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1. Introduction

The Nuclear Operations Analysis Center (NOAC) at Oak Ridge National Laboratory (ORNL) was contracted in August 1986 by Nuclear Regulatory Commission (NRC) to review the Tennessee Valley Authority (TVA) Sequoyah Nuclear Station (SQN) Pump and Valve Inservice Test Program (IST) program. 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 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 Safety Evaluation Report (Ref. 1) and subsequent TVA submittals which modified and added items to the original program. Three relief requests were found that had not been evaluated. Enclosure 1 contains a Technical Evaluation Report for these three relief requests and one additional relief request which was submitted in response to a recent Integrated Design Inspection (IDI) report (Ref. 12).

Enclosure 2 contains a revision to one item of the previously submitted TER from NOAC.

2. Background

A Safety Evaluation Report (Ref. 1) concerning the IST Program at SQN was issued April 5, 1985 by NRC. TVA submitted thirteen additional relief requests and/or deviations from Ref. 1 in Ref. 2 and 3. Ref. 5 contains additional information submitted by TVA in response to a request by NRC in Ref. 4 for more information on these thirteen requests. Ref. 6 contains three additional relief requests submitted by TVA.

Ref. 7 is an interim draft of a Technical Evaluation Report (TER) prepared by ORNL/NOAC for the thirteen relief requests contained in Ref. 2 and 3 and three relief requests contained in Ref. 6. Ref. 8 contains another five relief requests from TVA. Ref. 9 contains additional information on the relief requests contained in Ref. 8. Ref. 10 is an interim TER prepared by ORNL/NOAC for the 21 relief requests contained in Ref. 2, 3, 6, and 8. Ref. 11 revised the Ref. 10 TER in response to additional information provided by TVA.

Ref. 12 identified the ERCW Screen Wash Pumps to be included in the TVA SQN Pump and Valve IST Program. Ref. 13 added the ERCW Screen Wash Pumps to the IST Program and requested relief from certain ASME Code¹ requirements for testing these pumps.

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.

3. Summary

The original Ref. 1 Safety Evaluation Report prepared by NRC and all subsequent TVA submittals which revised or added items to the S&N Pump and Valve IST Program were given an overall review to assure that all open items or relief requests were addressed. The review found three requests for relief that had not been evaluated.

Enclosure 1 contains a technical evaluation report of these three relief requests; plus an evaluation of a relief request submitted in response to a recent Integrated Design Inspection (IDI) report (Ref. 12). Each of the relief requests were evaluated to determine if the relief sought from Code requirements is clearly justified on the basis of impracticality or undue hardship; and whether the request is in accordance with applicable sections of 10CFR50.55a. The four relief requests have been judged acceptable and relief should be granted.

Enclosure 2 contains a revision to a previously evaluated relief request contained in Ref. 11 and has been judged acceptable and relief should be granted.

REFERENCES

1. Letter from Thomas M. Novak, NRC to H.G. Parris, TVA dated April 6, 1985. "Safety Evaluation Report on Sequoyah Inservice Test Program for Pumps and Valves (ISTP)".
2. Letter from J.A. Domer, TVA to E. Adensam, NRC dated August 16, 1985.
3. Letter from R. Gridley, TVA to B. Youngblood, NRC dated June 6, 1986.
4. Letter from B. Youngblood, NRC to S.A. White, TVA dated September 18, 1986.
5. Letter from R. Gridley, TVA to B. Youngblood, NRC dated November 17, 1986, "Sequoyah Nuclear Plant - Inservice Testing Program".
6. Letter from R. Gridley, TVA to B. Youngblood, NRC dated December 12, 1986, "Sequoyah Nuclear Plant - Additional Relief Requests to Sequoyah Inservice Testing Program".
7. Technical Evaluation Report (Interim) from G.A. Murphy, ORNL to James Pulsipher, NRC dated March 17, 1987.
8. Letter from R. Gridley, TVA to U.S. NRC, dated July 2, 1987, "Sequoyah Nuclear Plant - Inservice Test Program".
9. Letter from R. Gridley, TVA to U.S. NRC, dated August 14, 1987, "Sequoyah Nuclear Plant - Additional Information on Sequoyah Inservice Test Program".
10. Interim Technical Evaluation Report from G.A. Murphy, ORNL to James Lombardo, NRC dated August 31, 1987.
11. Technical Evaluation Report ORNL/NRC/LTR-87/11 from G.A. Murphy, ORNL to James Lombardo, NRC dated September 18, 1987.
12. Letter from James G. Keppler to S.A. White dated October 9, 1987, "Items Identified by the Integrated Design Inspection Requiring Resolution Prior to Restart of Sequoyah Unit 2".
13. Letter from R. Gridley, TVA to U.S. NRC, dated November 17, 1987, "Sequoyah Nuclear Plant (SQN) - Addition of Screen Wash Pumps to SQN In-service Test Program".

