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October 23, 2002

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Duke Energy Corporation
Oconee Nuclear Station, Unit 1, 2, 3
Docket Nos. 50-269, 270, 287
Fourth Ten Year Inservice Test Program
Pump Relief Request No. ON-GRP-01,
ON-GRP-02

Pursuant to 10 CFR 50.55a(a)(3)(i), attached are two Requests for Relief from specific pump testing requirements specified by ASME OM "Code for the Operation and Maintenance of Nuclear Power Plants with Addenda," 1995 Edition with 1996 addenda, which is invoked by the ASME Boiler and Pressure Vessel Code, Section XI.

The first request, ON-GRP-01, is to allow Duke Energy Corporation (Duke) to use alternate acceptance criteria for vibration monitoring of smooth running pumps (i.e. pumps with vibration velocity readings less than 0.05 ips). Vibrations below 0.05 ips represent acceptable operation and variations in readings are typically due to accuracy and repeatability issues rather than significant pump degradation. The requested relief is similar to a relief requested by Palo Verde by letter of December 10, 1998 and approved by the staff on July 9, 1999.

The second request, ON-GRP-02, is a request to use alternative acceptance criteria for hydraulic test parameter readings during the new two year "Comprehensive Test". The Comprehensive Test establishes more restrictive acceptance criteria than the quarterly pump tests. However, these acceptance criteria appear to be overly restrictive. It is anticipated that "Comprehensive Test" results could fall into the required action range when little or no actual degradation has occurred, thus creating unnecessary confusion relative to pump operability.

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Therefore, Duke requests that the NRC grant relief as authorized under 10 CFR 50.55a(a)(3)(i).

If there are any questions or further information is needed you may contact R. P. Todd at (864) 885-3418.

Very truly yours,

W. R. McCollum, Jr.
Site Vice President

Attachment

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Pump Generic Relief Request

Item Number ON-GRP-01

Category Type Smooth Running Pumps

Function Various

Test Requirement OMa-1996 ISTB paragraph 6.2 states that if deviations fall within the alert range of Table ISTB 5.2.1-1, the frequency of testing specified in paragraph ISTB 5.1 shall be doubled until the cause of the deviation is determined and the condition corrected. Likewise, if deviations fall within the required action range of Table ISTB 5.2.1-1, the pump shall be declared inoperable until either the cause of the deviation has been determined and the condition corrected, or an analysis of the pump is performed and new reference values are established.

Basis for Relief This is a request for authorization of a proposed test alternative which provides an acceptable level of quality and safety pursuant to 10CFR50.55a(a)3(i).

The repeatability of pump vibration readings at ONS is in the range of 0.05 ips due to hydraulic flow noise in this amplitude range and the repeatability of the vibration instruments. When vibration velocities are less than 0.05 ips, changes have been shown to be non-significant.

At vibration velocities less than 0.05 ips, flow noise and instrument repeatability can significantly affect reference values. Candidates for "smooth-running" status will be analyzed per ISTB paragraph 4.3 to verify that use of this relief request will not prevent the detection of significant pump degradation.

For displacement reference values less than 0.5 mils, it is noted that the Section XI code in effect for the third interval IST Program sets the Alert Range at >1.0 mil and the Required Action Range at >1.5 mil. This implies a minimum reference value of 0.5 mils, which is equivalent to 0.047 ips for 1800 rpm pumps and 0.094 ips for 3600 rpm pumps. The effective reference values proposed for smooth-running pumps are roughly equal to the implied Section

XI reference values for 1800 rpm pumps and more conservative than the implied reference values for 3600 rpm pumps. Without this relief request, the Alert Ranges for some smooth running pumps will be reduced by a factor of 10.

The ONS Predictive Maintenance (PdM) Program is part of the Preventive Maintenance (PM) Program. The PM Program was developed using RCM, NPRDS, EPRI, and INPO guidelines as well as factoring in ONS site-specific experience and regulatory requirements. The PM Program and PdM activities are controlled by plant procedures. Each of these pumps has regularly scheduled PM and PdM activities performed on that pump as described in the PM Model Work Orders. The performance of the system associated with each of these pumps is monitored and compared to performance criteria under the ONS Maintenance Rule Program. This ensures the continued effectiveness of the PM program to minimize component failures and maintain or improve system performance (balance availability and reliability).

