot assembly and a minimum reactor pressure of 940 psig is specified to minimize potential damage to the pilot valve and disc surfaces. Testing at each startup from cold shutdown would produce additional stress cycles, which may lead to a low cycle fatigue failure.

In a letter dated July 30, 1998, the licensee stated that these valves are inaccessible during operation and are not equipped with external or remote position indication based on valve obturator or actuator position. Verification of valve position changes is based upon system response (i.e., thermocouple indication or acoustic monitors). The instruments which detect the process parameter variation are designed to provide a gross indication of valve position (open or closed). These instruments are not designed to correlate process parameter values, intermediate valve position, or stroke time. Installation of instrumentation to directly indicate valve position would require system modifications. These modifications would be costly and result in additional radiation exposure.

4.1.1.2 Proposed Alternate Testing

The licensee proposed the following:

> Following each refueling outage or once each operating cycle with reactor pressure at least 940 psig, these valves will be exercised in accordance with the operational test requirements set forth in the JAF Technical Specifications. SRV [safety relief valve] tailpipe temperatures and acoustic monitors will be used to verify valve opening.

4.1.1.3 Evaluation

Operation of these valves during power operation causes reactor pressure and power transients that could result in a reactor trip. It would not be practical to exercise these valves quarterly during power operation as failure to close may result in a rapid depressurization and cooldown of the reactor vessel (loss-of-coolant accident) and a reactor trip. NUREG-0626 "Generic Evaluation of Feedwater Transients and Small Break Loss-of-Coolant Accidents in GE-Designed Operating Plants and Near Term Operating License Applications" recommends reduction of challenges to relief valves to lessen the risk of small break loss of coolant accidents (see also NUREG-0737, Section II.K.3.16). Therefore, a reduced frequency of testing is appropriate.

These valves must be exercised while the reactor is at power because reactor steam warms the valve seating surfaces and aids in preventing seat damage and leakage. The valves should not be exercised when the reactor is at low temperature and pressure during cold shutdowns. In that condition, reactor steam is not available to warm them even though the valve operators are capable of cycling the valve without steam pressure. The licensee's proposal to full-stroke exercise these valves after refueling outages on the return to power operation with steam pressure of 940 psig gives adequate assurance of operational readiness.

These valves are not equipped with external or remote position indication based on valve obturator or actuator position. Verification of valve position changes is based on system response (i.e., thermocouple indication or acoustic monitors). This response is not very accurate and lags actual valve position. Installation of instrumentation to directly indicate valve position would require system redesign and modification. The licensee proposes to verify the operational readiness of these valves following each refueling outage or once each operating cycle when the reactor pressure is 940 psig, per plant Technical Specifications. Valve opening will be verified using temperature and acoustic monitors, which will provide assurance of valve operability.

4.1.1.4 Conclusion

Based on the determination that compliance with the Code requirements is impractical and considering the licensee's proposal, relief is granted and the alternative imposed pursuant to 10 CFR 50.55a(f)(6)(i). This relief has been granted giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

4.1.2 Relief Request VRR-02

The licensee requests relief from the requirements of OM-1, Section 3.3.1.1 for 02RV-71A, B, C, D, E, F, G, H, J, K and L. OM-1, Section 3.3.1.1 specifies the test sequence for ASME Class 1 pressure relief devices such as main steam pressure relief valves with auxiliary actuating devices. 02RV-71A, B, C, D, E, F, G, H, J, K and L are Code Class 1, Category B/C , main steam relief valves. These valves open to relieve reactor pressure during an accident or transient condition. (These valves can also be opened by a manual switch to relieve reactor pressure during an accident or transient condition and valves 02RV-71A, B, C, D, E, G, and H open on receipt of ADS actuation signal.)

4.1.2.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

Currently during refueling outages, the SRV pilot assembly is removed and transported to a certified valve testing facility for performance of the following tests: setpoint (lift pressure), reseat (reclosing pressure), and pilot stage seat tightness. A main body slave is used to test each pilot. ANSI/ASME OM-1 states, "No maintenance, adjustment, disassembly, or other activity which could affect as found set pressure or seat tightness data is permitted prior to testing." Since main body seat leakage is monitored continuously during normal plant operation, its seat tightness as found determination is satisfied prior to the pilot assembly removal.