ENCLOSURE 1

SEAWAY NUCLEAR PLANT RELIEF REQUESTS TO SQN INSERVICE TEST PROGRAM

1. Ultrasonic Flow Measurement

Reference - Ref. 2, Enclosure 2, Item 2.3.3.

Code Requirement - Article IWP-4110 of the ASME code requires that instrument accuracy shall be within $\pm 2\%$ of full scale.

Relief Request - The Licensee has requested relief from the instrument accuracy requirements of IWP-4110 for flow measurement of Auxiliary Feedwater Pumps (AFWP) and Centrifugal Charging Pumps (CCP). The Licensee proposes to use ultrasonic flow measurement devices with $\pm 3\%$ full-scale accuracy on these pumps.

Licensee's Basis for Requesting Relief - The Licensee states that manufacturer specifications for ultrasonic flow measurement devices being procured for the AFWPs and CCPs quote an accuracy of 1-3%. The use of ultrasonic flow measurement devices would eliminate the need for plant modifications to install internally mounted devices and the problems inherent in such devices, such as increased system resistance, flow obstruction, and system unavailability during maintenance and repair. The Licensee would also incur significant additional expense to install internally mounted devices with only a 1% increase in accuracy over the ultrasonic devices.

Evaluation - The Licensee's proposal to use ultrasonic flow measurement devices for the AFWPs and CCPs would produce a decrease in flow measurement accuracy of only 1%. 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 AFWP and CCP flow to $\pm 2\%$ accuracy. The acceptance criteria specified by the Licensee for ultrasonic flow measurement will give reasonable assurance of satisfactory pump performance intended by the Code. The Code requirement is impractical in this case and 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.

2. RHR Suction from RCS FCV-74-1 and -2

Reference: Ref. 3. Relief Request PV-19

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 and from the exceptions defined in Article IWV-3412, -3415, and -3416 for valves FCV-74-1 and FCV-74-2, RHR Suction from RCS.

Licensee's Basis for Requesting Relief - These valves can not be opened at normal operating pressures due to the pressure interlock in their control circuitry. They are only opened to allow the RHR system to be placed in the decay heat removal mode of operation. Full stroking of these valves during the decay heat mode of operation isolates the decay heat removal capacity, the mixing capacity needed to maintain uniform boron concentration within the RCS, and the ability to produce gradual reactivity changes during boron concentration reductions in the RCS. The Licensee states that it is not generally considered prudent to move a valve from its safety related position to perform a periodic code test when that testing places the unit in an overall degraded condition. Additionally, the Licensee refers to Unresolved Safety Issue (USI) A-31, "Residual Heat Removal Shutdown Requirements" and USI A-45, "Shutdown Decay Heat Removal Requirements", to emphasize that the reliability of heat removal functions is specifically identified as being dependent on the frequency of events that jeopardize decay heat removal operations, such as inservice testing for example.

