



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE TESTING PROGRAM RELIEF REQUEST RR-PMP-05

DUKE POWER COMPANY

OCONEE UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 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. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. Additionally, paragraph (f)(4)(iv) of Section 50.55a provides that IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda of the Code that are incorporated by reference in paragraph (b) of Section 50.55a, subject to the limitations and modifications listed therein, and subject to Commission approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met. 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 see NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

The 1989 Edition of the ASME Code is the latest edition incorporated by reference in paragraph (b) of Section 50.55a. Subsection IWV, 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. OM-10 replaces specific requirements in previous editions of Section XI, Subsection IWV, of the ASME Code.

2.0 BACKGROUND

The Keowee Hydro Station provides emergency power for Oconee Units 1, 2, and 3, similar to the function of an emergency diesel generator. The pumps that are the subject of the relief request were not designed with test lines and instrumentation to enable full compliance with inservice testing requirements based on both the age of the station and the initial purpose of the installation. However, Duke Power Company has determined that the pumps are subject to inservice testing and has added them to the program.

3.0 EVALUATION

3.1 Relief Request RR-PMP-05

By letter dated March 29, 1996, Duke Power Company submitted Revision 24 of the Inservice Testing Program for Oconee Units 1, 2, and 3, which included Relief Request No. RR-PMP-05. The request relates to the pump testing requirements of the 1986 Edition of the ASME Code. The specific pumps are used at the Keowee Hydro Station to maintain the Keowee turbine sump water level below 34 inches, as measured from the bottom of the sump. This level is below the level that would allow water to enter the turbine guide bearing reservoir. As such, these sump pumps perform a safety function in the event that emergency power is necessary to ensure safe shutdown of the Oconee units, maintain safe shutdown, and mitigate the consequences of an accident. The pumps are designated ISI Class "C," and Duke Power Company Class "F."

According to the "System Piping Classification Correlation for ONS [Oconee Nuclear Station]," ISI Class "C" corresponds to an ASME Code Class 3 designation, although a Duke Class F, while safety-related, does not appear to be ASME Code Class 1, 2, or 3, but rather ANSI B31.1.0. Therefore, it is not clear how these two different classifications affect the pumps and the staff has reviewed the relief request assuming the pumps are ASME Code Class 3.

3.2 ASME Code, Section XI, Requirements

The 1986 Edition of Section XI of the ASME Code includes requirements for pump testing in Subsection IWP. The relief request applies to the following specific requirements from Subsection IWP:

- *IWP-3100/IWP-3300*: Measure pump inlet pressure before pump startup and during test; observe proper lubricant level or pressure during test; and measure pump bearing temperature during at least one inservice test each year.
- *IWP-3210*: If the allowable ranges of inservice test quantities cannot be met, the Owner shall specify in the record of tests the reduced range limits to allow the pump to fulfill its function, and those limits shall be used in lieu of the ranges given in Table IWP-3100-2.

- *IWP-3500*: Except when measuring bearing temperature, each pump shall run at least 5 minutes under conditions as stable as the system permits prior to measurement or observation of the IST quantities.
- *IWP-4110/IWP-4600*: Flow rate instrument accuracy must be within ± 2 percent of full scale. Flow rate shall be measured using a rate or quantity meter installed in the pump test circuit. If the instrument does not indicate the flow rate directly, the test record shall include the method used to reduce the data.

3.3 Licensee's Basis for Relief

The licensee states:

Per NUREG-1482 Section 5.1.2 and [as discussed] in the ONS [Oconee Nuclear Station] ASME Inservice Testing Program Document Section 5.2.9, inlet pressure, proper lubricant level or pressure, and bearing temperature are no longer required to be monitored. These data provide no useful data with regards to the intent of IST requirements.

Per discussion in Section 5.8.1 in the ONS ASME Inservice Testing Program Document, alternate acceptance criteria are used in lieu of the acceptance criteria prescribed in Table IWP-3100-2. This is consistent with IWP since the procedures clearly specify the acceptance criteria, and the procedures reference the ONS ASME Inservice Testing Program Document.

Per discussion in Section 5.8 of NUREG-1482, a licensee may follow the requirements of Paragraph 5.6 [of] OM-6 for the duration of tests if it determines the shorter duration represents stable operation pursuant to 10 CFR 50.55a(f)(4)(iv). Paragraph 5.6 [of] OM-6 states after pump conditions are as stable as the system permits, each pump shall be run at least 2 [minutes]. At the end of this time at least one measurement or observation of each of the quantities required shall be made and recorded. These pumps are aligned to drain the turbine wheel pit sump. The sump volume that can be removed by the sump pumps is limited to ensure adequate margin for safety when performing the test. This limits run time of the pumps to approximately 7 minutes.

