Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

February 19, 2003

10 CFR 50.90

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) - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING TECHNICAL SPECIFICATION (TS) CHANGE 02-07, "ONE-TIME FREQUENCY EXTENSION FOR TYPE A TEST (CONTAINMENT INTEGRATED LEAK RATE TEST [CILRT])," TAC NOS. MB6987 AND MB6988

Reference: NRC letter to TVA dated February 10, 2003, "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Request for Additional Information on Technical Specification (TS) Change No. 02-07, "One-Time Frequency Extension for Type A Test (Containment Integrated Leak Rate Test [CILRT])" (TAC Nos. MB6987 and MB6988)

This letter provides additional information requested by the reference letter to support NRC review of SQN TS Change 02-07. The enclosure provides TVA responses to the NRC staff questions.

This letter is being sent in accordance with NRC RIS 2001-05. There are no commitments contained in this submittal. Please direct questions concerning this issue to me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 19 day of February, 2003.

Sincerely,

Pedro Salas
Licensing and Industry Affairs Manager

Enclosure
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ENCLOSURE

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
SEQUOYAH (SQN)
TECHNICAL SPECIFICATION (TS) CHANGE NO. 02-07,
ONE-TIME FREQUENCY EXTENSION FOR TYPE A TEST
CONTAINMENT INTEGRATED LEAK RATE TEST

NRC Question 1

On Page E1-8, under IWE Inspection Program Activities, the staff understands that the licensee is using the 1992 Edition and the 1992 Addenda of Subsection IWE. IWE-1240 requires the owner to identify the surface areas requiring augmented examinations. Please provide the NRC staff with the list of areas identified for augmented examination and a summary of examinations performed.

TVA Response

The areas identified for IWE-1240 augmented examinations were provided on Page E1-9 of reference 1. The following provides an excerpt from the reference 1 submittal:

> *"The Units 1 and 2 augmented examination areas identified are at chilled water system penetrations X-64, X-65, X-66, and X-67 on the exterior side of the SCV. These areas are examined once per period in accordance with ASME Section XI, Subsection IWE, Table IWE-2500-1, Examination Category E-C, Item Number E4.12. The nozzle reinforcement on the exterior side of the penetrations had corrosion due to moisture absorbed and held against the nozzle reinforcement by foam insulation. These areas were ultrasonically examined and thickness data showed that the remaining thickness was acceptable. Accordingly, the areas identified to date for augmented examination have not impacted the structural integrity or leak tightness of the steel containment vessel."*

The areas described above have been identified for augmented examination in accordance with ASME Section XI, Subsection IWE, Table IWE-2500-1, Examination Category E-C, Item Number E4.12. These augmented areas were ultrasonically examined for minimum wall thickness. The initial examinations on the penetrations were performed March 7, 2000 for Unit 1 (cycle 10 refueling outage), and May 6, 1999 for Unit 2 (cycle 9 refueling outage). The next scheduled examination of these areas is during the next period (the next period contains both the cycle 12 and cycle 13 refueling) outages.

NRC Question 2

On Page E1-8, under IWE Program, the licensee considered the first inspection period as 5 years (September 9, 1996 to September 8, 2001) - the period given to the licensees to complete their first period examination in 10 CFR 55.55a. In the NRC response to Nuclear Energy Institute (NEI) questions 13, 15, and 16, on containment inservice inspections requirements entitled "Response to NEI's Topic and Specific Issues related to Containment Inspection Requirements," dated May 30, 1997, the NRC explained that this interpretation of the rule was incorrect. The staff noted that the inspection periods should be determined as required in the American Society of Mechanical Engineers (ASME) Code, Section XI. Please provide your actual start dates of the first and subsequent inspection periods for ASME Code Class MC components in the first interval as required by the ASME Code, Section XI.

TVA Response

The first credited examination for the first period IWE program was performed for Unit 1 on January 19, 2000 during the cycle 10 refueling outage and for Unit 2 on March 24, 1999 during the cycle 9 refueling outage. All of the first period examinations were completed prior to the September 9, 2001 date. Based on the NRC clarification of 10 CFR 50.55a, TVA plans to revise the IWE program to establish the start of the first period for both units on September 9, 1998. The second period for both units will begin on September 9, 2001, and the third period for both units will begin on September 9, 2005. The first IWE interval for both units will end on September 8, 2008.

