May 9, 2003

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNIT 1 - REQUEST FOR RELIEF FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS, SECTION XI CODE REQUIREMENTS FOR TESTS FOLLOWING REPAIR, MODIFICATION, OR REPLACEMENT (TAC NO. MB8431)

Dear Mr. Scalice:

By letter dated April 15, 2003, Tennessee Valley Authority (TVA) submitted a request for relief from certain requirements of Subsection IWE of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, for its Sequoyah Nuclear Plant, Unit 1 (SQN1). Specifically, the requested relief is associated with test requirements following repair or modification of the containment as they pertain to steam generator replacement activities at SQN1.

Our evaluation and conclusion are contained in the enclosed Safety Evaluation. The U.S. Nuclear Regulatory Commission staff has concluded that your proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), your proposed alternative is authorized on a one-time basis following replacement of the steam generators at SQN1.

If you have any questions regarding this issue, please contact Mr. Michael Marshall at 301-415-2734.

Sincerely,

/RA/

Allen G. Howe, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-327

Enclosure: As stated

cc w/encl: See next page

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Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO INSERVICE INSPECTION PROGRAM RELIEF REQUEST FOR

CONTAINMENT TESTING AFTER STEAM GENERATOR REPLACEMENT FOR

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT UNIT NO. 1

DOCKET NUMBER 50-327

1.0 INTRODUCTION

By letter dated April 15, 2003, Tennessee Valley Authority (TVA), the licensee for Sequoyah Nuclear Plant, Unit 1 (SQN1), submitted a request for relief from certain inservice inspection (ISI) requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI. Specifically, in its relief request, the licensee proposed an alternative to the leakage test requirements of ASME Code, Section XI, paragraph IWE-5221.

As part of its steam generator (SG) replacement activities for SQN1, two holes are being cut in the steel containment in order to replace the SGs because the existing equipment hatch is not large enough to accommodate the new SGs. After the SG replacement and containment repair, appropriate leakage testing is required by the ASME Code, Section XI, to ensure the pressure integrity of the containment.

In lieu of an integrated leak rate (Type A) test as required by ASME Code, Section XI, Subsection IWE-5000, the licensee proposed an alternative consisting of a system pressure test at peak calculated containment pressure (P_a) followed by a local leak rate test to verify the leak tight integrity of the containment repairs. In its letter, the licensee states that a local leak rate test together with a system pressure test (instead of the Code-required Type A test) is a more appropriate test to ensure the adequacy of the containment steel vessel repair. In addition, the licensee states that the pre-test and post-test activities required by a Type A test are far more involved and time consuming than the proposed local leak rate test and provides no additional quality or accuracy to that provided by the proposed alternative.

2.0 REGULATORY EVALUATION

In the *Federal Register* dated August 8, 1996, the Commission amended Section 50.55a of Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a) to incorporate by reference the 1992 Edition through the 1992 Addenda of the ASME Code, Section XI, Subsections IWE. Subsection IWE provides the requirements for inservice inspection (ISI) of Class MC (metallic

containment components) and the metallic liner of Class CC (concrete containment components). The Code of record for SQN1 is the 1992 Edition with the 1992 Addenda. The regulations require that ISI of certain Code Class MC and CC components be performed in accordance with Section XI of the ASME Code except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (g)(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.

Paragraph IWE-5221 of Subsection IWE of the ASME Code, Section XI states:

> Except as noted in IWE-5222, repairs or modifications to the pressure retaining boundary or replacement of Class MC or Class CC components shall be subjected to a pneumatic leakage test in accordance with the provisions of Title 10, Part 50 of the Code of Federal Regulations, Appendix J, Paragraph IV.A.

10 CFR Part 50, Appendix J, Paragraph IV.A states:

> Any major modification, replacement of a component which is part of the primary reactor containment boundary, or resealing a seal welded door, performed after the preoperational leakage rate test shall be followed by either a Type A, Type B, or Type C test as applicable for the area affected by this modification . . . .

Depending on the containment area affected and extent of the repair or modification, the licensee must determine what type of leak rate test is appropriate. A review of containment repair activities at SQN1 indicates that a Type A test may be the most appropriate leakage test because of the magnitude of repair and its potential impact on the containment structural integrity. In general, a Type A test provides useful information about the overall condition of containment and total leakage, but would not provide the required information for the specific areas affected by the repair. In order to evaluate and demonstrate the effectiveness and leak-tightness of the containment steel vessel repair and welds, a local leak rate test (Type B) may be necessary.

The staff has reviewed the licensee's basis in support of the licensee's request for relief from the requirements in ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

To facilitate the SQN1 SG replacement, the free-standing steel containment vessel (SCV) of SQN1 will be breached. The licensee states that two holes will be cut in the SCV in order to replace the SGs. This work must be performed in order to remove the SGs from the containment. After the SGs are moved through the containment access, the SCV steel containment section that was removed will be reattached by welding. Following the SCV repair, appropriate leakage testing in accordance with ASME Code, Section XI is required to verify the integrity of the repairs and to return the SCV to operable status. The licensee proposes that a local leak rate test be performed on the new pressure boundary welds of the SCV and a

containment pressure test be performed as an alternative to a Type A test, which is specified in the ASME Code.