The Licensee proposes to full stroke exercise these valves while shutting down the plant when RHR is being placed in decay heat removal mode if the valves have not been exercised in the last 3 months or the projected outage would cause the valves to require testing prior to plant startup. If the valves have not been stroked during the plant shutdown and the surveillance interval expires during the outage, or if the outage exceeds 3 months, the valves need not be exercised until plant startup when the RHR system is being removed from decay heat removal mode of operation.

Evaluation - Testing the valves in question during operation or cold shutdown in accordance with the Code requirements is impractical and could result in a decrease in the level of safety if tested while the RHR system is providing decay removal capability. Testing these valves when the RHR system is being placed in or removed from the decay heat removal mode of operation is an acceptable alternative to Code-required testing.

2. (Continued)

Conclusion - Relief should be granted from the IWV-3411 requirement and IWV-3412, -3415, and -3418 requirements for testing during operation or cold shutdown. Testing these valves when the RHR system is being placed in or removed from the decay heat removal mode of operation will meet the intent of the Code. The Code requirement is impractical in this case and 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.

3. Auxiliary Feedwater (AFW) Pump Common Return to Condensate Storage Tank (CST) - Check Valves 3-894 and 3-895

Reference - Ref. 3, Relief Request PV-20

Code Requirement - Article IWV-3521 requires valves to be exercised at least once every 3 months, except as provided by articles IWV-3522.

Relief Request - The licensee has requested relief from the requirements of IWV-3521 for the performance of valve exercising every 3 months and from the exceptions contained in Article IWV-3522 for valves 3-894 and 3-895, AFW pump common return to CSTs.

Licensee's Basis for Requesting Relief - The Licensee states that exercising these check valves would require simultaneous operation of both motor driven AFW pumps and the turbine driven AFW pump (or four motor-driven AFW pumps to produce equivalent flow). Coordination of operation and testing of all pumps together on a quarterly basis would place an unusual burden on the plant and shift operating crew. Alternative testing would provide an acceptable level of safety. These check valves are not ASME code class 1, 2, or 3.

The Licensee states that the NRC has defined non-visual verification of full stroke exercising to be "verification of the maximum flow rate through the check valve identified in any of the plant's safety analyses." The Licensee states that no such maximum number is specifically identified for total AFW pump recirculation flow rate. Additionally, plant instrumentation is not available to measure this flow rate.

The Licensee proposes to part-stroke exercise the check valves during the individual quarterly pump tests with a single pump operating on recirculation. Full-stroke exercising will be performed not less than every two years. This will be done either manually following disassembly or by verified acceptable operation of two motor-driven and one turbine-driven AFW pumps or four motor-driven pumps operating concurrently on recirculation. When using pumps for exercising the check valves, verification of acceptable pump performance during concurrent operation will constitute verification of satisfactory check valve full stroke.

Evaluation - Testing the valves in question during operation would result in hardship and unusual difficulty without a compensating increase in the level of quality or safety. Testing the valves by part-stroking during quarterly pump tests and full-stroking at least every two years is an acceptable alternative to the frequency specified in IWV-3521 and IWV-3522.

3. (Continued)

Conclusion - Relief should be granted from the IAW-3521 and IAW-3522 requirements for testing during operation and full stroke verification with full flow rate. The Code requirement is impractical in this case and 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.

4. Essential Raw Cooling Water (ERCW) Screen Wash Pumps

Reference - Ref. 13.

Code Requirement - Article IWP-3100 of the ASME Code requires, among other parameters, that the flow rate, bearing vibration amplitude, and bearing lubricant level or pressure for pumps shall be measured.

Relief Request - The Licensee has requested specific relief from the IWP-3100 requirement to measure the flow rate, bearing vibration amplitude, and bearing lubricant level or pressure on the ERCW Screen Wash Pumps.

