



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 REQUEST FOR RELIEF PR-5  
FLORIDA POWER AND LIGHT COMPANY  
TURKEY POINT UNITS 3 AND 4  
DOCKET NUMBERS 50-250 AND 50-251

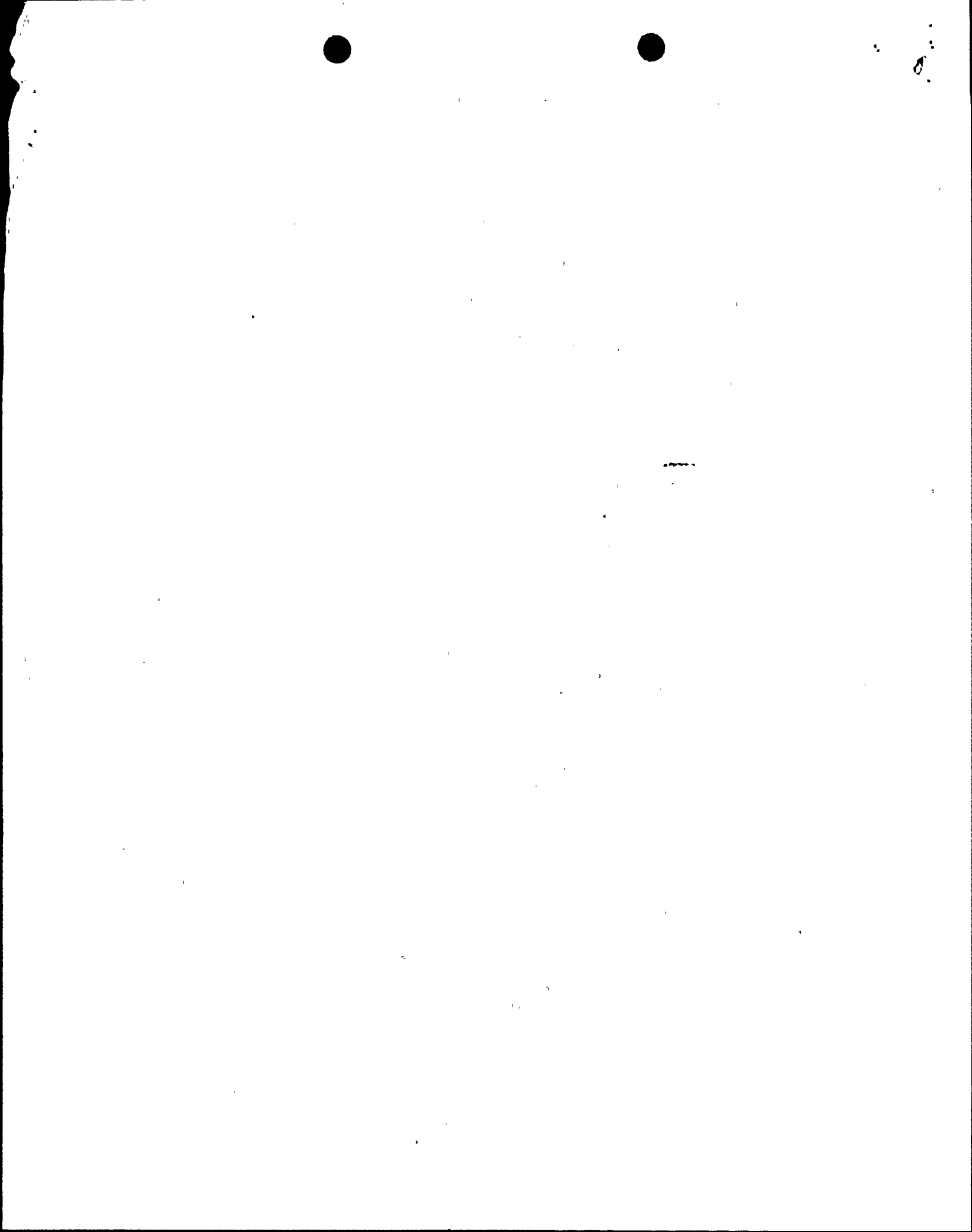
1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain 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. 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 without further NRC review. Implementation of the GL 89-04 positions is subject to inspection.

Section 10 CFR 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. 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 contained in this Safety Evaluation (SE).