The sections of the SCV that were removed will be re-welded in place by qualified personnel in accordance with the owner's Code of record requirements. The design Code of record for the SCV is the ASME Code, Section III, 1968 Edition through the Winter 1968 Addenda. Consistent with the owner's Code of record requirements, examinations will be performed on the SCV repair welds. As a minimum, a magnetic particle test of the back gouge of the root pass will be performed and 100 percent radiography will be performed on the pressure boundary containment SCV final repair welds. The SCV repair welds will be tested by a local leakage/pressure test by pressurizing the containment vessel to the required test pressure of at least P_a (per the TS P_a is 12.0 pounds per square inch gauge (psig)) and performing a bubble test of the repair welds. The test pressure will be held between 12.2 psig and 12.5 psig. Pressurizing containment to P_a will structurally test the SCV repair weld. Zero detectable leakage is the acceptance criterion. This is determined by the absence of bubble formation. Any leakage identified will be corrected and the test will be performed again. The SCV will be pressurized through an existing penetration using an external air compressor. It takes approximately 4 hours to pressurize the SCV to the test pressure. Once attaining test pressure, the pressure will be held for 10 minutes before and during the bubble testing and visual examination. It will take approximately 1-2 hours to perform the bubble test and complete the visual examination. The SCV will be depressurized in a controlled manner which takes approximately 2-4 hours. Qualified personnel will conduct all examinations. The combination of the 100 percent radiography, which will show that the repair welds meet the construction code radiography acceptance criteria and the local leak rate test of repair welds by performing the bubble test while the SCV and repair welds are at accident pressure, are adequate to prove the integrity of the repaired areas.

The licensee proposes an alternative to the SCV test requirement of ASME Code, Section XI, paragraph IWE-5221 to verify the leak-tight integrity of the primary containment. The proposed alternative is to perform an "as-left" local leak rate test on the SCV repair welds in lieu of the Type A test specified by the ASME Code, Section XI, paragraph IWE-5221 for this type of repair activity. The local leak rate test will be performed concurrent with a containment pressure test. TVA has determined that a local leak rate test is the most appropriate test to perform on the SCV to meet the testing requirements of the Code. A Type A test is less sensitive than a local leak rate test. TVA considers that the local leak rate test, in conjunction with the planned containment pressure test, will provide an acceptable level of quality and safety.

An integrated leak rate test provides assurance of overall containment integrity, but it does not provide any additional assurance of the quality of the repair welds of the containment vessel. The integrated leak rate test requires additional schedule time, manpower, and dose and test instrumentation to be installed throughout containment. The integrated leak rate test takes longer to perform and virtually stops all other work from taking place inside of the containment for several days.

A local leak rate test provides the most accurate and direct method of assuring the leak tight integrity of the repair welds. The local leak rate test is considered superior for determining leakage at the repaired areas as compared to a Type A test. The local leak rate test measures leakage at the repair area, while an integrated leak rate test measures total containment

leakage. This test is being performed to reestablished the leak-tight integrity of the SCV due to the repair welds. Also, SQN's acceptance criterion for leakage of the repair welds will be zero leakage. This acceptance criterion is a more stringent criterion than that of a Type A test. Therefore, if there is any leakage of the SCV at the repair welds, it would be identified by the local leak rate test, and corrected.

Additionally, the containment pressure test, performed at P_a, will reestablish the structural integrity of the SCV. Therefore, the required pressure test at P_a and local leak rate test of the SCV repair welds satisfy or exceed the intent of a Type A test to establish containment integrity after a repair activity.

The staff finds that the proposed system pressure test of the containment at P_a will satisfactorily structurally test the containment steel vessel repair weld, and the associated inspections will demonstrate the acceptability of the general condition of the containment structure as well as the leak-tight integrity of the repaired containment under design basis accident pressure. The staff also finds that the proposed local leak rate test (bubble test) will demonstrate the leak-tight integrity of the containment steel vessel repair welds.

4.0 CONCLUSION

The staff concludes that the proposed alternative meets the intent of IWE-5221, and will satisfactorily test the structure as well as ensure the leak-tight integrity of the SCV repair. Therefore, the staff concludes that alternative proposed in relief request provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3) (i), the licensee's alternative to performing a Type A leakage test following containment repair is authorized on a one-time basis for the spring 2003 SG replacement outage at SQN1.

5.0 REFERENCES

U.S. Code of Federal Regulations, Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter I, Title 10, "Energy," Section 50.55a, Codes and standards.

ASME *Boiler and Pressure Vessel Code*, Section XI, Subsections IWE, 1992 Edition including the 1992 Addenda, New York, NY.

American National Standards Institute/American Nuclear Society, (ANSI/ANS) 56.8-1994, "Containment System Leakage Testing Requirements."

Letter from Jim Smith (TVA) to NRC, "Relief Request for Relief from ASME Section XI Code Requirements - Tests Following Repair, Modification, or Replacement - Due to SG Replacement for Sequoyah Nuclear Plant Unit 1," dated April 15, 2003.

Principal Contributor: G. Bedi, NRR

Dated: May 9, 2003