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

September 15, 2014

Vice-President, Operations
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – INSERVICE TESTING PROGRAM ALTERNATIVE REQUEST PRR-05 RE: RESIDUAL HEAT REMOVAL PUMP VIBRATION LEVELS (TAC NO. MF3680)

Dear Sir or Madam:

By letter dated February 21, 2014, as supplemented by letter dated July 31, 2014, Entergy Nuclear Operations, Inc., the licensee, submitted alternative request PRR-05 to the Nuclear Regulatory Commission (NRC). The licensee proposed alternatives to certain inservice testing (IST) requirements of the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code), for the IST program at the James A. Fitzpatrick Nuclear Power Plant (Fitzpatrick) for the remainder of the fourth 10-year IST program interval, which began on October 1, 2007 and is scheduled to end on September 30, 2017.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use the proposed alternative in PRR-05 regarding vibration level requirements for the residual heat removal pumps on the basis that the ASME OM Code requirements present an undue hardship without a compensating increase in the level of quality or safety.

The NRC staff has determined that proposed alternative PRR-05 provides reasonable assurance that the affected components are operationally ready. The staff further finds that complying with the specified ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the staff authorizes alternative request PRR-05 for Fitzpatrick for the remainder of the fourth 10-year IST program interval. All other ASME OM Code requirements for which relief or an alternative was not specifically requested and approved in the subject requests remain applicable.

Please contact Douglas Pickett at 301-415-1364 or Douglas.Pickett@nrc.gov if you have any questions.

Sincerely,

Benjamin G. Beasley

Benjamin G. Beasley, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure:
Safety Evaluation

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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 NO. PRR-05 FOR THE FOURTH 10-YEAR INTERVAL

ENTERGY NUCLEAR OPERATIONS, INC.

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated February 21, 2014 (Agencywide Documents Access Management System (ADAMS) Accession No. ML14057A553), as supplemented by letter dated July 31, 2014 (ADAMS Accession No. ML14213A115), Entergy Nuclear Operations, Inc., the licensee, submitted alternative request PRR-05 to the Nuclear Regulatory Commission (NRC) for review and approval. The licensee proposed alternatives to certain inservice testing (IST) requirements of the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code), for the IST program at the James A. Fitzpatrick Nuclear Power Plant (Fitzpatrick) for the remainder of the fourth 10-year IST program interval, which began on October 1, 2007 and is scheduled to end on September 30, 2017.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use proposed alternative PRR-05 on the basis that the ASME OM Code requirements present an undue hardship without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Paragraph 10 CFR 50.55a(f), "Inservice Testing Requirements," states, in part, that IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda.

Paragraph 10 CFR 50.55a(a)(3), states, in part, that alternatives to the requirements in paragraph (f) of 10 CFR 50.55a may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternative provides an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the NRC's findings with respect to authorizing the proposed alternatives to the ASME OM Code given below, the NRC staff finds that regulatory authority

exists for the licensee to request, and the Commission to authorize, alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request PRR-05

The fourth 10-year IST interval began on October 1, 2007 and is scheduled to end on September 30, 2017. The fourth interval IST program code of record is the ASME OM Code, 2001 Edition with Addenda through OMb-2003 Addenda.

Table ISTB-5100-1, "Centrifugal Pump Test Acceptance Criteria," states that the alert range for centrifugal pumps is greater than 0.325 inches per second (in/sec) to 0.70 in/sec.

ISTB-5121, "Group A Test Procedure," (e), states, in part, that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5100-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5100-1."

ISTB-5122, "Group B Test Procedure," (d), states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5100-1 and corrective action taken as specified in ISTB-6200."

ISTB-6200, "Corrective Action," (a), "Alert Range," states that "If the measured test parameter values fall within the alert range of Table ISTB-5100-1, Table ISTB-5200-1, Table ISTB-5300-1, or Table ISTB-5300-2, as applicable, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected."

The licensee requested to use an alternative vibration alert range for the pumps listed in Table 1 below. The pumps are classified as ASME Class 2 and ASME OM Code Group A.