The ONS Predictive Maintenance Program routinely uses vibration analysis, lubricant analysis, and, as appropriate, infrared thermographic analysis , to predict the need for maintenance so that equipment can be reworked prior to failure. The components included in this program include those considered important to safe and reliable plant operation, including all the pumps in the IST Program. The intervals for monitoring are based on manufacturer's recommendations, maintenance history, cost effectiveness, and experience. Although the monitoring, analyses, database, and software used in the Predictive Maintenance Program do not fall under the ONS Quality Program, the Predictive Maintenance Program still provides valuable information for assuring the operational readiness of smooth-running pumps.

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

The lubricant analysis program samples lubricants and analyzes them to identify degradation or negative trends. Capabilities include wear debris, lubrication cleanliness, and limited chemical composition analysis.

In both the vibration monitoring and lubricant analysis programs, recently acquired data is compared with previous data to detect any indicated degradation of equipment condition. If degradation indicates the reliability of operating equipment may be negatively affected, or if acceptance criteria is no

longer being met, appropriate corrective action is taken. Corrective action may include: continuing trending of the degraded condition, if the condition is not considered to be immediately threatening to the equipment and can be corrected during a time window convenient to plant operation; additional testing or monitoring to confirm the suspected degraded condition; inspection and repair of the equipment as necessary; changes to preventive maintenance procedures or schedules; or design changes.

ONS expends considerable resources on preventive and predictive maintenance. One result of these efforts is pumps that run very smoothly. To continue to impose Code-mandated Alert and Required Action values on smooth-running pumps unnecessarily penalizes ONS for achieving this high level of performance.

Test Alternative

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

In addition to the Code-mandated parameter monitoring (developed head, flow overall vibration, etc.), additional pump performance parameters are monitored under the Predictive Maintenance Program. This program includes the following:

- Spectrum band monitoring
- Bearing acceleration monitoring (on ball and roller bearings only)
- Bearing oil analysis (for oil lubricated bearings)
- Motor Current Signature analysis (for all but the smallest motors)

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

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

This alternative will be utilized for the remainder of the current 120 month interval.

Pump Generic Relief Request

Item Number ON-GRP-02

Category Type Comprehensive Test Hydraulic Acceptance Criteria

Function Various

Test Requirement Per OMa-1996 Table ISTB 5.2.3-1, Comprehensive Test Hydraulic Acceptance Criteria, the following Acceptable and Required Action ranges are specified:

Test Parameter	Acceptable Range	Required Action Range
P (Positive displacement pumps)	0.93 to 1.03 P_r	> 1.03 P_r
ΔP (Vertical line shaft pumps)	0.95 to 1.03 ΔP_r	> 1.03 ΔP_r
Q (PD and vertical line shaft pumps)	0.95 to 1.03 Q_r	> 1.03 Q_r
ΔP (Centrifugal pumps)	0.93 to 1.03 ΔP_r	> 1.03 ΔP_r
Q (Centrifugal pumps)	0.94 to 1.03 Q_r	> 1.03 Q_r

If deviations fall within the required action range of Table ISTB 5.2.3-1, the pump shall be declared inoperable until either the cause of the deviation has been determined and the condition corrected, or an analysis of the pump is performed and new reference values are established. (ISTB paragraph 6.2)

Basis for Relief This is a request for authorization of a proposed test alternative which provides an acceptable level of quality and safety pursuant to 10CFR50.55a(a)3(i).

Inherent to any measurement are the associate effects of instrument accuracy and uncertainty. Within Comprehensive pump testing there are several measurements that may be affected by instrument accuracy and uncertainty. As documented within ISTB 4.3, reference values are established at readily duplicated points of operation in regions of relatively stable pump flow when the pump is known to be operating acceptably. However, even in keeping with the requirements of ISTB 4.3, the reference values must be established using