ANSI/ASME OM-1 also states, "Tests prior to maintenance or set pressure adjustment, or both, shall be performed in the following sequence: (a) visual examination; (b) seat tightness determination; (c) set pressure determination; (d) determination of compliance with the Owner's set tightness criteria; (e) determination of electrical characteristics and pressure integrity of solenoid valves; (f) determination of pressure integrity and stroke capability of air actuator; (g) determination of operation and electrical characteristics of position indicators; (h) determination of operation and electrical characteristics of bellows alarm switch; and (i) determination of actuating pressure of auxiliary actuating device sensing element, where applicable, and electrical continuity".

Strict adherence to the sequence cannot be satisfied by testing the pilot assembly only. Currently, the plant's test practices ensure that applicable tests specified in ANSI/ASME OM-1 Section 3.3.1.1, Main Steam Pressure Relief Valves with Auxiliary Actuating Devices, are performed and the entire valve operability is verified in accordance with Technical Specifications, but not in the sequence specified by OM-1 Section 3.3.1.1.

Common industry practice is to test the Target Rock safety/relief SRV pilot assemblies as separate units. Therefore, removal of the entire valve assembly for testing would create hardship by (1) extending plant outages for the removal and installation process, (2) cost increase and schedule delays for decontamination, and (3) increased shipping expenses. These hardships are not warranted since there is no compensating increase in the level of quality and safety. The as found test data is not affected and all applicable tests required by ANSI/ASME OM-1 are performed.

4.1.2.2 Proposed Alternate Testing

The licensee proposed the following:

SRV pilot assemblies will be tested using a slave main valve body to comply with ANSI/ASME OM-1, Periodic Testing requirements.

4.1.2.3 Evaluation

The licensee does not test its SRVs using one complete test sequence. Rather, the licensee sends its SRV pilot assemblies to a certified valve testing facility for the performance of certain tests required by Section 3.3.1.1 of OM-1. Common industry practice is to test the Target Rock safety/relief SRV pilot assemblies as separate units. As a result, strict adherence to the sequence specified in Section 3.3.1.1 of OM-1 cannot be satisfied.

In Attachment 4 to the licensee's letter of July 30, 1998, the licensee correlated the OM-1 test sequence and requirements to those performed on the SRVs installed at the JAF plant. The testing sequence and practices used by the licensee ensure that all of the tests specified in Section 3.3.1.1 of OM-1 are performed (as applicable). The entire valve operability is verified in accordance with Technical Specifications, but not in the sequence specified by Section 3.3.1.1 of OM-1. Leakage of the main stage disks is monitored continuously during normal plant operation which is acceptable.

Removal of the entire valve assembly for testing would create hardship on the licensee by (1) extending plant outages for the removal and installation process, and (2) schedule delays for decontamination. Such hardships are without compensating increase in the level of quality and safety since the proposed alternative provides assurance of valve operability.

4.1.2.4 Conclusion

Based on the determination that the proposal provides reasonable assurance of operational readiness and, thus, compliance with the Code would result in hardship without a compensating increase in the level of quality and safety, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

4.2 Traversing In-Core Probe (TIP) System

4.2.1 Relief Request VRR-03

For the valves 07SOV-104A, B, and C, the licensee requests relief from the requirements of Section 4.2.1.4 of OM-10, which specifies that power-operated valves be stroke-time tested. These Code Class 2, Category A valves are required to close to provide containment isolation.

4.2.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> The computer control system for the TIP system includes a provision for measuring valve cycle time (opened and closed) and not closure time alone. The sequence opens the subject valve (stroke < 2 seconds), maintains it energized for 10 seconds (including the opening stroke), and de-energizes the valve solenoid allowing the valve to stroke closed (< 2 seconds). The total elapsed time is specified to be ≤ 12 seconds.