Table 1: Pumps affected by Alternative Request PRR-05

Pump	Name	Code Class	Pump Category	P&ID Drawing
10P-3A	Residual Heat Removal (RHR) Pump A	2	Group A	FM-20A
10P-3B	RHR Pump B	2	Group A	FM-20A
10P-3C	RHR Pump C	2	Group A	FM-20A
10P-3D	RHR Pump D	2	Group A	FM-20A

Reason for Request

The licensee states:

> Pursuant to 10 CFR 50.55a, "Codes and Standards," paragraph (a)(3)(ii), [an alternative] relief is requested from the vibration criteria requirements of ASME OM Code ISTB Table ISTB-5100-1 during the Group A or biennial comprehensive pump test or any other time vibrations are taken to determine pump operational readiness.

[An alternative] relief is requested from ISTB Table ISTB-5100-1, and associated sections (ISTB-5121(e), ISTB-5122(b), and ISTB-6200(a)) that refer to Table ISTB-5100-1, requirements to test the pump on an increased periodicity due to vibration levels exceeding the ISTB alert range absolute limit of 0.325 in/sec. Compliance with the specified requirement results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The increased periodicity of testing is an additional burden to the operations staff, plant scheduling, and adds unnecessary run time to all RHR pumps. This request is based on analysis of vibration and pump differential pressure data indicating that no pump degradation is taking place.

Proposed Alternative

The licensee states:

James A. FitzPatrick [JAF] is proposing to use an alternative vibration alert limit of greater than or equal to 0.408 in/s. This provides an alternative method that continues to meet the intended function of monitoring the pump for degradation over time while keeping the required action level unchanged.

Pump Testing Methodology

The RHR pumps at James A. FitzPatrick are tested using a full flow recirculation test line back to the suppression pool for each pump surveillance test (including quarterly group A tests and bi-annual comprehensive pump tests). These pumps have a minimum flow line (per division) which is used only to protect the pump from overheating when pumping against a closed discharge valve. The min-flow line isolation valve for each division is initially open when the pump is started, and flow is initially recirculated through the min-flow line back to the suppression pool. Then, the full flow test line isolation valve is throttled open to establish flow through the full flow recirculation test line. The min-flow line is then isolated automatically, and all flow is directed through the full flow test line for the IST test.

The RHR system is operated in the same manner and under the same conditions for each IST test, regardless of whether JAF is operating or shutdown. Consequently, the pumps will experience the same potential for flow-induced, broad band vibration whenever they are tested, whether JAF is operating or shutdown. As a result, this alternative is requested for the inservice testing of RHR pumps when vibration measurements are required or any other time vibrations are recorded to determine pump operational readiness (i.e., post-maintenance testing, other periodic testing, etc.).

NRC Staff Document NUREG/CP-0152

NRC staff document NUREG/CP-0152, "Proceedings of the Fourth NRC/ASME Symposium on Valve and Pump Testing," dated July 15-18, 1996, included a paper entitled "Nuclear Power Plant Safety Related Pump Issues," prepared by the NRC staff. That paper presented four key components that should be addressed in a[n] [alternative] relief request of this type to streamline the review process. These four key components are as follows:

I. The licensee should have sufficient vibration history from the inservice testing which verifies that the pump has operated at the vibration level for a significant amount of time, with any "spikes" in the data justified.
II. The licensee should have consulted with the pump manufacturer or vibration expert about the level of vibration the pump is experiencing to determine if the pump operation is acceptable.
III. The licensee should describe attempts to lower the vibration below the defined code absolute levels through modifications to the pump.
IV. The licensee should perform a spectral analysis of the pump driver system to identify all contributors to the vibration levels.

The following is a discussion of how these four key components are addressed for this alternative request.

I. Vibration History

a. Testing Methods and Code Requirements

Elevated vibration levels on the RHR pumps, has been a condition that has existed since original installation. Prior to 1998, testing was measured in displacement (mils). These readings were taken in two directions, horizontal in-line with pump flow and horizontal perpendicular to pump flow. In 1998, JAF entered the third 10-year interval and implemented ASME/ANSI OM-1989, OM-6, for pump testing. During this interval, IST vibration data was taken in displacement (mils). Additional data was also taken in velocity (inches per second), with an additional data point in the axial direction. At the time, the velocity data points were used as info only. Upon the fourth 10-year interval at JAF, ASME OM Code 2001/2003 Addenda was adopted. With this adoption, it was determined that vibration measurements in velocity would be a much better indicator of pump condition and would be beneficial in terms of early identification of degradation. Therefore, data exists for two vibration points on each RHR pump from January 1986 to August 1998 in mils. Data from December of 1998 to present is in the form of inches per second at three vibration data points. Various analyses of this data are included as figures within this [alternative request.

b. Review of Vibration History Data

IST trends of RHR Pump vibration, which include data from 1998 through present, show readings to be consistently at or above current IST vibration alert criteria. ....it can be seen that, 10P-3B and 10P-3C have exceeded the current ASME OM Code alert criteria of 0.325 inches per second.

