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1. Introduction

The Nuclear Operations Analysis Center (NOAC) at Oak Ridge National Laboratory (ORNL) was contracted in August 1986 by the Nuclear Regulatory Commission (NRC) to review the Tennessee Valley Authority (TVA) Sequoyah Nuclear Station (SQN) Pump and Valve Inservice Test Program (IST) for conformance to the ASME Code[1]. NOAC was directed to first review certain priority items requested by TVA to support the restart of SQN. NOAC prepared an interim Technical Evaluation Report (TER) ORNL/NRC/LTR-87/11 (Reference 1) dated September 18, 1987 for these priority items. NOAC was then directed to review all TVA SQN IST Program submittals dating back to August 15, 1985 for any open items or unevaluated relief requests. NOAC reviewed the initial TVA SQN IST Program (Reference 2) and subsequent TVA submittals which modified and added items to the original program.

2. Background

In Reference 3, NOAC provided an evaluation of three relief requests that had not been addressed previously. Enclosure 1 of Reference 3 contained a request for relief from the Code requirement of ±2 percent instrument accuracy for pump flow measurements. The relief request was granted for flow measurement only on the auxiliary feedwater pumps (AFWP) and centrifugal charging pumps (CCP). The purpose of this TER is to evaluate the relief requests contained in References 4 and 5. Reference 4 requests relief for eight essential raw water cooling valves on the containment spray heat exchangers. Reference 5 requests relief to use ultrasonic flow measurement devices on (1) the safety injection pumps, (2) the containment spray pumps, (3) the essential raw cooling water pumps, (4) the component cooling water pumps, (5) the residual heat removal pumps and (6) the diesel fuel oil transfer pumps.

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[1]American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, Division 1, Subsections IWP and IWV. The effective edition of Section XI with regard to the TVA program is the 1974 Edition through Summer 1975 Addenda (Unit 1) and the 1977 Edition through the Summer 1978 Addenda (Unit 2).

3. Summary

Enclosure 1 contains a technical evaluation report of relief requests to use ultrasonic flow measurement devices with ±3 percent full-scale accuracy on selected Section XI pumps. The requests were evaluated to determine if the reliefs sought from Code requirements are in accordance with applicable sections of 10CFR50.55a. The relief requests have been judged acceptable and relief should be granted.

An additional relief request for quarterly testing of the essential raw water cooling valves (Reference 4) was judged acceptable and relief should be granted.

REFERENCES

1. Technical Evaluation Report ORNL/NRC/LTR-87/11 from G.A. Murphy, ORNL to James Lombardo, NRC dated September 18, 1987.

2. Letter from J.A. Domer, TVA to E. Adensam, NRC dated August 16, 1985.

3. Technical Evaluation Report ORNL/NRC/LTR-87/12 from G.A. Murphy, ORNL to James Lombardo, NRC dated December 30,1987.

4. Letter from R. Gridley, TVA to U.S. NRC, dated April 22, 1988, "Sequoyah Nuclear Plant (SQN) Units 1 and 2 - Relief Request for Eight Essential Raw Cooling Water (ERCW) Valves on SQN's Containment Spray Heat Exchangers".

5. Letter from R. Gridley, TVA to U.S. NRC, dated August 4, 1988, "Sequoyah Nuclear Plant (SQN) - Relief Request from American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Regarding Generic Use of Ultrasonic Flow-Measurement Devices".

ENCLOSURE 1

SEQUOYAH NUCLEAR PLANT
RELIEF REQUESTS FOR INSERVICE TEST PROGRAM

1. Ultrasonic Flow Measurement - Safety Injection and Containment Spray Pumps

Reference - Reference 5

Code Requirement - Article IWP-4110 of the ASME code requires that instrument accuracy shall be within ±2 percent of full scale.

Relief Request - The Licensee has requested relief from the instrument accuracy requirements of IWP-4110 for flow measurement of safety injection (SI) and containment spray (CS) pumps. The Licensee proposes to use ultrasonic flow measurement devices with ±3 percent full-scale accuracy on these pumps.

Licensee's Basis for Requesting Relief - The Licensee states that manufacturer specifications for ultrasonic flow measurement devices procured for the SI and CS pumps quote an accuracy of 1 to 3 percent.

The use of ultrasonic flow measurement devices for these pumps during Code-required tests would eliminate the need for modifications to these systems. To ensure a fixed resistance configuration, each SI pump must be tested through its own minimum flow line, which does not contain a flow measuring device. Each CS pump does have flow instrumentation in its fixed resistance configuration; however, the accuracy provided by these devices is less than that of the ultrasonic flow measurement devices.

In order to meet the Code requirements for both pumps, plant modifications would be required to (1) install flow instrumentation on the SI pump minimum flow line and (2) change the present flow instrumentation on the CS system to meet the ±2 percent accuracy requirement. The benefits of a possible one percent increase in accuracy for an internally mounted device do not warrant the expense of a plant modification. Furthermore, the use of ultrasonic flow measurement devices will preclude incidence of problems inherent in internally-mounted devices,(e.g., increased system resistance, flow obstruction, and system unavailability during maintenance and repair).

Evaluation - The Licensee's proposal to use ultrasonic flow measurement devices for the SI and CS pumps would produce a decrease in flow measurement accuracy of only 1 percent. Such a decrease would not significantly degrade the ability to trend pump performance in accordance with the intent of the Code. The criteria would still be sufficiently conservative to assure an acceptable level of safety. Strict compliance with the Code-specified requirement in this case would be impractical and impose an unnecessary hardship with no compensating increase in the level of safety or quality.