4.2.1.2 Proposed Alternate Testing

The licensee proposed the following:

> The overall cycle time (opened and closed) for these valves will be measured and evaluated in accordance with OM-10 Section 4.2.1.8.

4.2.1.3 Evaluation

07SOV-104A, B and C are containment isolation valves (CIVs) in the TIP system that close to isolate containment. Their operation is controlled by the TIP system computer, which also measures the stroke time of the overall cycle. The system opens each valve, then 10 seconds later it closes the valves. The overall cycle time is verified to be ≤ 12 seconds. Since the closure of the valves is initiated 10 seconds after the open signal and the acceptance criteria is ≤ 12 seconds, the proposed acceptance criteria is essentially the same as that applied to rapid-acting valves per GL 89-04, Position 6, (≤2 seconds) and is applied to operation in the safety function direction.

The test results will be evaluated per Section 4.2.1.8 of OM-10. Additionally, these valves are verified leak tight during Appendix J testing each refueling outage. To independently stroke time these valves to each position would require major system redesign and modification, and would be a hardship to the licensee that would not be offset by a compensating increase in the level of quality or safety. The proposed testing allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code requirements.

4.2.1.4 Conclusion

Based on the determination that the proposal provides reasonable assurance of operational readiness and, thus, compliance with the Code would result in hardship without a compensating increase in the level of quality and safety, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

4.3 High Pressure Coolant Injection (HPCI) System

4.3.1 Relief Request VRR-04

For 23HPI-402 and 23HPI-403, the licensee requests relief from the requirements of Section 4.3.2.2 of OM-10 which states that each check valve shall be exercised or examined in a manner which verifies obturator travel to the closed, full-open or partially open position required to fulfill its function. These ASME Code Class 2, Category C, HPCI turbine exhaust line check valves open to eliminate any differential pressure that could force water from the suppression chamber into the HPCI exhaust piping when the suppression chamber pressure is greater than atmospheric. They close to prevent HPCI exhaust steam from entering the suppression chamber air space, thus bypassing the quenching action of the suppression pool.

4.3.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> There are no position indicators on these valves or other means for verifying valve closure[;] thus[,] the only practical means of verifying closure is to perform a back-leakage test. Since the valves are installed in series with no intermediate test tap, verifying [that] each individual valve closes is not practical.
>
> To perform the specified safety function in the closed direction, only one valve of the pair needs to close. Thus in accordance with NUREG-1482 Section 4.1.1, verifying that either valve closes is adequate to demonstrate reliable operation of the pair.

4.3.1.2 Proposed Alternate Testing

The licensee proposed the following:

> These valves will be exercised open and the pair (at least one valve) will be verified to close during cold shutdown and each refueling outage in accordance with OM-10 Section 4.3.2.2 (f) and (g). In accordance with NUREG-1482, if the closure test of the pair of valves fails, then corrective action will be applied to both valves prior to returning the system to operability.

4.3.1.3 Evaluation

These check valves are located in series without intermediate test taps. They are simple check valves not equipped with position indication or external operators. Their function is to close to prevent steam from entering the suppression chamber vapor space and to open to break the vacuum created by condensing steam in the turbine exhaust line. According to system drawings, the line containing these valves has isolation valves and test taps accessible outside of the suppression chamber. This provision should allow testing with air or nitrogen, both open (which tests both valves open) and closed (which confirms only the closure capability of one valve of the pair).

The licensee is unable to individually verify closure of these valves at any frequency. Thes valves have no provision for external verification of position (i.e., position indicators, pipe taps). Requiring installation of instrumentation to verify valve position would involve system redesign and modifications. These modifications would be burdensome to the licensee. However, the closure capability of this valve pair in series could be verified by leak testing. Testing the pair closed would give reasonable assurance of operational readiness and supply a reasonable alternative to the Code test method provided that both valves are declared inoperable and repaired or replaced if excessive leakage is noted. This position is consistent with the guidance provided in Section 4.1.1 of NUREG-1482.

