



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY

DIABLO CANYON POWER PLANT UNITS 1 AND 2

DOCKET NOS. 50-275 AND 50-323

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 and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Commission pursuant to 10 CFR 50.55a(f)(6)(i), (a)(3)(i), or (a)(3)(ii). In order to obtain authorization or relief, the licensee must demonstrate that: (1) conformance is impractical for its facility; (2) the proposed alternative provides an acceptable level of quality and safety; or (3) compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Guidance related to the development and implementation of IST programs is given in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," issued April 3, 1989, and its Supplement 1, issued April 4, 1995. Also, NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," that was promulgated by GL 89-04, Supplement 1, provides guidance.

Section 50.55a authorized the Commission to grant relief from ASME Code requirements or to approve proposed alternatives upon making the necessary findings. The NRC staff's findings with respect to granting or not granting the relief requested or authorizing the proposed alternative as part of the licensee's IST program are contained in this Safety Evaluation (SE).

By letter dated December 29, 1995, Pacific Gas and Electric Company (licensee) submitted relief requests P-RR1, P-RR2, and V-RR12 for Diablo Canyon Power Plant (DCPP) Units 1 and 2, second ten-year interval program for IST of pumps and valves. The DCPP Units 1 and 2 IST Program was developed to the 1987 Edition of ASME Operation and Maintenance (OM) Standard, with addenda through OMa-1988, for the second ten-year interval that began on January 1, 1996, for Unit 1 and on June 1, 1996, for Unit 2.

2.0 RELIEF REQUEST P-RR1

P-RR1 requests relief from OM-6, Paragraph 4.6.1.2.(b), which states that digital instruments shall be selected such that the reference value shall not exceed 70 percent of the calibrated range of the instrument.

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### Licensee's Basis for Request

The licensee provided the following basis:

Digital instruments are used for measuring pressure, flow, speed, and vibration.

All digital gauges used at DCPD meet the accuracy requirements of Part 6, Section 4.6.1.1, and Table 1. The percent of accuracy is applied over the calibrated range of the instrument.

Relief is requested from the requirement that the reference value cannot exceed 70% of the calibrated range. To satisfy this requirement, it may, at times, be necessary to select a higher than desired full scale range on the instrument. Applying the gauges' percent of error to this higher full-scale range would result in a greater error and, therefore, a less accurate reading.

This has become burdensome for testing some of DCPD's safety related pumps whose full flow differential pressure are close to their Technical Specification (TS) limits. Due to the Code's requirement, gauges must be installed with the full-scale range high enough to ensure that the full flow differential pressure is less than 70% of full-scale value. To determine the instrument inaccuracy, DCPD then multiplies the gauges' percent of error times the full-scale value. This inaccuracy is then added to the result from the in-field measured differential pressure. At times, this extra error can cause a test to fail or unnecessarily create extra workload for the I&C calibration lab by requiring pre- and post-calibrations. This 70% rule has also required selecting and installing different instruments and/or calibration for different operational conditions resulting in additional costs and personnel utilization hardship with no benefit in the pump testing.

All gauges, analog or digital, used at DCPD are selected for use within their calibrated range and within the accuracy requirements of Part 6, paragraph 4.6.1.1, as specified in Table 1, or better.