instrumentation which introduces the effects of both instrument accuracy and uncertainty. Similarly, during future Comprehensive testing, the readings obtained for comparison against the acceptance criteria carry with them the effects of both instrument accuracy and uncertainty.
ISTB Table 4.7.1-1 specifies the required instrument accuracy for Code testing. Specifically, an instrument accuracy of ±0.5% for pressure and differential pressure is required for Comprehensive tests. Likewise, an instrument accuracy of ±2.0% for flow is required for Comprehensive tests. With a Comprehensive test being performed by either setting flow and reading differential pressure (or pressure) or setting differential pressure (or pressure) and reading flow, the testing is affected by the instrument inaccuracies and uncertainties for both flow and differential pressure (or pressure). By definition, Comprehensive tests are performed within 20% of pump design flow which typically corresponds to a point on the pump curve where developed head can vary significantly over a small range of flow. Thus, the testing effects of the instrument accuracy on flow readings may be as significant as or greater than those of the pressure instrument accuracy depending upon the shape of the pump curve.

It is realistic that the effects of the instrument accuracy on the flow and differential pressure (or pressure) readings of the reference value and test values may lead to the upper Comprehensive acceptance value of 1.03 times the reference value being reached. However, other variables must also be considered. As documented ISTB 1.3 and Section 5.5.4 of NUREG-1482, the accuracy described by code testing only refers to calibration and does not account for other instrument uncertainty terms. Additionally, as documented within Section 5.3 of NUREG-1482, a tolerance of the instrument accuracy is allowed for the establishment of the pump at its fixed parameter. Therefore, it is probable based on the combined effects of instrument accuracies, instrument uncertainties, and conditions of the test that on occasions the upper Comprehensive acceptance value specified in ISTB Table 5.2.3-1 of 1.03 times the reference value will be exceeded. Therefore, the upper end acceptance criteria allowed by ISTB Table 5.2.3-1 appears overly restrictive which may result in pumps being unnecessarily declared inoperable when pump degradation has not occurred.

A comparison was also made between the quarterly test acceptance criteria versus the Comprehensive test acceptance criteria. When compared to quarterly test acceptance criteria, the upper end of allowable values is reduced by 7% (1.10 Reference vs 1.03 Reference) for Comprehensive testing, yet the required differential pressure (or pressure) accuracy is only increased by 1.5% (2% vs 0.5%) with the flow accuracy requirements being the same between tests. The magnitude of reduction in the upper end acceptance criteria values does not

seem to be supported by the minimal increase in required differential pressure (or pressure) instrumentation accuracy. It is not only possible but probable that quarterly results could meet the code required acceptance criteria for Group A or Group B tests, yet fall outside of the allowable Comprehensive test parameters. While this does not create a problem in code application (i.e., there are two different tests with two different acceptance criteria), this information cannot be ignored in practice. As a result, this situation creates confusion and raises questions relative to pump operability with plant personnel.

Previous editions of the Code have allowed an upper end acceptable value of 1.07 times the reference value and have proven to be effective in detecting pump degradation. In addition, the magnitude of the upper end acceptable value is consistent with the allowed magnitude of degradation on the lower end. The requested deviation from the Code is for the upper acceptance ranges only as applied to Comprehensive testing. Thus, an increase in acceptable limits appear justified and warranted from both a practical and safety risk standpoint.

Test Alternative

The proposed alternative is to expand the upper end Acceptable Range and Required Action Range for the hydraulic Comprehensive test parameters as outlined below. The proposed alternative provides an acceptable level of quality and safety. Comprehensive tests will be performed in accordance with the instrument accuracy specified in ISTB Table 4.7.1-1 and per the frequency specified in Table ISTB 5.1-1. Comprehensive tests will also be performed per the parameters as outlined in ISTB paragraph 5.2.3. However, in lieu of the Comprehensive test hydraulic acceptance criteria specified in Table ISTB 5.2.3-1, the upper end Acceptable Range and Required Action Range will be established as follows:

Test Parameter	Acceptable Range	Required Action Range
P (Positive displacement pumps)	0.93 to 1.07 P_r	> 1.07 P_r
ΔP (Vertical line shaft pumps)	0.95 to 1.07 ΔP_r	> 1.07 ΔP_r
Q (PD and vertical line shaft pumps)	0.95 to 1.07 Q_r	> 1.07 Q_r
ΔP (Centrifugal pumps)	0.93 to 1.07 ΔP_r	> 1.07 ΔP_r
Q (Centrifugal pumps)	0.94 to 1.07 Q_r	> 1.07 Q_r

This alternative will be utilized for the remainder of the current 120 month interval.