RHR pump differential pressure trends illustrate the differential pressure data during the same time period as the vibration [data]. These graphs show a step change in flow around the 2009 time frame. This change is due to surveillance test changes in which test flow was lowered. The change was made after

engineering analysis resulted in revised pump flow criterion. These trends do not show any signs of hydraulic degradation.

A review of the maintenance history for all four pumps and motors shows very minimal maintenance has been performed beyond the normally scheduled preventive maintenance. The only maintenance deemed to have the potential to effect vibration values is that of mechanical seal replacement. [RHR Pumps] 10P-3A and 10P-3C both had mechanical seals replaced in 2009. Post work testing of these replacements did not show any change in vibration values.

Average run times for each RHR pump per cycle is approximately 200-300 hours. Run times of this nature, combined with the pumps and motors being built and maintained to the nuclear quality standards, are considered to have a low likelihood for significant wear related degradation.

c. Review of "Spikes" in Vibration Data

Trends of recent vibration history (4th Interval) do not show any significant spikes above baseline levels. Instead, all values are seen as fairly consistent and there have been no significant degrading trends associated with vibration data for the past 15 years.

While the overall vibration trends have been steady, when compared to the [ASME OM] Code recent vibration data points have exceeded the acceptance criteria. RHR pump 10P-3B was the first pump to exceed the acceptance criteria in August of 2011. The V1 data point was reported as 0.34 in/s vice the 0.325 in/s requirement. Per ISTB-6200(a) of the [ASME OM] Code, 10P-3B has been tested twice per quarter since this criteria failure. This increased frequency testing also affects 10P-3D, as surveillance testing procedures test both pumps in that particular division. In September of 2012, 10P-3C exceeded the acceptance criteria in both the V1 and V2 directions with values of 0.34 in/s each. [RHR Pumps] 10P-3C, and subsequently 10P-3A have been on increased frequency testing since. Since the first instance in 2012, 10P-3C has exceeded the criteria in the V2 direction three additional times, once in August of 2013, once in November, and once in December with readings of 0.38, 0.34, and 0.35 in/s respectively.

II. Consultation- Pump Manufacturer/Vibration Expert

During the initial investigation for the cause of the failed vibration acceptance criteria, Mancini Consulting Services (an industry pump expert) and Flowserve (the pump vendor) were consulted for input.

Each RHR pump motor is vertically mounted to the pump casing, with the piping entering and exiting the pump casing horizontally. The RHR pump motors weigh approximately 6500 pounds and operate at 1800 RPM [revolutions per minute]. Other motor specs include: 1000 Hp [horsepower], 3 Phase, 60 Hz [hertz], 4000 Volts. The pump casing, weighing 6100 pounds, is mounted on a reinforced floor pad.

The 20-inch suction piping enters the room level with the pump centerline. An additional 20-inch line tees into the suction piping approximately 5 feet from the pump. The 16-inch discharge piping leaves the pump on the same plane as suction piping but then elbows 90 degrees vertically 6 feet from the pump. This is then followed by a discharge check valve and an isolation valve on the vertical run.

Points V1, V2, and V_{axial} are the specified locations for IST data collection. V1 is taken in the vertical direction in line with pump flow. V2 is taken 90 degrees from V1 perpendicular to pump flow. V_{axial} is taken 90 degrees from the V1 and V2 plane, on the underside of the motor.

Resonance testing was performed on all four RHR pump housings in the V1, V2, and V_{axial} directions. Analysis has shown that the contributing cause of vibration in the V1 and V2 directions is from broadband peaks in the spectrum between 85.1 to 102.7 Hz. These frequencies fall in the area of pump operation as these pumps are of a three vane design. In the case of the RHR pumps, vane pass frequency excitations are influencing vibration measurements.