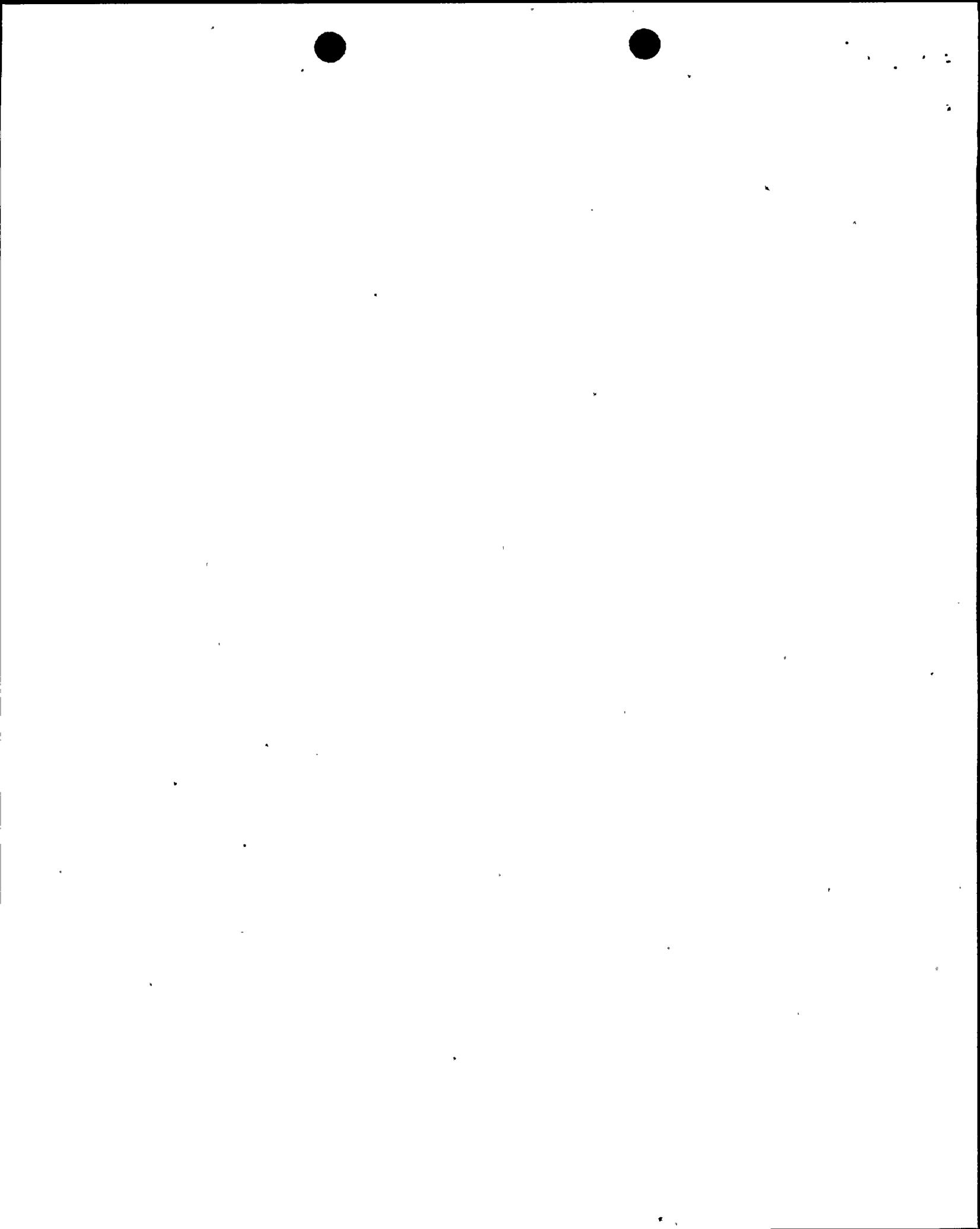
### Proposed Alternate Testing

The licensee proposed the following:

All digital gauges will satisfy the accuracy requirement of OM-6, Paragraph 4.6.1.1, and Table 1, and be used within the calibrated range of the instrument.

### Evaluation

The instrument accuracy and range requirements of OM-6, Paragraph 4.6, are to ensure that test measurements are sufficiently sensitive to changes in pump condition to allow detection of degradation. With regard to digital instruments, OM-6, Paragraph 4.6, specifies that Table 1 requirements for



accuracy apply over the calibrated range and that the reference value shall not exceed 70 percent of the calibrated range of the instrument. Section 5.5.2 of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants" provides guidelines on the use of digital instruments.

The licensee has requested relief from the requirement that the reference value cannot exceed 70 percent of the calibrated range. In order to meet this requirement, it may be necessary to select a higher range on the instrument. The licensee indicated that selecting a higher range would result in a less accurate reading and can cause a test to fail or require recalibrating the instruments, thereby resulting in "hardship with no benefit in the pump testing."

It is not evident from the information presented that there is "hardship with no benefit in the pump testing." In order to justify this request, the basis should be expanded to include the following: (1) description of the instrument(s), including manufacturer's technical specifications, calibration procedures, and vendor's recommendation with regard to measurements above 70 percent of calibrated range; (2) historical test and maintenance record of the pump(s) tested by the instrument; and (3) description of how the instrument's accuracy varies above 70 percent of calibrated range. The licensee's basis as presented is not in sufficient detail to justify this request. Relief is therefore denied.

### Conclusion

Based on the determination that the relief request is not in sufficient detail to justify the proposed alternative, relief as requested is denied.

