January 3, 2005

10 CFR 50.55a

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2 - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) FOR ASME RELIEF REQUEST ISPT-09

Reference: TVA letter to NRC dated August 6, 2004, "Sequoyah Nuclear Plant (SQN) – American Society of Mechanical Engineers (ASME) Section XI Inservice Pressure Test Program Relief Request (ISPT-09)"

The purpose of this letter is to respond to NRC's RAI concerning a SQN request for relief from ASME code (ISPT-09). The details of the RAI were discussed during an October 19 telephone call.

Enclosure 1 provides TVA responses to the NRC request. Enclosure 2 provides the revised request for relief ISPT-09. It should be noted that the revised ISPT-09 supersedes the original ISPT-09 provided in the referenced letter.

There are no regulatory commitments identified in this letter. Please direct questions concerning this issue to me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

Original signed by:

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc (Enclosure):
Mr. Douglas V. Pickett, Senior Project Manager
U.S. Nuclear Regulatory Commission
Mail Stop O-7A15
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2739

ENCLOSURE 1

SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION (RAI)
FOR ASME REQUEST FOR RELIEF ISPT-09

NRC requested TVA provide additional information to support NRC's review of a SQN request for relief ISPT-09. The following provides the requested information.

NRC Request

Please confirm the start and end dates for the second 10-year inspection interval at SQN, Units 1 and 2.

TVA Response

The SQN second ten-year inservice inspection interval began on December 16, 1995, and will be completed on May 31, 2006, for both units. The end of the inspection interval has been extended beyond ten calendar years to coincide with the Unit 1 Cycle 14 refueling outage as permitted by paragraph IWA-2430(c)(1) of Section XI of the ASME Boiler and Pressure Vessel Code.

NRC Request

The licensee cited requirements for pressure testing found in both the ASME Code and Code Case N-498-4. Code Case N-498-4 is an alternative to certain Code requirements for hydrostatic pressure testing of Class 1, 2, and 3 components, and is approved in Revision 13 of Regulatory Guide 1.147 for general use, provided the licensee meets the stated condition that hold times during these pressure tests are maintained according to the 1989 Edition of ASME Section XI.

The licensee's proposal contains references to both ASME Code and Code Case N-498-4 requirements, therefore it appears the licensee has adopted the alternatives described in Code Case N-498-4 (with the condition imposed), in conjunction with associated Code requirements that are required for pressure testing of the subject components.

Please note that Code Case N-498-4 is a *voluntary* alternative to ASME Code requirements and the Staff expects that Code Cases approved in Regulatory Guide 1.147 will be adopted in their entirety. Further, the regulations at 10 CFR 50.55a(a)(3), allow licensee's to propose alternatives to Code and/or CFR requirements, provided (i) an acceptable level of quality and safety will be realized by the alternative, or (ii) existing Code or CFR requirements would impose an unusual hardship or difficulty without a compensating increase in quality and safety. However, no mechanism for evaluating a licensee's proposal to an

existing, NRC-approved, voluntary alternative, is allowed by the provisions at 10 CFR 50.55a(3). This would, in effect, be providing an alternative to an alternative.

The issues related to test pressures and temperatures for the piping segments defined in ISPT-09 should be addressed as a stand alone alternative to ASME Code requirements, not as an alternative to Code Case N-498-4. Please revise the proposal accordingly, re-state the basis for the alternative, describe the hardship or unusual difficulty that would be incurred if the ASME Code or CFR requirements are imposed, and clearly define all conditions or provisions that will be met by the proposed alternative.

TVA Response

TVA's request for relief ISPT-09 has been revised to remove any reference to the ASME Code Case N-498-4. The revised relief request is provided in Enclosure 2. The revised request states that relief is requested from the requirements of the 1989 Edition of Section XI of the ASME Code.

NRC Request

For each of the piping segments listed in the Table in the licensee's proposed alternative, please state the piping material, nominal pipe size and overall length of the segment. In addition, submit the isometric drawings (ISOs) associated with the piping segments listed in this request.

TVA Response

The revised request for relief is provided in Enclosure 2 and contains the piping material information. As discussed with NRC during the October 19, 2004, telephone conference call, pipe dimensions and lengths are being provided in lieu of isometric drawings.

NRC Request

In the licensee's basis for relief, it is stated that a test pressure of 2400 psig and temperature of 110°F will be applied to piping segments associated with the RCP seal injection, alternate charging, charging, and pressurizer spray systems. However, in the proposed alternative, it is stated that test pressure and temperature for these segments will be the *respective segment pressure and temperature*. Please clarify and confirm that these system segments will be pressurized to 2400 psig at 110°F.