The staff notes (i.e., from the licensee's cold shutdown justification for these valves (CSJ-11)) that operation of the HPCI pump turbine does not prove operability of these valves and special testing of these valves would be required. This testing necessitates isolation of the vacuum breaker piping, which results in the inoperability of the HPCI system for the duration of the test. Due to the importance of the HPCI system function and the lack of a redundant HPCI train, it is not prudent to perform this testing during plant operation at power. Therefore, the closure test, and the open test should be performed during cold shutdowns and each refueling outage as proposed by the licensee.

4.3.1.4 Conclusion

Based on the determination that the proposal provides reasonable assurance of operational readiness and, thus, compliance with the Code would result in hardship without a compensating increase in the level of quality and safety, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

4.4 Containment Atmosphere Dilution (CAD) System

4.4.1 Relief Request VRR-05

The licensee requests relief from the requirements of Section 1.3.4.3 (b) of OM-1 for 27AOV-IOIA, 27AOV-IOIB, 27VB-6, and 27VB-7. This section of the Code requires that primary containment vacuum relief valves be leak tested every 2 years unless historical data indicates a requirement for more frequent testing. 27AOV-IOIA, 27AOV-IOIB, 27VB-6, and 27VB-7 are ASME Code Class 2, Category A/C, valves that are required to open to equalize pressure in the torus with pressure in the reactor building and close to provide containment isolation.

4.4.1.1 Licensee's Basis for Request

The licensee provided the following basis for the relief request:

> The requirements for leak testing of containment isolation valves are covered in OM-10 Section 4.2.2.2. Compliance to OM-1 Section 1.3.4.3 (b) would treat these containment isolation valves differently than all other containment isolation valves. As stated in OM-10 Section 4.2.2.2, containment isolation valve leak testing shall be in accordance with 10 CFR 50 Appendix J.

4.4.1.2 Proposed Alternate Testing

The licensee proposed the following:

> Leak test the valves in accordance with OM-10 Section 4.2.2.2.

4.4.1.3 Evaluation

Section 4.2.2.2 of OM-10 requires that Category A valves, which are containment isolation valves (such as 27AOV-IOIA, 27AOV-IOIB, 27VB-6, and 27VB-7), shall be leak tested in accordance with 10 CFR Part 50, Appendix J. 10 CFR 50, Appendix J specifies both the frequency and method for testing various types of containment isolation valves (CIV).

In NRC Generic Letter 89-04, the NRC staff determined that the leak test procedures and requirements for CIVs specified in 10 CFR Part 50, Appendix J are equivalent to the requirements of IWV-3421 through 3425. IWV-3422 specifies that the leak-rate testing for Category A valves shall be conducted at least once every 2 years. This test frequency requirement is substantively identical to the requirement of Section 1.3.4.3(b) of OM-1 from which the licensee seeks relief. The staff concludes that compliance with the 2-year leak rate test frequency requirement, that is generally applicable to all ASME Class 2 and 3 primary containment vacuum relief valves is unnecessary in this instance because these particular valves also function as containment isolation valves and therefore must meet the Appendix J leak rate test requirements. Appendix J leak rate testing provides an acceptable level of quality and safety for CIVs by assuring valve leak integrity.

The staff is currently engaged in rulemaking to delete the limitation contained in 10 CFR 50.55a(b)(2)(vii) that CIVs "must be analyzed in accordance with paragraph 4.2.2.3(e) of Part 10, and corrective actions for these valves must be made in accordance with paragraph

4.2.2.3(f) of part 10 of ASME/ANSI OMa-1988 Addenda to ASME/ANSI OM-1987." The licensee must continue to meet this limitation on CIVs until rulemaking is final.

4.4.1.4 Conclusion

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

4.5 Service Water/Emergency Service Water System

4.5.1 Relief Request VRR-06

The licensee withdrew this relief request in its letter dated July 30, 1998.