### 3.0 RELIEF REQUEST P-RR2

P-RR2 requests relief from the Code requirements for vibration monitoring of the turbine-driven auxiliary feedwater pumps 1-1 and 2-1. Table 3a of OM-6 specifies, in part, that the pump testing frequency be doubled from every three months to every six weeks whenever the measured vibration levels fall within the alert range. P-RR2 requests that the lower limit on the alert range be relaxed from 0.325 in/sec to 0.450 in/sec for the pump bearings vibration testing on recirculation.

### Licensee's Basis for Request

The licensee provided the following basis:

The auxiliary feedwater (AFW) system provides a backup source of feedwater to the secondary side of the steam generators when the main feedwater system is unavailable. This maintains the heat removal capability of the steam generators. The system also functions as a source of feedwater during plant startups and shutdowns. The turbine-driven AFW pumps are used as an emergency back up to the motor-driven auxiliary feedwater pumps.



They are tested in accordance with ASME/ANSI OMa-1988 and Technical Specification 4.7.1.2.1.

Baseline testing and subsequent quarterly testing of the turbine-driven AFW pumps are performed while on recirculation. The baseline vibration levels for the outboard pump bearings were measured at 0.312 in/sec for pump 1-1 and 0.316 in/sec for pump 2-1. This was investigated and the pumps were found to be operating acceptably. Subsequent testing also showed that there is no increasing trend in vibration levels.

Per the ASME Code, any vibration levels greater than 0.325 in/sec fall into the alert range, which requires that the pump's testing frequency be doubled. Since these pumps were baselined, subsequent tests have yielded vibration levels either just slightly above or below 0.325 in/sec, thereby essentially oscillating around that value.

This vibration level is due to hydraulic instabilities in the pump during testing. The operating design flow for these pumps is 930 GPM. Due to thermal fatigue and plant transient concerns, the surveillance test is run with the pump on recirculation. Recirculation flow is approximately 45 gpm. To further investigate this vibration issue, vibration readings were taken during the 18-month full-flow test. The vibration levels dropped from >0.300 in/sec on recirculation to 0.099 in/sec at full flow.

The vibration levels observed on recirculation do not warrant doubling the testing frequency. In addition, industry experience has shown that extended or frequent operation at minimum flow can cause pumps to degrade. In the case of these pumps, vibration at an alert level of 0.325 in/sec is not indicative of potential pump problems when tested on recirculation.

#### Proposed Alternate Testing

The licensee proposed the following:

PG&E will set the vibration alert level to 0.45 in/sec for the turbine driven AFW pump bearing for pump testing on recirculation flow. The current action level of 0.700 in/sec will remain the same. The upper limit of the observed vibration data scatter is approximately 0.400 in/sec. An alert level of 0.450 in/sec will prevent the normal vibration from putting the pump on alert, yet it will still provide sufficient warning if the pump begins trending toward the action limit. The vibration levels will continue to be evaluated to the 0.325 in/sec alert level during full flow performance testing as required by the Code.

#### Evaluation

OM-6 requires that pumps with vibration levels between 0.325 in/sec and 0.700 in/sec be classified in the alert range and that the testing frequency



be doubled (from quarterly to every six weeks) until the cause of the vibration is determined and the condition corrected. The turbine-driven AFW pumps are used as an emergency back-up to the motor-driven AFW pumps, which are used to provide feedwater to the secondary side of the steam generator when the main feedwater system is not available and during plant startup and shutdown. The licensee believes that because of hydraulic instabilities associated with running the pumps at minimum flow, the lower limit on the vibration alert level of 0.325 in/sec would not be indicative of a potential pump problem when tested on recirculation. The licensee proposes to relax the alert level for these pump from 0.325 - 0.700 in/sec to 0.450 - 0.700 in/sec to reduce unnecessary vibration testing. During the 18-month full flow testing, the alert range of 0.325 - 0.700 in/sec will continue to be applied. The required action level would not be affected by the relief.

The basis provided by the licensee does not include vendor's recommendations or discussion of the cause for the high vibration levels being experienced for these pumps other than the lower flow conditions. Increasing the limit for alert action might be justified for an interim period in order for the licensee to provide additional information to justify the proposed alternative. The licensee should (1) assess methods to reduce current pump vibration levels, (2) confirm that an analysis has been performed which demonstrates that the pump is capable of continued operation at higher (i.e., up to 0.450 in/sec) vibration levels, (3) obtain the pump manufacturer's recommendation with respect to the proposed alternative, and (4) spectral analysis of the vibration signature of the pumps, if available.