III. Attempts to Lower Vibration

Prior to completely understanding the cause of the vibration, it was thought that after the adjustment of testing flow in early 2009, vibrations would decrease. Through the recent analysis of the vibration spectrum, the structural resonance and the running speed peaks can be seen. This analysis indicates that the running speed spectral peaks are consistent over years of testing. With the resonant frequency being considered as a significant contributor to exceeding the alert vibration range, options to reduce resonance reside in stiffening the pump or an internal design change (i.e. modifying to a 5 vane design).

JAF initially pursued a path to add additional stiffening to the pump and piping system. With the addition of supports, a new seismic analysis would be required for each RHR pump and the associated piping. Due to the complexity and resources needed for a new analysis, combined with the industry OE (see Fermi 2 approved submittal, ADAMS Accession Number ML101670372/ML100491856) which shows that stiffening operations also lend to the potential for vibrations to be transferred to the surrounding piping, efforts were ceased.

Major modifications, such as to add stiffening to the pump/motor system or changing the pump to a 5 vane design, when the pumps are not seen as degrading, are not deemed to result in an increase in the level of safety.

IV. Spectral Analysis

ASME OM Code 2001 Edition/2003 Addenda section ISTB-6400 states "If the reference value of a particular parameter being measured or determined can be significantly influenced by other related conditions, then these conditions shall be analyzed and documented in the record of tests." The footnote for "analyzed"

states "vibration measurements of pumps may be foundation, driver, and piping dependent. Therefore, if initial readings are high and have no obvious relationship to the pump, then vibration measurements should be taken at the driver, at the foundation, and on the piping and analyzed to ensure that the [reference vibration measurements are representative of the pump] and the [measured] reference vibration levels will not prevent the pump from fulfilling its function."

Spectral analysis shows the total vibration broken down into individual frequencies over a span from 0-1500 Hz. [The data] show a recent analysis followed by a historical compilation for the data points that coincide with the IST surveillance testing. Broadband vibration is seen occurring at three times the pump running speed. These vibrations may exceed the [ASME OM] Code alert criteria, which triggers the corrective action process and the need to increase the testing frequency.

Spectral data indicates that the overall vibration levels are primarily made up of a spectrum from 85 to 103 Hz due to the vane pass frequency induced by a three vane pump at 1800 rpm. As this vibration stems from the design of the pump, all four RHR pumps are susceptible. This vibration is accentuated on 10P-3B and 10P-3C due to the similar piping configurations. Spectral data do not indicate any degradation to the bearings, pump, or motor that would lead to imbalance or misalignment.

Basis for ASME OM Code Alternative Alert Values

By this [alternative] relief request, James A. FitzPatrick is proposing to increase the absolute alert limit for vibration from 0.325 in/s to 0.408 in/s for all four RHR pumps in the V1 and V2 directions. The vane pass induced broadband vibration occasionally causes the overall vibration value to exceed 0.325 in/s, resulting in the pumps being placed on an increased testing frequency. A new alert acceptance criterion of 0.408 in/s coincides with the Warning level that is already developed per the Predictive Maintenance (PdM) program. The basis for the .408 in/s "warning" level came from the Technical Associates of Charlotte recommendations for vertical pumps. The set points recommended were 0.350 in/s and 0.525 in/s. The PdM program uses those set points as high and low criteria but the program also has two additional levels. These two additional levels split the difference between the suggested set points, resulting in 0.408 in/s and 0.466 in/s.

Expert analyses and maintenance reviews have shown that this vibration has not resulted in degradation to the pump or motor. Data trends show that overall vibrations have remained steady since 1998. These analyses and reviews demonstrate that the corrective action of doubling the testing frequency does not provide additional assurance as to the condition of the RHR pumps or the ability to perform their safety function.

The new alert criteria values allow an alternative measure that still meets the intended function of monitoring the pump for degradation, while leaving the action levels as mandated by the [ASME OM] Code. The proposed criteria encompass the previous values that exceeded the alert level, which would eliminate the unnecessary actions

associated with exceeding the [ASME OM] Code Alert limits when the pump is not seen as degrading. Any corrective actions triggered by vibrations between 0.408 in/s to 0.7 in/s will result in the same actions as previously required when exceeding the alert limit of 0.325 in/s.