REQUEST FOR ADDITIONAL INFORMATION (RAI) FOR ASME REQUEST FOR RELIEF ISPT-09 (CONTINUED)

TVA Response

The piping segments identified in this question have been removed from TVA's ISPT-09 relief request (see Enclosure 2).

NRC Request

The licensee states that ECCS piping segments included in ISPT-09 will be pressurized to 1500 psig by using a safety injection pump with the test header aligned, but will only reach ambient temperature because the pump supply is from the refueling water storage tank, which is open to atmospheric conditions. State the operating pressures and temperatures of these ECCS line segments during a plant event that requires safety injection, i.e., operation of these lines. Include a discussion why the proposed pressure and temperature is adequate to ensure leakage integrity for these lines.

TVA Response

TVA's revised request is provided in Enclosure 2 and discusses the adequacy of the proposed alternative test. The temperature of each piping segment in the revised request will comply with IWB-5230 of the ASME code and thus relief from code temperature requirements have been removed from TVA's original ISPT-09 request.

NRC Request

For the line segments discussed in ISPT-09, list any other examinations that are conducted to ensure structural or leakage integrity. Specifically, describe any volumetric or surface examinations being performed as part of the current inservice inspection program, and list any indications that have resulted from these examinations.

TVA Response

The piping segments providing safety injection flow from the low pressure accumulators do not receive inservice examinations in the risk-informed program due to the low probability of failure and their low failure consequence. These piping segments are constantly monitored during plant operation by the automatic monitoring of accumulator pressure and level. Any leakage in these segments would be immediately identified to plant operators and Technical Specification actions taken. In the event of failure of these segments all leakage will be directed to the containment sump and will remain available for recirculation through the RHR and Containment Spray systems. The high pressure and intermediate pressure safety injection segments have been evaluated to determine their risk ranking. Those segments which were determined to be high in safety significance receive volumetric inservice examinations of selected welds, where possible. High safety significant segments, which are small diameter (1 ½ inches) joined by socket welds, cannot be adequately examined by volumetric methods. These high safety segments and all low safety significant segments receive a VT-2 visual examination each refueling outage during unit startup.

ENCLOSURE 2

SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2
REQUEST FOR RELIEF ISPT-09, REVISION 1

Summary: Implementation of certain ASME Section XI Code requirements for in-service pressure testing of certain ASME Class 1 piping segments under current plant design would violate the design and 10 CFR 50.55a(c)(ii) requirements for dual isolation capability of the reactor coolant pressure boundary. TVA has reviewed the SQN plant design and evaluated the hardships associated with testing these piping segments to the extent practical. Based on this review, TVA has determined that test methods required to achieve code compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. TVA's proposed alternative for pressure testing these segments of the ASME Section XI Class 1 boundary provides an acceptable level of quality and safety. Accordingly, based on the hardships associated with satisfying the ASME code requirements, TVA requests authorization to use alternative test methods in accordance with 10 CFR 50.55a (a)(3)(ii).

Units: 1 and 2

Systems: Reactor Coolant System (RCS) - System 68 (FSAR Figure 5.1-1)
Safety Injection System (SIS) – System 63 (FSAR Figure 6.3.2-1)
Residual Heat Removal System (RHR) – System 74 (FSAR Figure 5.5.7-1)

Components: Safety injection and residual heat removal (RHR) system piping segments are part of the reactor coolant pressure boundary located between the primary and secondary isolation valves from the reactor pressure vessel.

Class: 1

Function: The piping segments listed in Table 1 below are connected directly to the reactor coolant system and provide reactor core cooling water injection flowpaths during normal shutdown and startup conditions, and during postulated emergency conditions.

Code Requirement From Which Relief is Requested: The 1989 Edition of the ASME Boiler and Pressure Vessel code, Section XI, Table IWB-2500-1, Examination Category B-P, Note 2 requires that the pressure retaining boundary during the system hydrostatic test shall include all Class 1 components within the system boundary. Paragraph IWB-5222(a) requires that the test pressure be not less than 102% to 110% of the nominal operating pressure associated with 100% rated reactor power and as specified in Table IWB-5222-1.