NRC Question 3

On Page E1-11 under IWE Program Related Relief Requests, the licensee states that Relief Requests CISI-01 and CISI-04 for Examination Categories E-D, and E-G were authorized by NRC. In approved Relief Request CISI-01, alternative requirement (Appendix J, Option B) eliminates the need to perform visual examination of seals and gaskets in accordance with the 1992 Edition with the 1992 Addenda of the ASME Code Section XI,

Subsection IWE, Table IWE-2500-1, Category E-D, item E5.10 and E5.20. Approved Relief Request CISI-04 eliminates the requirement of Category E-G, Item E8.20 for the bolted connections that have not been disassembled and reassembled during the inspection interval. TVA is requested to confirm that bolts examination, as required by Item E8.10 of Examination Category E-G, will continue to be performed. Please provide the schedule when the seals and gaskets will be examined during the extended ILRT interval from 10-to-15 years.

TVA Response

As summarized above, the relief request CISI-01 was approved and allows Appendix J testing to be performed in lieu of code examinations. The extension of the integrated leak rate test (ILRT) interval from 10 to 15 years will not affect the frequency at which the seals and gaskets are tested for Appendix J. The provisions of Option B (10 CFR 50, Appendix J) allow extended test intervals up to 120 months for Type B components, based on acceptable performance. At SQN seals and gaskets are tested in accordance with 10 CFR Part 50, Appendix J, Option B and are Type B tested during a 60-month period for the full population. They are tested on a staggered basis such that a portion are tested each refueling outage. Since Option B was first implemented at SQN (Spring 1997 for Unit 1 and Fall 1996 for Unit 2), seals and gaskets on both units have been tested at least once and are undergoing their second round of testing on a staggered basis. In addition to the 60-month tests, testing is performed prior to and following disassembly of a containment penetration. Testing of seals and gaskets will also occur as part of the ILRT (Type A test) at the end of the 15-year extended interval since the Type A test will challenge all Type B test barriers.

NRC Question 4

The stainless steel bellows have found to be susceptible to trans-granular stress corrosion cracking, and leakages through them are not readily detectable by Type B testing (see NRC Information Notice 92-20, "Inadequate Local Leak Rate Testing"). On Page E1-7, the licensee states that the SQN containment mechanical bellows are two-ply laminated testable bellows. Please provide information regarding frequency of inspection and testing of these bellows during the extended ILRT interval from 10-to-15 years, and a description of corrective action that will be taken if a bellows test were to fail.

TVA Response

The bellows are tested under the 10 CFR 50 Appendix J program, Option B. If the bellows test fails the Appendix J Type B test, the bellows' sheet metal cover is removed, the bellows are pressurized to test pressure, and visually inspected for leakage using a bubble solution (snoop), lights, mirrors, etc. The bellows are repaired or replaced as necessary if the bellows are found to be leaking. The extension of the ILRT frequency from 10 to 15 years has no effect on this testing since the frequency of inspection and testing of these bellows is limited to 60 months as identified on page E1-7 of reference 1.

> *"Option B of 10 CFR 50, Appendix J would allow extended test intervals up to 120 months for Type B components, based on acceptable performance. Due to industry concerns, SQN has limited extended test intervals for bellows to 60 months. Additionally, penetrations with bellows are tested on a staggered basis such that a portion are tested each refueling outage."*

NRC Question 5

Inspections of some reinforced and steel containments (e.g., North Anna, Brunswick, D.C. Cook and Oyster Creek), have indicated degradation from the uninspectable (embedded) side of the steel shell and liner of primary containments. The major uninspectable areas of the ice condenser containment include those behind the ice baskets and part of the shell embedded in the basemat. Please discuss whether there are uninspectable areas and what programs are used to monitor their condition. Also, address how potential leakage due to age related degradation from these uninspectable areas are factored into the risk assessment in support of the requested ILRT interval extension from 10-to-15 years. Please note that the October 4, 2002, submittal does not provide any quantitative assessment of the potential impact that corrosion could have on large early release frequency (LERF) estimates. As discussed during the December 19, 2002, call, quantitative approaches for addressing this concern have been utilized in ILRT extension requests subsequent to TVA's original ILRT request in late 2001 (including those for D.C. Cook, McGuire, Catawba ice condenser containments, and for Susquehanna), and similar analyses should be provided for SQN.