Conclusion - Relief should be granted from the IWP-4110 requirement to measure SI pump and CS pump flows to ±2 percent accuracy. The ±3 percent acceptance criteria specified by the Licensee for ultrasonic flow measurement will give reasonable assurance of operational readiness of these pumps. Compliance with the Code-specified criteria in this case would result in hardship without a compensating increase in the level or quality of safety.

The proposed alternative is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the Licensee that could result if the requirements were imposed on the facility.

2. Ultrasonic Flow Measurement - Essential Raw Cooling Water Pumps, Component Cooling Water Pumps, Residual Heat Removal Pumps, and Diesel Fuel Oil Transfer Pumps

Reference - Reference 5

Code Requirement - Article IWP-4110 of the ASME code requires that instrument accuracy shall be within ±2 percent of full scale.

Relief Request - The Licensee has requested relief from the instrument accuracy requirements of IWP-4110 for flow measurement of the essential raw cooling water (ERCW) pumps, component cooling water (CCW) pumps, residual heat removal (RHR) pumps, and diesel fuel oil transfer (DFOT) pumps. The Licensee proposes to use ultrasonic flow measurement devices with ±3 percent full-scale accuracy on these pumps as a backup if normal plant instrumentation is out of service for maintenance or calibration.

Licensee's Basis for Requesting Relief - The Licensee states that manufacturer specifications for ultrasonic flow measurement devices procured for these pumps quote an accuracy of 1 to 3 percent. Installed in-line flow instrumentation is typically used to measure pump flow during testing. Periodic maintenance and calibration of installed plant flow instrumentation can delay scheduled pump performance tests until the plant instrumentation is returned to service. This could impose an accelerated maintenance work schedule simply for the purpose of conducting required pump tests.

The use of ultrasonics as a backup flow measurement method would reduce the scheduling impact on the plant and allow pump testing to start on time. This provides a net improvement to plant safety with regard to maintaining test frequency and assessment of pump performance.

An additional benefit is provided with regard to planning and scheduling of maintenance activities. Uncoupling maintenance activities from required pump test schedules will improve prioritizing of work activities directly affecting plant safety by providing alternatives for work items driven only by schedule.

The Licensee states that ultrasonics will only be used in lieu of plant-installed flow instrumentation when problems are encountered with the plant instrumentation. Maintenance and calibration of plant-installed instrumentation will be carried out in a timely manner to preclude repeated use of ultrasonics.

Evaluation - The Licensee's proposal to use ultrasonic flow measurement devices for backup flow measurement for the pumps in question would produce a decrease in flow measurement accuracy of only 1 percent. Such a decrease would not significantly degrade the ability to trend pump performance in accordance with the intent of the Code. The criteria would still be sufficiently conservative to assure an acceptable level of safety and quality. The Licensee's plan to use ultrasonics only as a backup when plant-installed instrumentation is not available is an acceptable alternative.

Conclusion - Relief should be granted from the IWP-4110 requirement to measure flow on the essential raw cooling water pumps, component cooling water pumps, residual heat removal pumps, and diesel fuel oil transfer pumps to ±2 percent accuracy when using ultrasonic flow measurement devices. The ±3 percent acceptance criteria specified by the Licensee for ultrasonic flow measurement will give reasonable assurance of operational readiness of these pumps. The

proposed alternative to use ultrasonic flow measurement devices when plant-installed instrumentation is not available would still provide an acceptable level of quality and safety.

The proposed alternative is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the Licensee that could result if the requirements were imposed on the facility.

3. Essential Raw Cooling Water System (ERCW) Valves FCV-67-123, -124, -125, and -126.

Reference: Reference 4, Relief Request PV-23

Code Requirement - Article IWV-3411 requires valves to be exercised at least once every 3 months, except as provided in Articles IWV-3412, IWV-3415, and IWV-3416.

Relief Request - The Licensee has requested relief from the requirements of IWV-3411 for the performance of valve exercising every 3 months.

Licensee's Basis for Requesting Relief - The raw water in the ERCW system contains chlorides which can cause heat exchanger tube pitting, and organisms which produce microbiologically-induced corrosion in the heat exchanger piping and shell. To preserve their integrity, these heat exchangers are placed in wet layup with demineralized water and corrosion inhibitors, and their chemistry is monitored. Whenever the chemistry specifications are exceeded, the heat exchangers are drained, flushed, and again placed in wet layup.

During plant modes 1, 2, 3, and 4, plant Technical Specifications require that the plant maintain two independent containment spray systems operable or enter a limiting condition for operation (LCO). When a containment spray heat exchanger is drained during the cleanup/layup operation, that containment spray loop must be declared inoperable, thereby placing the unit in an LCO.

Chemistry data demonstrates that the quarterly cycling of the inlet and outlet heat exchanger valves increases the ingression of raw water, thus forcing the plant to enter the LCO more often simply to preserve the integrity of the heat exchangers.

As an alternative, the Licensee proposes to full stroke exercise these valves at least once each refueling outage or each time the heat exchanger chemistry requires cleanup and layup, but at a frequency not to exceed once per quarter.

Evaluation - Testing these valves once every 90 days would frequently and unnecessarily place the plant in an LCO. The Code-specified requirement in this case would result in hardship and unusual difficulty without a compensating increase in the level of quality or safety.

Conclusion - For the valves in question, relief should be granted from the IWV-3411 requirement for testing on a quarterly basis. Testing of the valves each refueling outage or each time the heat exchanger chemistry requires cleanup and layup, (but at a frequency not to exceed once per quarter), will give reasonable assurance of operational readiness.

The Code requirement would result in a hardship in this case. The alternative proposed is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the Licensee that could result if the requirements were imposed on the facility.