The vibration specialist at JAF routinely performs a spectral analysis on all data recorded during RHR pump inservice testing [IST]. This analysis is in addition to IST total vibration values. The analysis provides additional confidence on the ability to detect degradation at an early stage.

Each RHR pump motor is also monitored through the Preventive Maintenance (PM) and Predictive Maintenance (PdM) programs. While these actions are intended to prevent degradation, any off-normal or unexpected conditions act as another indicator for early stages of degradation. PM and PdM activities include:

- Annual Non-Intrusive Thermography
- Annual Motor Bearing Sample
- 10-Year internal visual inspection

Conclusions

It has been determined through expert analysis that no internal pump or motor degradation is occurring due to the vane pass frequency induced vibrations. This phenomenon has become exposed since vibration readings have been taken in in/s. The available vibration and differential pressure data combined with the maintenance history support this conclusion.

Based on this information, James A. Fitzpatrick concludes that the increased test frequency for the RHR pump motors that exceeded the 0.325 in/s ASME OM Code alert limit does not provide additional information nor does it provide additional assurance as to the operational readiness of the pumps or their ability to perform their safety function. Testing these pumps on increased frequency and performing associated corrective actions places an unnecessary burden on plant staff and resources. An alert limit of 0.408 in/s will provide margin above baseline and expected vibration values to prevent exceeding the ASME OM Code alert limit due to vane pass frequency excitations.

NRC Staff Evaluation

ISTB-6200(a), "Corrective Action - Alert Range," requires that if the measured test parameter (vibration) values fall within the alert range (greater than 0.325 in/sec through 0.7 in/sec) of ASME OM Code Table ISTB-5100-1, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

ISTB-6200 requires that when the overall pump vibration measurement in any one measured direction exceeds 0.325 in/sec, the pump shall be declared in the alert range and the testing doubled until the cause of the deviation is determined and the condition is corrected. Although a pump is considered operable while in the alert range, increased vibration at this level may be an indication of degradation which would warrant further investigation. However, if a particular pump has been determined to be in good operating condition and has a historical record of

vibration in specific measured directions being measured in the alert range, then it is appropriate to adjust the alert level to consider the specific history and performance of the pump. Requiring more frequent testing under these conditions is considered a hardship because the reason for the vibration is understood and is determined not to be indicative of pump degradation.

The NRC staff notes that the licensee's submittal referenced ISTB-5122(b), defines the testing requirements for Group B pumps. Therefore, ISTB-5122(b) is not applicable to this alternative request, since the RHR pumps listed in Table 1 are all Group A pumps.

To accept pump vibration at a higher level than the ASME OM Code-required alert range absolute limits, NUREG/CP-0152 recommends evaluating four key elements: (1) vibration history to verify that pumps were operated at this level of vibration for a significant amount of time with justification of "spikes" in test data; (2) consulting with the pump manufacturer/ vibration experts to verify that the vibration levels of the pumps are acceptable; (3) attempts to lower the vibration level through modifications to the pumps or the system and structures of the pumps; and (4) perform spectral analysis to identify all contributors to the vibration level. Under the alternative request basis, the licensee provided information to address each of these key elements. The licensee also included its evaluation of all of these four key elements for the RHR pumps.

Alternative request PRR-05 states that three vibration points were available from December of 1998 to present. However, NRC staff noted that Figures 12 through 20 in the submittal of PRR-005 did not contain data from the third vibration point (V3, axial direction) for pumps 10P-3B and 10P-3C. The staff requested that the licensee provide figures showing vibration in the V3 (axial direction) as a function of time from December 1998 to present and a sample spectral analysis of the data measured in the V3 direction for pumps 10P-3B and 10P-3C. The licensee provided the requested data in its response dated July 31, 2014.

Alternative request PRR-05 stated that the pump vendor was contacted during the initial investigation of the cause for failed vibration acceptance criteria. Alternative request PRR-05 also states that the basis for the 0.408 in/sec alert limit comes from the Technical Associates of Charlotte recommendations for vertical pumps. The NRC staff asked that the licensee provide additional information regarding the pump vendor's comments on the proposed alternative vibration alert level of 0.408 in/sec. The RHR pump vendor did not recommend a specific value regarding the increased vibration alert limit, but stated that the pumps should not be adversely impacted provided that no upward trend existed in the vibration measurement data.