TVA Response

The uninspectable areas for SQN are discussed on pages E1-9, E1-10 and E1-11 of reference 1. The following provides an excerpt from reference 1:

Page E1-9

> *"A VT-3 visual examination was performed on the SCV interior surface in the vicinity of the moisture barrier at the interface of the SCV and raceway floor for Unit 1 during the Cycle 10 refueling outage and Unit 2 during Cycles 9 and 10 refueling outages. This examination was a result of the periodic VT-3 visual examination of the moisture barrier to meet the ASME Section XI, Subsection IWE, Table IWE-2500-1, Examination Category E-D, Item Number E5.30. The examination results identified degradation of the moisture barrier at various locations, where the seal was not adhered to the concrete and SCV interface on both units. A VT-3 examination of the SCV was performed from 12 inches above the floor to 6 inches below the floor during the Unit 1 Cycle 10 refueling outage and Unit 2 Cycles 9 and 10 refueling outages, over the full length of the moisture barrier. The VT-3 examination was in accordance with the requirements of IWE-2500(b). The examination identified conditions consisting of mild uniform corrosion, discoloration and minor pitting below the floor surface on both units. One area on Unit 1 was identified at 30 degrees azimuth where the SCV wall thickness was slightly reduced due to corrosion mechanisms. However, ultrasonic thickness measurements verified that there was no wall loss below original nominal wall plate thickness in this location. On Unit 2 the area between azimuth 170 degrees to 177 degrees that was examined during Cycle 9 refueling outage identified 11 areas of pitting and during Cycle 10 refueling outage one area at 273.5 degrees azimuth where the SCV wall thickness was slightly reduced due to corrosion mechanisms. However ultrasonic thickness measurements verified that there was no significant wall loss at these locations and each area was within the design minimum wall thickness. All areas were evaluated by Engineering and no detrimental flaws or significant degradation of the SCV liner were noted during the evaluation. All of the existing moisture barrier, along with the fiberglass filler in the crevice (6 inches below the surface), was removed and replaced with a polyurethane elastomeric material during the Units 1 and 2 cycle 10 refueling outages. This polyurethane elastomeric material*

will serve to fill the crevice area, act as the protective coating for the SCV, and provide a leak tight barrier."

TVA feels the actions described above will arrest any SCV degradation and will preserve containment integrity beyond the 5- year extension interval."

The moisture barrier is examined in accordance with the ASME Section XI code.

Pages E1-10 and E1-11

"During the Unit 1 Cycle 10 and Unit 2 Cycle 9 refueling outages ultrasonic thickness measurements were taken at three locations (2-foot x 3-foot grids) on the exterior side of the SCV at the seal area between the ice condenser and the SCV. These ultrasonic thickness measurements revealed no areas below the original nominal wall plate thickness. There was no material degradation noted in these examination areas.

The SQN steel containment vessel contains areas that are inaccessible inside containment due to the ice condenser system design configuration. These inaccessible areas are not specifically susceptible to degradation, however, TVA plans to perform additional inspections in these areas to validate integrity of the steel containment vessel. Additional ultrasonic thickness measurements on the SCV inaccessible areas will be performed during the Units 1 and 2 Cycle 12 refueling outages, to assess potential degradation. The ultrasonic thickness measurements will be taken at the 4-inch spacing line intersections in each 12-inch x 12-inch grid. Degraded areas will be evaluated by Engineering for inclusion under the augmented program per IWE-1240 of Subsection IWE of Section XI of ASME. These grids are randomly selected at the following areas:

Two inaccessible areas are behind the ice condenser wall panels and behind the insulation on the exterior of the SCV outside the incore instrument room. A sampling of 24 grids are planned for these areas.

- *796 elevation - SCV area at the interface to the top deck panel (6 grids)*
- *778-788 elevations - SCV area behind the ice condenser where sweating on the exterior side of the SCV has been observed (6 grids)*

- *721 elevation - SCV area at the vapor barrier for the ice condenser floor(6 grids)*

- *691-721 - elevation- SCV area behind the insulation on the exterior side (6 grids)*

The inaccessible SCV exterior area behind the emergency gas treatment system (EGTS) duct work at the floor to SCV interface will be VT-3 examined when the duct work is removed to allow access during the cycle 12 refueling outages on each unit. Following examination, this area will be examined when the general visual examination for the SCV is scheduled in accordance with the ASME Section XI code.

During the Unit 2 Cycle 11 refueling outage,12 feet of the EGTS duct work was removed and the SCV examined. Minor corrosion and pitting were identified with no visible signs of active corrosion. There were no detrimental flaws or significant degradation noted during the examination. The SCV at these locations was recoated."

The potential leakage due to age-related degradation in uninspectable areas is factored into TVA's risk assessment that supports the requested ILRT interval extension from 10 to 15 years. TVA's risk assessment is based on information described in the references 2 and 3.