5.0 REVIEW OF DEFERRED TEST JUSTIFICATIONS

Exercising valves on a cold shutdown frequency is not a deviation from the Code. The Code allows for testing during cold shutdown outages if it is impractical to test quarterly during operation. OM-10 allows for a refueling outage frequency if it is impractical to conduct testing quarterly while in operation, and during cold shutdown. The licensee must list these valves in the IST program and include cold shutdown justifications or refueling outage justifications for each valve or group of valves affected. Section 2.4.5 of NUREG-1482 recommends that these cold shutdown and refueling outage justifications be included in the IST program submitted to the NRC. While staff approval of deferred test justifications are not required by 10 CFR 50.55a, the staff reviewed the licensee's cold shutdown and refueling outage justifications for their consistency with Section 2.4.5, 3.1.1, and 4.1.4 of NUREG-1482.

In several deferred test justifications (e.g., CSJ-06, CSJ-09, CSJ-11) the licensee indicated that it would be imprudent [emphasis added] to test certain valves quarterly at power because of the associated decreased in the ability of the plant to respond to accident or transient conditions when these components were taken out of service for testing. While increased vulnerability of the plant to accident or transient conditions while in the test configuration is not listed as an example of impractical conditions justifying test deferrals in NUREG-1482, the staff agrees that it may be an acceptable basis on which to defer testing depending on the safety significance of the component(s) being taken out of service for testing and on the duration of the equipment outage. However, extending the test interval for a component with high safety significance can increase the time that the component is in a degraded or faulted condition without being detected and repaired (i.e., increase the component's fault exposure time) and thus result in an increase in risk. The licensee should revise the justification provided in the JAF IST program description for deferring these check valve tests (i.e., CSJ-06, CSJ-09, CSJ-11) to clarify why it is impracticable to test these valves quarterly during plant operation as required by the Code. If it is practical to test the subject check valves in accordance with the Code, the licensee should either test these valves quarterly or seek relief from the Code test requirements as necessary.

The staff notes that all of the licensee's excess flow check valve testing has been deferred to refueling outages (ROJ-01). The licensee indicated that exercising these valves requires isolation of their associated safety-related instrumentation, which could place the plant in an unsafe condition, initiate a plant transient or ECCS system actuation, or result in increased radiological exposure. While all of these are acceptable reasons for deferring quarterly at-power testing, the staff has observed (based on testing conducted at other BWRs prior to refueling outages while the reactors were still at power) that the testing of some excess flow check valves at power may be practical. The licensee should ensure that excess flow check valves are tested quarterly at power where practicable.

6.0 OVERALL CONCLUSIONS

The proposed alternative in relief request VRR-05 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on a determination that the proposal provides an acceptable level of quality and safety. The proposed alternative in relief requests PRR-01, PRR-02R1, PRR-03, PRR-04, VRR-02, VRR-03, and VRR-04 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on determinations that compliance with the Code would result in a hardship without a compensating increase in the level of quality and safety. Relief requests PRR-05R1 and VRR-01 are granted and the alternatives imposed as requested pursuant to 10 CFR 50.55a(f)(6)(i) based on the determination that compliance with the Code requirements is impractical. These reliefs are 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 would result if the requirements were imposed on the facility.

The standby liquid control system pump testing alternative PRR-02R1 is authorized for an interim period of 1 year pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that immediate compliance with the requirements would result in a hardship without a compensating increase in the level of quality and safety. This interim period will provide the licensee sufficient time to adequately address flow rate measurement accuracy. The licensee should either 1) resubmit this relief request with a more detailed description of how pumping time and human factors considerations preclude meeting the Code flow rate accuracy requirement (e.g., limitations associated with the sight glass design, graduation, orientation, or temporary test tank level instrumentation) and provide an indication of the flow rate accuracy that can reasonably be achieved with the installed system configuration or 2) install a flow rate instrument that directly measures the pump flow rate to the level of accuracy required by the Code.

All of the other relief requests that are granted and alternatives that are authorized in this safety evaluation are valid for the remainder of the licensee's third 10-year inservice testing interval.

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Date: November 17, 1998