The IST program evaluated in this SE covers the third 10-year IST interval for Turkey Point Units 3 and 4. The interval for Unit 3 began February 22, 1994, and the interval for Unit 4 began April 15, 1994. The third 10-year interval IST program is based on the requirements of the 1989 Edition of the ASME Section XI Code which references ANSI/ASME Standard OMA-1988, Part 6 (OM-6), for inservice testing of pumps. In Florida Power and Light Company's (the licensee) letter dated January 12, 1994, new Relief Request PR-5 was submitted. The licensee requested review of this new relief request by August 31, 1994. The remaining relief requests were approved in earlier intervals and have been updated to the 1989 Edition of Section XI of the ASME Code as necessary. A later Safety Evaluation will address the remaining relief requests as revised in accordance with the 1989 Edition of Section XI of the ASME Code.

9405260212 940519  
PDR ADOCK 05000250  
P PDR



## 2.0 RELIEF REQUEST PR-5

Relief Request PR-5 applies to the intake cooling water pumps P9A, P9B, and P9C. The applicable Code requirement is stated in Paragraph 4.6.1.6 of OM-6, which requires 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 1000 Hertz (Hz). The licensee requests relief to use instrumentation that does not meet the frequency response range.

### 2.1 Licensee's Basis for Relief

The licensee states:

The speed of the intake cooling water (ICW) pumps is approximately 900 rpm relating to a rotational frequency of 15 Hz. In order to satisfy the requirements of Paragraph 4.6.1.6, a vibration measurement system capable of measuring vibration to a lower limiting frequency of 5 Hz. would be required.

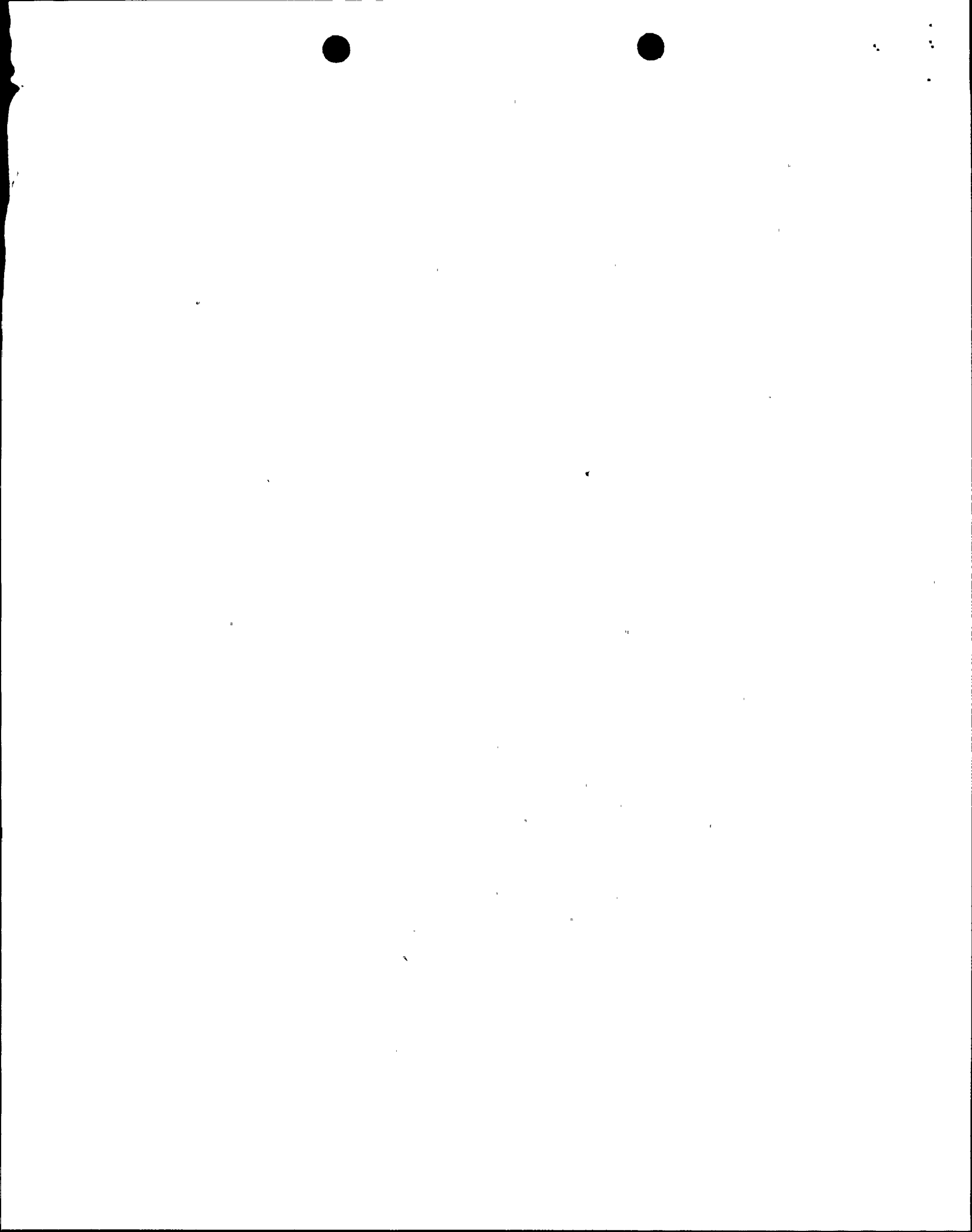
The instruments currently being used at Turkey Point have a lower frequency limit of 350 CPM [cycles per minute] or 5.8 Hz. This instrumentation is "state-of-the-art" industrial grade, high quality equipment. Satisfying the Code requirements with respect to frequency response would require the unnecessary procurement of new and more sophisticated equipment beyond that intended by the Code.