No flow instrumentation exists on the suction or discharge piping for the subject pumps. Pumping rate must be measured by determining the time period required to drain a predetermined volume from the sump. Indications are placed on the wall of the sump to mark the starting and finishing levels for the test. The indications are permanent placards mounted on the wall of the sump, so they are not subject to electrical drift and the uncertainty limits imposed on such equipment.

3.4 Alternate Testing

The licensee proposes:

Vibration measurement will commence as soon as the pumps are started to ensure that sufficient data are collected during the IST. A stopwatch is started when the level in the sump is even with the indicator marking the test starting level. The stopwatch is stopped and pressure readings are recorded when the level in the sump is even with the indicator marking the test finishing level. Pumping rate will be determined by measuring the time required to reduce the sump level from the upper to lower placards. Acceptance criteria will be based on differential pressure developed by the pump and time required to reduce sump level from the upper to lower placards.

3.5 Evaluation

As noted in the licensee's basis for relief, NUREG-1482 indicates that several parameters were deleted from the pump testing requirements through OM-6 as referenced in the 1989 Edition of the Code, based on the ASME Committee's determination that the parameters were either not useful or were maintenance items rather than testing items. Generic Letter 89-04, Supplement 1, allows licensees to implement the specific portions of the Code referenced in the appropriate sections of NUREG-1482 in order to delete these parameters. Therefore, it is acceptable to delete (1) measurement of the inlet pressure before starting a pump, (2) lubrication observations (level or pressure), and (3) bearing temperature, pursuant to paragraph (f)(4)(iv) of Section 50.55a, as discussed in NUREG-1482, Section 5.1.2.

Establishing alternative acceptance criteria, as the licensee notes, is allowed by the 1986 Edition of the ASME Code. The licensee is cautioned, however, to ensure that the criteria is consistent with the limits required for meeting any specific design basis functions (e.g., a minimum flow rate at a given differential pressure).

Because these pumps were not originally designed to enable inservice testing, flow rate instruments were not installed in the piping circuit. Alternate methods of determining the flow rate are acceptable when it is impractical to measure the flow or to install flow instruments. Though the licensee does not discuss the impracticalities or hardships that would result if flow rate instruments were required to be installed (e.g., expense of instrumentation, possible reconfiguration of piping, and installation costs), with the limited amount of water in the sump available for testing, the gain that might be realized by installing flow rate instruments (full compliance with the Code requirements) would be offset by the system configuration limitations (i.e., limited suction supply) that would continue to exist even if the instrumentation were installed. Using the placards to monitor flow rate is similar to using level instrumentation in a tank as the test is conducted. While this may not account for the change in the suction head, the volume of

water is limited such that a change in level would not significantly change the suction head; therefore, the impact on the differential pressure measurements should not necessitate adjustments to the differential pressure data. Consequently, based on the impracticalities in measuring flow rate directly, the burden that would be imposed if the licensee were required to install flow instruments, and the assurance of repeatability, the indirect method is acceptable pursuant to paragraph (f)(6)(i) of Section 50.55a. As noted by the licensee, the alternate method of reduction of data to determine flow rate is proceduralized.

Taking vibration measurements immediately following pump start is not discussed in the licensee's basis for relief. However, the limitations on pump run time are discussed and the reason for taking vibration measurements as soon as the pump start is "to ensure that sufficient data are collected during the IST." There is insufficient fluid inventory to run the pump until stable operation is ensured, and then run 2 minutes more prior to taking measurements. Because the run time is limited to no more than 7 minutes due to design limitations in the system, it is necessary to start measurements immediately. Requiring the licensee to wait 2 minutes could result in compromising the test data, repeating the test, necessitating an alternate source of suction fluid, or redesigning the sump configuration. The vibration data will be taken at approximately the same run time for each test which, in consideration of the impracticalities of design and the burden of imposing the Code requirements, will give reasonably repeatable results. Therefore, the alternate time for taking measurements is acceptable pursuant to paragraph (f)(6)(i) of Section 50.55a.

4.0 CONCLUSIONS

The staff grants relief pursuant to 10 CFR 50.55a(f)(6)(i) and approves the use of portions of a later edition of the ASME Code incorporated by reference in paragraph (b) of Section 50.55a as authorized by paragraph (f)(4)(iv) as discussed in the evaluation above. The approval allows the licensee to implement the proposed alternative testing that will give an adequate level of assurance of the operational readiness of the Keowee Station turbine sump pumps.

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