REQUEST FOR RELIEF ISPT-09, REVISION 1
(Continued)

Basis for Relief:

The piping segments listed in Table 1 below are connected directly to the reactor coolant system, and, in accordance with the reactor coolant pressure boundary definition in 10 CFR 50 paragraph 50.2, are classified as ASME Class 1 up to and including the second isolation valve. Each of these piping segments, except for the RHR system piping, is isolated from the primary reactor coolant system (RCS) by a self-actuating check valve designed to prevent primary reactor coolant from escaping the RCS, while providing a passive injection flowpath for coolant injection. The use of check valves in these piping segments for isolation from the RCS prevents, by design, their pressurization by the primary RCS, and conversely, their pressurization to any pressure greater than that in the RCS.

The RHR piping segment is also connected directly to the RCS; however, this piping is isolated from the RCS by two in-series motor-operated valves (MOVs). These MOVs are interlocked to ensure redundant isolation of the RCS from the lower design pressure (600 psig) RHR system. Plant operating instructions require that these MOVs be closed when the RCS pressure exceeds 350 psig.

During performance of the Section XI inservice hydrostatic pressure test, the RCS would be brought to system normal operating pressure of approximately 2235 psig, at which time the subject piping segments are isolated from the RCS by their respective check valves, or FCV-74-1 in the RHR segment. No method currently exists for pressurizing these piping segments to full test pressure during the Section XI hydrostatic pressure test.

Two methods that TVA investigated are: (1) the use of temporary high pressure hoses connected to RCS test connections, vent or drain piping to “jumper” around the isolation check valves, and (2) the use of hydrostatic pumps connected to each piping segment. Both of these methods conflict with plant design requirements and 10 CFR 50.55a(c)(ii) by eliminating the double isolation boundary required for the reactor coolant pressure boundary when the reactor vessel contains nuclear fuel. The use of either of these methods would require a redesign of the RCS and the installation of new piping designed to meet the plant construction code and licensing commitments. This option is cost prohibitive and imposes a burden to TVA which is not commensurate with the increase to plant safety achieved through compliance with the ASME Section XI pressure test requirement versus use of the proposed alternative test method.

The purpose of the ASME Section XI pressure test is to detect existing through-wall defects in the pressure retaining boundary by the identification of leakage from the boundary. The detection of pressure boundary leakage from such through-wall defects can be achieved at pressures lower than the pressure associated with 100% rated reactor power.

The proposed alternate testing method will achieve the highest test pressure in each piping segment listed in Table 1 that can be achieved without plant modification, and while continuing to comply with plant Technical Specifications and design requirements when nuclear fuel is contained in the reactor.

The difference in the amount of leakage at the proposed alternative test pressure versus the ASME Section XI required test pressure is estimated by the following equation:

$$L_p = L_{XI} \text{ X } (P_p/P_{XI})^{1/2}$$

Where: L_p = the leakage at the proposed test pressure
L_{XI} = the leakage at the Section XI required pressure
P_p = the proposed test pressure of 1500 psig
P_{XI} = the Section XI required pressure of 2235 psig

For the safety injection system piping, the expected leakage from a through-wall defect would be approximately:

$$L_p = L_{XI} \text{ X } (1500/2235)^{1/2} = L_{XI} \text{ X } 0.82$$

or, 82% of the leakage at the higher Section XI test pressure.

For the RHR system piping, the expected leakage from a through-wall defect would be approximately:

$$L_p = L_{XI} \text{ X } (350/2235)^{1/2} = L_{XI} \text{ X } 0.40$$

or, 40% of the leakage at the higher Section XI test pressure.

The Section XI test procedure requires a holding time (4 hours for insulated components and 10 minutes for non-insulated components) after attaining test pressure in order to allow sufficient fluid leakage to collect to ensure detection by the visual, VT-2, examination.

As shown above, the estimated reduction in the amount of leakage from a through-wall defect would not be expected to prevent detection of a leak during a visual VT-2 examination.