Monitoring lower frequencies (less than rotational speed) is performed primarily for the purpose of detecting oil whirl in the pump bearings. Other conditions that could result in low frequency vibration (less than shaft speed) are included in the general category of mechanical "rub" which is not considered to be significant from the aspect of pump degradation.

The use of the existing instrumentation as specified by the alternate testing will adequately provide for monitoring pump condition for the following reasons:

- (a) For vertical shaft equipment rotating at these speeds oil whirl is an unlikely phenomenon; and
- (b) If oil whirl were to occur, it would be manifested at a frequency equal to one-half of the rotational frequency, or, in this case, approximately 7.5 Hz., which is well within the range of the proposed instrumentation.

Vibration measurements taken on these pumps with instruments capable of monitoring frequencies to 5.8 Hz. are adequate for assessing the operational readiness of these pumps as required by the Code.



## 2.2 Alternative Testing

The licensee proposes:

The instruments used for measuring vibration on the ICW pumps will have a frequency response range that extends to a lower limiting frequency of 6 Hz. or less.

## 2.3 Evaluation

In a paper entitled "Introduction to ASME/ANSI OMa-1989A, Part 6 - 'Inservice Testing of Pumps in Light-Water Reactor Power Plants' - and Technical Differences Between Part 6 and ASME Section XI, Subsection IWP," by John Zudans of Florida Power and Light Company, included in NUREG/CP-0111, "Proceedings of the Symposium on Inservice Testing of Pumps and Valves," the change in the frequency response range is discussed. According to the paper, the change in the frequency response range from "1/2 minimum speed to at least maximum pump shaft rotational speed" in Section XI, IWP, to "1/3 minimum pump shaft rotational speed to at least 1000 Hertz" in OM-6 was based on a publication on measuring vibration for "velocity" testing, to more adequately envelope all potential noise contributors.

The Code requirements for frequency response ranges are general in order to cover the various types of pumps installed in safety-related applications in nuclear power plants. The 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. Though vibration instrumentation in low frequency response ranges is available, it is not in wide use, is difficult to calibrate, and may not be as commercially available as other instrumentation.

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. Vibrations at one-half of running speed, or lower, may indicate "oil whip" in journal bearings, or looseness in other types of bearings. Though the relief request basis does not describe the type of bearings in the ICW pump, it does indicate that oil whip would be indicated within the range of the available instrumentation. The instrumentation is within 0.8 Hz of an instrument that would meet the OM-6 requirement to be in a range of 1/3 rotational speed to 1000 Hz (5.8 Hz versus 5.0 Hz).

The instrumentation conformed with the requirements of IWP (1/2 rotational speed). It would be a hardship or unusual difficulty to require the licensee to procure new vibration instrumentation, which is not currently

widely available in the commercial market at very low frequency ranges, for application to only one group of pumps in the inservice testing program. Imposition of the requirements for 1/3 running speed would not provide a compensating increase in the level of quality and safety in the monitoring of the pumps.

#### 2.4 Summary

The alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on the hardship or unusual difficulty without a compensating increase in the level of quality and safety that would ensue if the Code requirements were imposed. The alternative method provides adequate assurance of the operational readiness of the intake cooling water pumps.

#### 3.0 CONCLUSION

The staff concludes that the relief request evaluated in this SE will provide reasonable assurance of the operational readiness for the applicable pumps to perform their safety-related functions. The staff has determined that authorizing an alternative pursuant to 10 CFR 50.55a (a)(3)(ii) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest. In making this determination, the staff has considered the burden on the licensee if the Code requirements were imposed.

Principal Contributor: Patricia Campbell, DE/EMEB