In addition, the NRC staff noted that the data provided in alternative request PRR-05 shows that the ASME OM Code alert range value of 0.325 in/sec has been exceeded only on pumps 10P-3B and 10P-3C. The staff asked the licensee to provide justification on why the alternative request is necessary for RHR pumps 10P-3A and 10P-3D. In a response dated July 31, 2014, the licensee stated that RHR pumps 10P-3A and 10P-3C are common to Train A, and RHR pumps 10P-3B and 10P-3D are common to Train B. The licensee further stated that the Fitzpatrick IST Program implementing procedures require increased frequency testing of both pumps in each particular train if the ASME OM Code alert range value is exceeded on one of the pumps.

The licensee stated that the four RHR pumps at Fitzpatrick have a three vane design and operate at 1800 rpm, which results in a vibration spike at vane pass frequencies near 90 Hz. The licensee's current analysis and assessments of these conditions determined that the vibrations were not exhibiting any degrading trends and current vibration levels were not damaging the pumps. From this evaluation, it was determined that the peak vibration levels occur between frequencies of 85 to 103 Hz, due to the vane pass frequency of the pump. Since the primary contributor to vibration is the vane pass frequency, modifications to the pump to change the vane design would merely change the frequency at which the pump vibrates and would not necessarily result in an overall decrease in vibration levels. Therefore, compliance with the ASME OM Code requirements would be a hardship if an alternate testing acceptance criterion is not allowed.

Each RHR pump motor is also covered by various PdM maintenance activities, including annual non-intrusive thermography, annual motor bearing sampling, and a 10-year internal visual inspection. The licensee also performs spectral analysis on the inservice test data obtained during IST, which will allow identification of vibration sources that are not associated with vane pass frequency. This maintenance and testing regime provides for early identification and analysis of any degradation.

Based on the above information, the NRC staff found that the licensee has submitted sufficient vibration history to verify that the pumps have operated at this vibration level for a significant period of time with no adverse impacts on performance. Spike data have been justified by consultation with an independent pump expert. The licensee has described attempts to reduce vibration and has demonstrated that the cause of the vibration appears to be the vane pass frequency inherent to the pump design. Spectral analysis of the pump-driver system was performed to identify all contributors to vibration levels. Based on the evaluation of the provided historical pump vibration data, the staff concluded that these are not indicative of degraded pump performance.

The licensee has proposed to raise the minimum vibration alert range for the four RHR pumps listed in Table 1 from 0.325 in/sec to 0.408 in/sec. The NRC staff reviewed the historical vibration information for the four RHR pumps and noted that the vibration parameters cited in the alternative request for RHR pumps 10-P3B and 10-P3C do occasionally exceed the ASME OM Code, Table ISTB-5100-1 minimum alert level of 0.325 in/sec alert limit. The analysis and evaluation that the licensee has performed provides reasonable assurance of operational readiness. Additionally, the proposed alternative alert limit of 0.408 in/sec is below the required action limit of 0.700 in/sec and the licensee has demonstrated that these pumps have a normal operational history at this vibration level with no adverse consequences.

Based on the NRC staff's review of the historical vibration data provided, the additional PdM activities proposed, and the identification of vane pass frequency as a primary contributor to vibration, the staff finds that implementation of the proposed alternative is acceptable for the pumps listed in Table 1. Therefore, the staff finds that the complying with the specified ASME OM Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that proposed alternative PRR-05 provides reasonable assurance that the affected components are operationally ready. The staff finds that complying with the specified ASME OM Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the staff authorizes alternative request PRR-05 for Fitzpatrick for the remainder of the fourth 10-year IST program interval, which began on October 1, 2007 and is scheduled to end on September 30, 2017.

All other ASME OM Code requirements for which relief or an alternative was not specifically requested and approved in the subject requests remain applicable.

Principle Contributor: Jason Carneal, NRR

Date: September 15, 2014

Please contact Douglas Pickett at 301-415-1364 or Douglas.Pickett@nrc.gov if you have any questions.

Sincerely,

/RA/
Benjamin G. Beasley, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure:
Safety Evaluation

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