Table 1 – Piping Segment Description						
Description	**Nominal Pipe Diameter (inches)**	**Pipe Schedule**	**Segment Length (feet)**	**Pipe Material**	**Piping Design Pressure (psig)**	**Proposed Test Pressure (psig)**
Reactor Coolant System Loop 1						
Safety injection Accumulator No. 1 to Loop 1 cold leg (CKV-63-622 to CKV-63-560)	10	140	20	SA376 Type 304	2580	1500
Low pressure safety injection from RHR system CKV-63-633 to the 10 inch Loop 1 cold leg injection line	6	160	25	SA376 Type 304	2580	1500
High pressure safety injection piping from the 3 inch common header from CKV-63-581 to Loop 1 cold leg piping to CKV-63-586	1 ½	160	60	SA376 Type 304	2580	1500
Safety Injection pump piping from CKV-63-543 to the 8 inch Loop 1 hot leg injection line	2	160	5	SA376 Type 304	2580	1500
Safety Injection pump piping from CKV-63-551 to the 6 inch Loop 1 cold leg injection line	2	160	25	SA376 Type 304	2580	1500
Low pressure safety injection from RHR system CKV-63-640 to the Loop 1 hot leg injection CKV-63-641	8 6	140 160	30 5	SA376 Type 316	2485	1500
Reactor Coolant System Loop 2						
Safety injection Accumulator No. 2 to Loop 2 cold leg (CKV-63-623 to CKV-63-561)	10	140	20	SA376 Type 316	2580	1500
Low pressure safety injection from RHR system CKV-63-632 to the 10 inch Loop 2 cold leg injection line	6	160	15	SA376 Type 316	2580	1500
High pressure safety injection piping from the 2 ½ inch common header from CKV-63-581 to Loop 2 hot leg piping to CKV-63-587	1 ½	160	105	SA376 Type 304	2580	1500
Safety injection pump piping from CKV-63-547 to the 6 inch Loop 2 hot leg injection line	2	160	40	SA376 Type 304	2580	1500
Safety injection pump piping from CKV-63-553 to the 6 inch Loop 2 cold leg injection line	2	160	20	SA376 Type 304	2580	1500

Table 1 – Piping Segment Description (continued)						
Reactor Coolant System Loop 3	**Nominal Pipe Diameter (inches)**	**Pipe Schedule**	**Segment Length (feet)**	**Pipe Material**	**Piping Design Pressure (psig)**	**Proposed Test Pressure (psig)**
Safety injection Accumulator No. 3 to Loop 3 cold leg (CKV-63-624 to CKV-63-562)	10	140	20	SA376 Type 316	2580	1500
Low pressure safety injection from RHR system CKV-63-634 to the 10 inch Loop 3 cold leg injection line	6	160	15	SA376 Type 316	2580	1500
High pressure safety injection piping from the 3 inch common header from CKV-63-581 to Loop 3 cold leg piping to CKV-63-588	1 ½	160	40	SA376 Type 304	2580	1500
Safety injection pump piping from CKV-63-545 to the 8 inch Loop 3 hot leg injection line	2	160	5	SA376 Type 304	2580	1500
Safety injection pump piping from CKV-63-555 to the 6 inch Loop 3 cold leg injection line	2	160	25	SA376 Type 304	2580	1500
Low pressure safety injection from RHR system CKV-63-643 to the Loop 3 hot leg injection CKV-63-644	8	140	35	SA376 Type 316	2485	1500
Reactor Coolant System Loop 4						
Safety injection Accumulator No. 4 to Loop 4 cold leg (CKV-63-625 to CKV-63-563)	10	140	25	SA376 Type 304	2580	1500
Low pressure safety injection from RHR system CKV-63-635 to the 10 inch Loop 4 cold leg injection line	6	160	20	SA376 Type 304	2580	1500
High pressure safety injection piping from the 3 inch common header from CKV-63-581 to Loop 4 cold leg piping to CKV-63-589	1 ½	160	25	SA376 Type 304	2580	1500
Safety injection pump piping from CKV-63-549 to CKV-63-558 in the 6 inch Loop 4 hot leg injection line	2 6	160 160	40 5	SA376 Type 304 SA376 Type 316	2580 2580	1500 1500
Safety injection pump piping from CKV-63-557 to the 6 inch Loop 4 cold leg injection line	2	160	5	SA376 Type 304	2580	1500
RHR piping between FCV-74-1 and FCV-74-2	14	160	35	SA376 Type 316	2485	350

Proposed Alternative Test Method: The piping segments from the high pressure and intermediate pressure safety injection system and the safety injection accumulators will be pressurized using the safety injection pumps to approximately 1500 psig which is the pressure achieved with the safety injection pumps running in the minimum recirculation flow mode.

The piping segments from the RHR system segment will be pressurized to approximately 350 psig and visually examined when the RHR system is providing shutdown cooling during plant startup following the refueling outage.

Based on the hardships associated with costly plant modifications and redesign, TVA considers the proposed alternative test method to be acceptable for satisfying pressure boundary integrity of the segments identified in Table 1 while maintaining compliance with plant design requirements, plant Technical Specifications and the requirement of 10 CFR 50.55a(a)(c)(ii). Sufficient test pressure in conjunction with the test pressure holding time will allow detection of any leakage from the pressure retaining boundary of the subject piping segments. Accordingly, TVA requests relief from the ASME code in accordance with 10 CFR 50.55a(a)(3)(ii).