Licensee's Basis for Requesting Relief - The Licensee states that no inline instrumentation exists to measure flow; and that the physical configuration of the pumps and piping does not allow the use of portable flow measuring equipment such as ultrasonics. Additionally, a minimum discharge pressure has been specified which assures adequate flow to the spray nozzles. The Licensee states that the ERCW Screen Wash Pumps will be tested by calculating inlet pressure and measuring discharge and differential pressures. (The system configuration provides fixed flow resistance). Additionally, spray nozzle pattern will be observed. System performance degradation will be detected when differential and/or discharge pressures fall into the alert ranges, or if poor spray nozzle performance indicates system degradation.

For pump bearing vibration measurement, the Licensee states that the bearings are inaccessible as the pump is a deep well vertical turbine pump submerged in a pit.

For pump bearing lubricant level or pressure measurement, the Licensee states that the pump uses water lubricated bearings, except for the suction case bearings, which are sealed and grease packed, thus lubricant level and pressure cannot be measured.

Evaluation - In addition to pump inlet and differential pressure, the Code requires periodic measurement of other parameters. These data are to be collected and trended to prevent degradation of pump performance to unacceptable levels. Obtaining pump flow rate, bearing vibration amplitude, and bearing lubricant level or pressure measurements would be impractical in this case because the existing equipment configuration does not permit measurement of these parameters. The Licensee's proposed testing method meets the intent of the Code in that pump operability and performance trending can be accomplished by calculating pump inlet pressure and measuring differential pressure since it is a fixed resistance system. Strict compliance with the Code-specified requirements would be impractical and impose an unnecessary hardship with no compensating increase in the level of safety or quality.

4. (Continued)

Conclusion - Relief should be granted from the IWP Code requirement to measure flow rate, bearing vibration amplitude, and bearing lubricant level or pressure on the ERCW Screen Wash Pumps. The proposed testing will give reasonable assurance of satisfactory pump performance intended by the Code. The Code requirements are impractical in this case and the proposed testing 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.

ENCLOSURE 2

SEQUOYAH NUCLEAR PLANT

REVISED EVALUATION OF RELIEF REQUEST TO SQN INSERVICE TEST PROGRAM

1. RV head vent valves FSV-68-394, -395, -396 and -397

Note - This is a revision of a prior evaluation contained in Ref. 11, Enclosure 1, Item 9. The previous evaluation had addressed the head vent throttle valves, FSV-68-396 and -397, and had not included the head vent block valves, FSV-68-394 and -395. This revision adds the head vent block valves which were inadvertently omitted in Ref. 11.

Code Requirement - IWV-3300 requires that valves with remote position indicators shall be observed at least once every two years to verify that valve operation is accurately indicated.

Relief Request - The Licensee has requested specific relief from the IWV-3300 requirement that valves with remote position indicators shall be observed ... to verify that valve operation is accurately indicated.

Licensee's Basis for Requesting Relief - The Licensee states that these valves are totally enclosed solenoid-actuated valves and that their position or operation cannot be visually observed. The Licensee proposes to utilize portable acoustic monitoring equipment to provide an indirect means of verifying valve position as an alternate method of verifying that valve operation is accurately indicated. Under the test method, an acoustical "trace" is made for each valve as it is opened and closed. Valve position is noted on the trace as a function of time. Valve position is thereby verified indirectly by noting the acoustical trace attributable to either an open or a closed valve.

Evaluation - The Licensee has demonstrated that visual confirmation of valve position, as required by IWV-3300, is not practical due to the totally enclosed design of the valve. A design change would place a burden on the Licensee without a compensating increase in safety or quality. An acoustical trace test method proposed by the Licensee provides an indirect means of confirming valve position which meets the intent of IWV-3300.

² A graphical recording of noise level caused by changes in flow turbulence.

1. (continued)

Conclusion - Relief should be granted for valves FSV-68-394, -395, -396 and -397 from the IWV-3300 requirement that valve operation be observed because the totally enclosed design of the valve prevents direct observation of valve position. The acoustical trace test method described above, performed once every two years in accordance with Section XI of the Code, is an acceptable alternative and 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.