Increasing the test interval when the alert limit is exceeded would result in additional testing of the pump, which could cause accelerated wear and tear. Given that the required action level specified in the Code is not affected by the relief and that the Code-required alert range will continue to be applied during the 18-month full-flow testing, compliance during the interim period would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative should provide an acceptable level of quality and safety during the interim period.

### Conclusion

For an interim period of six months from the date of the letter forwarding this safety evaluation, the proposed alternative testing is authorized pursuant to 10 CFR 50.55a (a)(3)(ii), based on a finding that compliance during this interim period would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee should provide the NRC within six months a revised request indicating the actions taken and providing additional basis to raise the alert limit.

### 4.0 RELIEF REQUEST V-RR12

Relief is requested from OM-10, Paragraph 4.2.1.1, which requires Category A and B valves to be tested nominally every 3 months, except as provided by Paragraphs 4.2.1.2, 4.2.1.5, and 4.2.1.7. This relief request pertains to all manually operated valves.



### Licensee's Basis For Request

The licensee provided the following basis:

This relief will apply to all manual valves which have an active safety function to stroke open and/or close. This would include manual valves which are credited in the safety analysis for being capable of being repositioned to shut down the plant, to maintain the plant in a safe shutdown condition, or to mitigate the consequences of an accident.

ASME/ANSI OMa-1987 including OMa-1988 addenda does not explicitly address the exercising frequency for manual valves. NRC GL 89-04, Supplement 1 (NUREG-1482) stated the NRC's position that the Code does include manual valves and that manual valves must be tested per the Code. This implies that the stroking of manual valves with an active safety function is covered by paragraph 4.2.1.1, which stated that they shall be tested nominally every three months.

In response to NUREG-1482, the O&M Committee has drafted changes to the Code that provides an exclusion to paragraph 4.2.1.1 for manual valves. This exclusion will allow manual valves to be tested on a nominal frequency of every five years. The precedent for a five year frequency is provided in OM-1 for Class 1 safety and relief valves.

Although the Code is moving toward a five year frequency, DCPD is proposing that all safety related Code Class 1, 2, and 3 manual valves be exercised at a refueling outage frequency.

### Proposed Alternate Testing

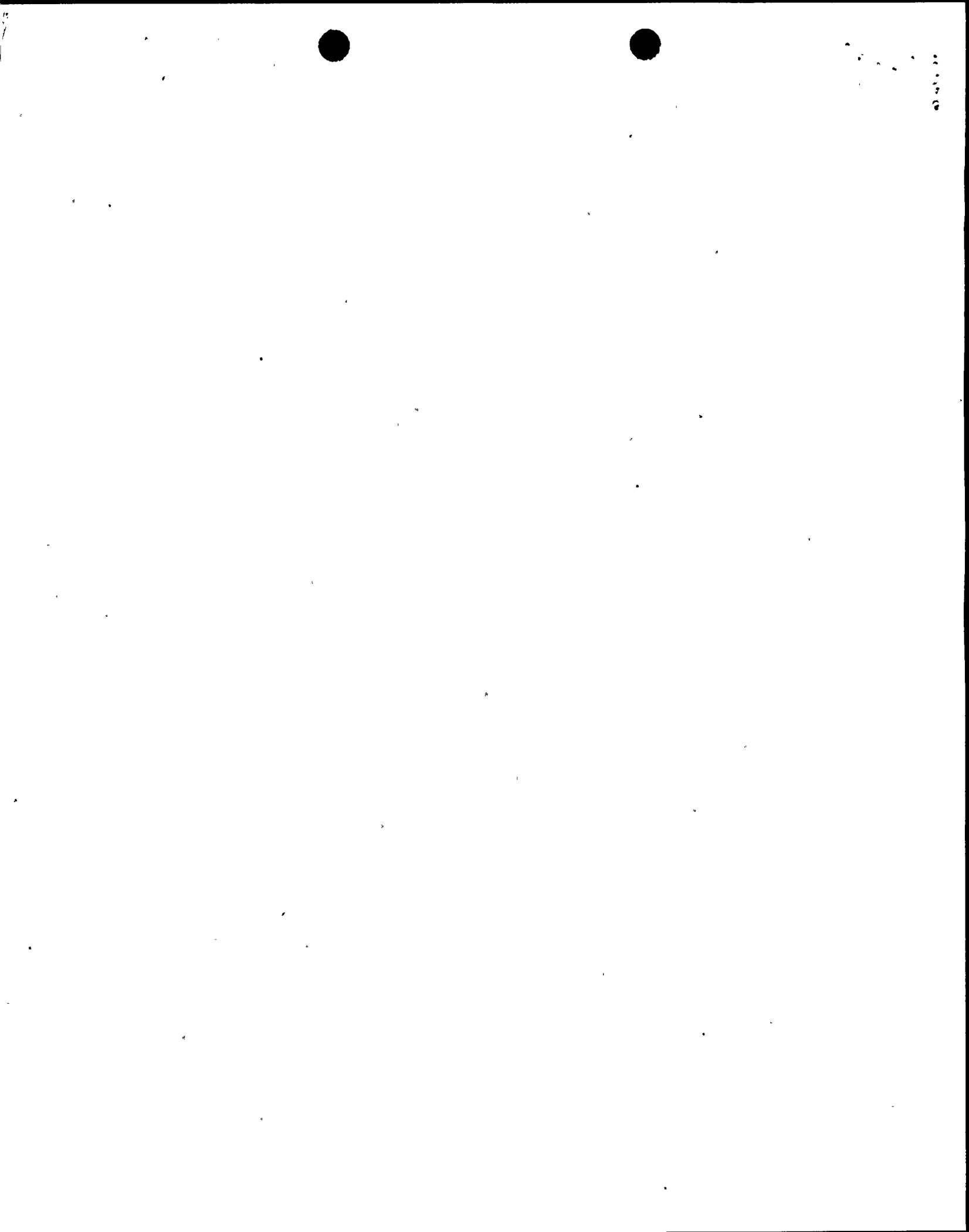
The licensee proposed the following:

These valves will be exercised every refueling outage to verify their active safety functions. Manual valves which have a safety function to prevent back leakage or to have their position indications verified will continue to have these functions tested per the Code required frequencies.

### Evaluation

The NRC's position with respect to inservice testing of manual valves is contained in NUREG-1482, Section 4.4.6, "Manual Valves," which states:

The staff has received questions about the requirements for including manual valves in the IST programs. The Code includes manual valves that meet the scope requirements of 10 CFR 50.55a. To comply with the Code, exercising requirements for a manual valve must be in accord with applicable IST requirements of IWV or OM-10 if the manual valve is credited in the safety analysis for being capable of being repositioned to shut down the plant, to maintain the plant in a safe shutdown condition, or to mitigate the consequences of an accident. (If the manual valve is included in actions in emergency operating procedures,



but is not credited in the safety analysis, it does not fall within the scope of the IST program; however, such a valve may be periodically exercised at an appropriate frequency to ensure that it can move freely for reasons other than IST.) Applicable inservice tests could include exercising (but not stroke timing), leak testing, and position indication verification, at the frequency specified in the code, as practical. Additionally, manual valves which are passive but have position indication would be subject to position indication verification.

The manual valves in question have an active safety function to stroke open and/or close. Although, the proposed alternative calls for exercising the manual valves every refueling outage, the basis does not address the impracticability of testing quarterly and during cold shutdowns as required by the Code. The fact that a Code Committee appeared to be moving toward a five-year interval would not, in itself, justify relaxing the test interval. Relief as requested is therefore denied based on the information presented.

If exercising the valves is impracticable during power operation on a quarterly basis and during cold shutdown, relief request is not required to defer testing to every refueling outage, since OM-10, Paragraph 4.2.1.2, allows full-stroke exercising at each refueling outage under such conditions. NUREG-1482, Section 2.4.5, "Deferring Valve Testing to Cold Shutdown or Refueling Outages," provides additional information with regard to this issue. The basis for deferral of testing is subject to review during NRC inspections.

### Conclusion

If exercising the valves is impracticable during power operation on a quarterly basis and during cold shutdown, relief request is not required to defer testing to every refueling outage as long as justification is documented in the IST program for performing tests during every refueling outage. The licensee proposes to use an alternate method and does not show the impracticability of testing quarterly and during cold shutdowns as required by OM-10, Paragraph 4.2.1.2. Relief as requested is denied based on the information presented.

### 5.0 CONCLUSION

Relief requests V-RR12 and P-RR1 are denied. Relief request P-RR2, which proposes to relax the alert limit for pump vibration measurements, is authorized pursuant to 10 CFR 50.55a (a)(3)(ii) for an interim period of six months from the date of the SE based on a finding that compliance during this interim period would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. For relief request P-RR2, the licensee should investigate alternatives and/or provide additional information to justify the proposed alternative beyond the interim period.

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