The probability of a preexisting containment leak as a function of LLRT and ILRT intervals, is developed in the risk assessment provided in reference 2 (see page 8 of Enclosure 4). The probability of a preexisting containment leak consists of two factors:

1. leakage from a containment penetration (i.e., through the isolation valve/device) and

2. leakage from the free standing steel shell (i.e., through the welds connecting the containment shell steel plates - see Figure 3.8.2-9 of SQN's UFSAR)

The rate of occurrence of a preexisting leak in a containment penetration $-\lambda_p$, is based on the information in NUREG-1493.

The rate of occurrence of a preexisting leak in the containment liner $-\lambda_l$, is estimated in the reference 2 evaluation (see page 8 of Enclosure 4) as equivalent to the mean failure rate for a storage tank rupture. The effect of including this term on the probability of a preexisting small and preexisting large leak is shown on page 9 of Enclosure 4 of reference 2. Specifically, the probability of a preexisting leak increases by a factor of 1.14 and 1.24 for a 1-in-10 year and a 1-in-15 year ILRT, respectively (relative to a 3-in-10 year ILRT frequency). Had the probability of a preexisting liner leak not been included, the probability of a preexisting leak would have increased only by a factor of 1.10 and 1.15 for a 1-in-10 year and a 1-in-15 year ILRT, respectively (again, relative to a 3-in-10 year ILRT frequency).

The probability of a large preexisting containment leak for a 3-in-10 year ILRT is 0.021 (see page 9 of Enclosure 4 of reference 2). Therefore, the probability of a preexisting leak due to liner corrosion/age degradation is (0.021)(1.24 - 1.15) = 1.9E-3 for the 1-in-15 year ILRT. This probability of a preexisting leak due to liner corrosion/age degradation is very large and comprises (1.24 - 1.15)/(1.24 - 1) ~ 38 percent of the total preexisting leakage probability. Numerically, the probability of a large preexisting leak due to liner corrosion/age degradation used in reference 1 is a factor of 15 greater than the value used in other utility ILRT extension requests (see page 7 of reference 3).

NRC Question 6

TVA has updated the delta LERF value from the original October 9, 2001, ILRT extension request for Unit 2 based on a more recent probabilistic risk analysis (PRA). The new delta LERF is estimated as the original delta LERF times the ratio of the new core damage frequency (CDF) (based on "Draft Revision 2" of the PRA, circa August 2001) to the original CDF. This simplified approach for estimating the delta LERF could skew the results if the new risk profile is substantially different from the original risk profile. TVA needs to provide a delta LERF estimate based on the latest PRA, in conjunction with the methodology for assessing LERF impact described in the October 9, 2001, ILRT submittal.

TVA Response

The increase in LERF is based on SQN's latest probalistic safety analysis (PSA) (Revision 2). The increase in LERF for this change is independent of any change in the risk profile between the version of the PSA used in TVA's reference 2 submittal (Revision 1 version) and the latest PSA (Revision 2 version). This is because the only change is the probability of a preexisting leak. The increase in the probability of a large preexisting containment leak when the frequency of an ILRT is reduced from 3-in-10 years to 1-in-15 years is (1.24 - 1.0)(0.021) = 0.00504 (see reference 2 - page 9 of Enclosure 4). Because this is a large preexisting leak, all core damage events result in a large early release. Hence, the increase in LERF is the product of the increase in probability of a preexisting leak and the core damage frequency or (0.00504)(1.27E-5) = 6.5E-8/year.

The effect of the change in LERF calculated above on population dose can also be quantified by multiplying the population dose for large preexisting leaks given in TVA's reference 2 submittal (see Table 8 of Enclosure 4) by the ratio of the CDFs from Revision 1 and Revision 2 of the PSA. The increase in population dose when the frequency of an ILRT is reduced from 3-in-10 years to 1-in-15 years is [(45.9 - 37.1) + (53 - 42.6)] (1.27E-05/4.02E-05) or ~ 6 person-rem.

References

1. TVA letter to NRC dated October 4, 2002, Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Technical Specification (TS) Change No. 02-07, "One Time Frequency Extension for Type A Test (Containment Integrated Leak Rate Test [CILRT])"

2. Letter from the TVA to NRC dated October 9, 2001, Sequoyah Nuclear Plant (SQN) - Unit 2 - Technical Specification (TS) Change No. 01-10, One-Time Frequency Extension for Type A Test (Containment Integrated Leak Rate Test (CILRT))

3. Letter from Constellation Nuclear to NRC dated March 27, 2002, Calvert Cliffs Nuclear Power Plant Unit 1 Docket No. 50-317 - Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension