December 4, 2002

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 — REQUEST FOR ADDITIONAL INFORMATION CONCERNING UNIT 1 STEAM GENERATOR REPLACEMENT TOPICAL REPORTS AND ASSOCIATED TECHNICAL SPECIFICATION AMENDMENT (TAC NOS. MB5370, MB5371, MB5387)

Dear Mr. Scalice:

Three topical reports were submitted to the U.S. Nuclear Regulatory Commission (NRC) for review and approval in March and April 2002, by the Tennessee Valley Authority (TVA). The topical reports provide the technical basis for the methodology and associated modifications to be applied during the Sequoyah Unit 1 steam generator replacement project. One of the three topical reports (24370-TR-C-002) pertains to the conduct of activities intended to ensure safe operation of Unit 2 during heavy load lift activities, and the proposed compensatory measures intended to ensure safe shutdown capability of Unit 2 in the unlikely event that a heavy load drop occurs over Essential Raw Cooling Water system piping. The NRC staff is in the process of reviewing these submittals.

As discussed during a conference call on September 19, 2002 and during a public meeting held October 24, 2002, the NRC staff requires responses to the enclosed Request for Additional Information to proceed with its review. During a subsequent phone call on November 25, 2002, Mr. Jim Smith of the Sequoyah licensing staff stated that TVA would respond to this request by December 20, 2002.

Please have your staff contact Eva Brown at (301) 415-2315 or Ron Hernan at (301) 415-2010 if there are any questions regarding the enclosed request.

Sincerely,

/RA for by Eva Brown/

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure: Request for Additional Information

cc w/enclosure: See next page

December 4, 2002

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 — REQUEST FOR ADDITIONAL INFORMATION CONCERNING UNIT 1 STEAM GENERATOR REPLACEMENT TOPICAL REPORTS AND ASSOCIATED TECHNICAL SPECIFICATION AMENDMENT (TAC NOS. MB5370, MB5371, MB5387)

Dear Mr. Scalice:

Three topical reports were submitted to the U.S. Nuclear Regulatory Commission (NRC) for review and approval in March and April 2002, by the Tennessee Valley Authority (TVA). The topical reports provide the technical basis for the methodology and associated modifications to be applied during the Sequoyah Unit 1 steam generator replacement project. One of the three topical reports (24370-TR-C-002) pertains to the conduct of activities intended to ensure safe operation of Unit 2 during heavy load lift activities, and the proposed compensatory measures intended to ensure safe shutdown capability of Unit 2 in the unlikely event that a heavy load drop occurs over Essential Raw Cooling Water system piping. The NRC staff is in the process of reviewing these submittals.

As discussed during a conference call on September 19, 2002 and during a public meeting held October 24, 2002, the NRC staff requires responses to the enclosed Request for Additional Information to proceed with its review. During a subsequent phone call on November 25, 2002, Mr. Jim Smith of the Sequoyah licensing staff stated that TVA would respond to this request by December 20, 2002.

Please have your staff contact Eva Brown at (301) 415-2315 or Ron Hernan at (301) 415-2010 if there are any questions regarding the enclosed request.

Sincerely,
/RA for by Eva Brown/
Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure: Request for Additional Information

cc w/enclosure: See next page

<u>DISTRIBUTION</u>:

PUBLIC	PDII-2 R/F	OGC	ACRS	RHernan(hard copy)
AHowe	EBrown	BClayton (Hard Copy)	MHart	SWeerakkody
JMa	KManoly	FReinhart	GHatchett	PFredrickson, RII
MRubin				

ADAMS Accession No. ML023380703 ***See previous concurrence

OFFICE	PDII-2\PM	PDII-2\PM	PDII-2\LA	SPSB\SC *	SPLB\SC *	PDII-2\SC
NAME	EBrown for RHernan	EBrown	BClayton	FReinhart	SWeerkkody	AHowe
DATE	12/4/02	12/4/02	12/3/02	10/15/02	10/21/02	12/4/02

OFFICIAL RECORD COPY

<u>REQUEST FOR ADDITIONAL INFORMATION</u>

<u>STEAM GENERATOR REPLACEMENT</u>

<u>TOPICAL REPORTS AND RELATED TECHNICAL SPECIFICATION AMENDMENT</u>

<u>SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2</u>

<u>DOCKET NOS. 50-327 AND 50-328</u>

References:

1. Letter from the Tennessee Valley Authority (TVA) to the U.S. Nuclear Regulatory Commission (NRC), “Sequoyah Nuclear Plant (SQN) - Steam Generator Replacement Project - Topical Report No. 24370-TR-C-001, ‘Alternate Rebar Splice - Bar-Lock Mechanical Splices’,” March 18, 2002

2. Letter from the TVA to the NRC, “Sequoyah Nuclear Plant (SQN) - Steam Generator Replacement Project - Topical Report No. 24370-TR-C-002, ‘Rigging and Heavy Load Handling’,” April 15, 2002

3. Letter from the TVA to the NRC, “Sequoyah Nuclear Plant (SQN) - Steam Generator Replacement Project - Topical Report No. 24370-TR-C-003, ‘Steam Generator Compartment Roof Modification’,” March 28, 2002

<u>Topical Report No. 24370-TR-C-001, “Alternate Rebar Splice - Bar-Lock Mechanical Splices”</u>

1. Provide a copy of the Bechtel/Idaho National Engineering and Environmental Laboratory (INEEL) test report for the Bar-Lock Mechanical Splices. The report should include information on who performed the splice tests, their qualifications, and how the tests were performed.

2. Describe TVA’s involvement, if any, in the Bechtel/INEEL test program.

3. Clarify whether TVA has evaluated and determined that the Quality Assurance (QA) programs of the reinforcing bar supplier (Consolidated Power Supply), the reinforcing bar fabricator (Birmingham Steel Corporation), the manufacturer of the Bar-Lock coupler (including lockshear bolt, and serrated rail), and the contractors who performed the tests (Bechtel/INEEL), meet theTitle10, *Code of Federal Regulations* (10 CFR), Part 50, Appendix B, requirements. Provide the results of TVA’s evaluations of theses QA programs.

4. Page 10 the report states that Bechtel has witnessed and verified implementation of Bar-Lock’s manufacturing quality control processes and procedures for compliance with the applicable provisions of American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) N45.2. Identify and submit for staff’s review the applicable provisions of ANSI/ASME N45.2 that were considered. Discuss how the Bar-Lock’s manufacturing quality control processes and procedures comply with the 10 CFR Part 50, Appendix B requirements.

Enclosure

5. Page 11 of the report states that “Since the Bar-Lock couplers will be used in a nuclear safety-related application, they are subject to a commercial grade dedication program.” Describe and submit the commercial grade dedication program for staff’s review.

6. Page 12 of the report states that the records of bolt shear test results were examined. Describe how the bolt shear test was conducted and submit a typical bolt shear test result, including the relationship between applied shear force and recorded shear deformation of a test bolt.

7. The Bar-Lock coupler system relies on the clamping force generated on the rebars between the lockshear bolts and serrated rails. Provide the magnitude of the compressive stress and force on the tip of a lockshear bolt and the strain in the bolt after the bolt installation. Provide the stress relaxation characteristic of the lockshear bolt (relaxation is defined as the loss of its compressive stress under strain for a period of time). Provide evidence that the clamping force generated by the lockshear bolt would not be reduced, as a result of the relaxation phenomenon, to a point that would degrade the proper function of the Bar-Lock coupler system during the life of the plant.

<u>Topical Report No. 24370-TR-C-002, “Rigging and Heavy Load Handling”</u>

8. Section 7.1 of the topical report discusses the dose consequences of dropping an original steam generator (OSG) outside the containment. For staff to complete review of your dose consequences analysis, additional information is needed on the referenced calculation (Reference 23 of the topical). Provide the assumptions, inputs and methodologies used to determine the dose consequences of dropping the OSG. This should include the source term (isotopes and activities), control room ventilation system operation assumptions and the atmospheric dispersion factors (X/Qs) used in the dose calculation. Additionally, if the X/Qs are newly calculated and have not been reviewed by the staff, provide the inputs (including meteorological data), assumptions (including the location of the drop) and methodologies used to calculate the X/Q values.

9. Describe the attributes of the heavy lift plan for the various loads to be lifted. Specifically, identify who is responsible for the development and approval of the lift plan. Are persons responsible for the plan development registered professional engineers having specialized knowledge of critical lift operations? Demonstrate that the plan, in part, is based upon the following: (1) the rated capacity and operational limitations specified by the crane’s load chart, (2) measured, as opposed to calculated, weights for the materials to be hoisted, (3) thorough studies of wind speed and its effect on crane and hoisted load, and (4) consideration of the effects of ground conditions and all dynamic forces on the crane’s stability.

10. Will cranes (outside lift system (OLS) and mobile cranes used to erect the OLS) and work areas be equipped with strategically located instruments to monitor wind velocity (speed and direction) at or near the elevation of hoisted loads? If not, provide a justification for not making the necessary provisions to measure wind velocity. If monitoring will be done, describe how and provide the basis for the monitoring scheme chosen.

11. What actions will be taken to ensure the crane is equipped with correctly calibrated instruments to accurately monitor all parameters affecting safe crane operation?

12. Section 5.1 of the topical report states that the rated load for the proposed crane configuration for the SQN SG replacement ranges from 440.8 tons (400 metric tons) to 517.9 tons (470 metric tons), depending on the lift radius. The OLS does not completely conform to the requirements of ANSI B30.5, "Crawler, Locomotive, and Truck Cranes," and the load test requirements of B30.5 in Section 5-2.2.2 do not subject the OLS to complete functional testing with and without the load following erection. Provide a response to the following:

    (a) Will a load test of the OLS at 110-percent of the largest postulated load to be carried by the OLS be performed? What is that load and how is it determined? Will full-performance tests with 100-percent of the largest postulated lifted load for all speeds and motions for which the system is designed be performed?

    (b) How will verification be performed during and following erection of the OLS of the proper assembly of electrical and structural components?

    (c) Describe how TVA will verify the integrity of all control, operating, and safety systems of the OLS following erection.

    (d) How will TVA demonstrate the ability of the OLS to protect against an overload situation to include the ability of the OLS to withstand a load hang-up?

13. Will lifting devices be used that are not specially designed meet the guidelines of NUREG-0612, Section 5.1.1(5), as set forth in ANSI B30.9, "Safety Standard for Cranes, Derricks, Hoists, Hooks, Jacks, and Slings"? In addition, do the interfacing lift points on the old/new SGs, such as the lifting lugs meet the guidelines of NUREG-0612, Section 5.1.6(3)(a) or (b)? What criteria are the interfacing lift point (i.e., the SG trunnions) designed to meet?

14. Provide a description of how the OLS is anchored to the platform and describe the critical locations in the load carrying parts of the OLS for the various boom configurations. During a design basis earthquake with or without the largest postulated lifted load to include pendulum and swinging loads, demonstrate that the OLS will remain anchored to the platform and that the platform and OLS will be prevented from overturning.

15. What are the minimum wind conditions for operation of the OLS, how was the minimum wind condition determined, and what is its basis? If these conditions are encountered during heavy load lifts what actions will be taken to secure the load and place it in a safe condition?

16. Section 5.2 of the submittal indicates that the mobile (lattice boom and/or truck) cranes used in the assembly/disassembly of the OLS will have a current certification and will be load tested during production. However, the licensee did not indicate if the mobile cranes will be "proof tested" to ensure proper operation. Demonstrate the operability of the mobile cranes prior to assembly of the OLS by testing in accordance with B30.5.

Will a 110 percent static load test be completed and will full performance tests with 100 percent of the largest postulated lifted load for all speeds and motions for which the system is designed be conducted prior to heavy lift operations?

17. Section 5.2 of the submittal states that “restrictions on the use of these cranes (mobile cranes-lattice boom and/or truck) will be imposed to specify the weather conditions under which they may be operated and how and when to secure the mobile cranes in case of inclement weather, and the restrictions are designed to preclude adverse interactions with safety–related SSCs [systems, structures and components].” With respect to the use of the mobile cranes for assembly and disassembly of the OLS, provide a response to the following:

    (a) Describe the restrictions for use of the mobile cranes during assembly/disassembly of the OLS.

    (b) What are the minimum wind conditions for operation of the mobile cranes? How was the minimum wind condition for operation determined and what is its basis (e.g., dead weight of the boom with maximum postulated lifted load)?

    (c) Describe the safety-related SSCs that could potentially be affected by a dropped load during assembly/disassembly of the OLS. What effects could a load drop, during assembly/disassembly, have on Unit 1/Unit 2 operations?

    (d) Describe how an operator, to include those responsible for operations, will be notified of the minimum wind conditions for operation. What actions will be taken if it is determined that winds near or at the limiting conditions for operations have been reached? How long will it take to perform these actions?

    (e) Since the mobile cranes have the potential to interact with safety-related SSCs during assembly/disassembly describe the safe-load paths for these cranes. What processes or procedures will be used to ensure that mobile crane operations will remain within the safe load paths?

    (f) Demonstrate that the mobile cranes under seismic load during assembly/disassembly, with its largest postulated load, will not fail and potentially impact safety-related SSCs.

18. The submittal in Section 4.2(2) states that crane operations will be conducted by highly trained and qualified personnel. Also Section 4.2(3) references Sections 5.1 and 5.2 as providing the details of operator qualifications that conform to ANSI B30.5. With respect to operator qualifications provide a response to the following:

    (a) Describe how the qualification program satisfies the requirements in Section 5-3 of ANSI B30.5.

    (b) ANSI B30.5, in Section 5-3, states that only designated operators shall operate the crane. However, designated operators are selected or assigned by the employer or the employer’s representative as being qualified to perform specific duties. If operators are, or are not, employed by SQN, what requirements/criteria are used to designate operators as being qualified (e.g., physical faculties and fitness, deviations from physical qualifications, grounds for disqualifications, required safety instruction, written examination, and performance test, as well as specific crane written examination and experience requirements)?

19. NUREG-0612, Control of Heavy Loads at Nuclear Plants, provides guidelines in Section 5.1.1(7) for crane designs which rely on criteria within ANSI B30.2 and Crane Manufacturers Association of America (CMAA) specification No. 70. Section 2-1 of B30.2 provides criteria for construction and installation and CMAA 70 specifies design stresses, service classification, and structural design, mechanical design, electrical and electrical equipment. However, ANSI B30.5 provides no criteria for crane design. What are the critical load bearing parts, load controlling parts, and operational safety devices of the OLS and how do the operational safety devices work together to ensure safe load handling (e.g., interlocks, upper hoist limit switch, lower hoist limit switch, rotate limit switch, emergency stop switches, locking devices, overload indicators, radius indicator, and overspeed, pressure, and temperature devices with shutdown capability if any)?

20. The topical report provides no information on the haul route from the transport location identified on Figure 5-2, whether the potential to interact with safety-related SSCs exists along the haul route, and whether those SSCs could either withstand the impact of a dropped SG or will be protected to preclude them from damage. What is the distance between the lay down area and the old and new SG storage area and what is the method used to load test the haul route (civil/structural)? What are the safety-related components that are located along the haul route that could be impacted by a dropped SG? What safety functions/systems would be impacted? What measures are to be taken to preclude a SG drop along the haul route and preclude the identified components from being damaged if a SG drop occurred?

21. In accordance with recommendations provided in NUREG-0612, Section 5.1, discuss the potential for accidental dropping of the SG inside the reactor containment building. Discuss the potential consequences that could result from dropping the SG and any compensatory measures that could be implemented to minimize and manage the damage from the drop. Provide rationale for choosing a clearance of 20 feet (ft) above the dome for lifting the SGs when it's been analytically determined that at 12.75 ft or greater a dropped SG would perforate the dome and steel containment vessel.

22. Explain what is meant by discharge piping in Section 8.3 of the topical report (e.g., is it the discharge to the ultimate heat sink or is it the flow of cooling water to safety and nonsafety related loads)? If discharge is to the safety and nonsafety related loads, describe the effects of an essential raw cooling water (ERCW) Train A discharge piping failure for both units on plant operations from a heavy load drop from the maximum postulated lifted load. What safety related SSCs will be affected and what compensatory measures will be implemented to minimize and manage the damage from the drop?

23. The topical report, in Section 8.3 for the Unit 2 ERCW supply piping, determined the peak particle velocity from a drop load using Reference 14 of the topical report. However, Reference 14 indicated that criteria for underground utilities are not available,

which includes pipelines. Moreover, Reference 14 indicated that criteria should be based on available controlled tests and not on evaluations. The load used in Reference 14 was a two-ton ball dropped from 40 ft which is a few orders of magnitude lower than the largest postulated load that can be potentially dropped at SQN (400-500 tons). What assumptions were made, such as soil type, soil compaction, depth of piping, vulnerability of supply piping during the lift (length of time during lift that makes this situation plausible), difference in loads evaluated in Reference 14, and height of lifted load above surface? How were uncertainties accounted for in the calculation considering that the reference provides no criteria to evaluate peak particle velocities in soil for underground utilities? What was the calculated peak particle velocity and pressure 63 ft away from the drop and what design pressure is the piping designed to withstand? Does the compacted soil around the piping act as a missile shield to protect the ERCW supply line piping and if so how was this factored into the evaluation?

24. Section 8.3 of the topical report indicated that the ERCW duct banks would be negatively impacted from an OSG or replacement SG (OSG/RSG) drop. What safety-related equipment/functions would be impacted from a dropped OSG/RSG? What is the depth of the duct banks below the surface and what is the maximum pressure the duct banks can withstand without risk of failure? What were the assumptions in the analysis and what were the soil pressures 1 ft above, at the duct bank surface, and 1 to 3 ft below the duct banks as a result of dropping an OSG/RSG? What is the depth of soil to be added to account for a potential load drop? Specify what soil type, total area to be covered, and compaction requirements for the additional fill, and provide a drawing indicating the locations where fill will be added.

25. What impact will the closing of valves 1-26-575 and 1-26-653, as discussed in Section 8.8 of the topical report, have on the operability of the high pressure fire protection system? What compensatory measures are going to be implemented during the periods of valve closure? For mobile cranes operating during assembly/disassembly of the OLS is there adequate depth of cover for fire protection piping to prevent mechanical injury?

26. Although safe load paths have been identified on Figure 5-2 of the rigging and heavy load handling topical report the staff believes that it will be difficult for the operator to stay within the safe load path during the various lifts. Describe the communications plan, administrative controls, crane operator actions, and crane automatic actions used to control the lift within the safe load path identified in Figure 5-2 of the topical report.

27. How much time will expire during the movement of an OSG along the load path (from the containment to the transporter) where interaction with safety-related SSCs could occur? How much time will expire during the movement of the RSGs along the load path (from the transporter to containment) where interaction with safety-related SSCs could occur? What is the total time to move the OSGs and RSGs between the transporter and inside containment? What is the total time the SGs will be in a position to drop and cause damage to the safety-related SSCs (consider SSCs that may be impacted along the haul route from the transporter location to the storage facility)?

28. An OSG/RSG drop over Unit 1 ERCW components would require realignment of the component cooling water system from Unit 2 to provide spent fuel pool cooling. With Unit 1 defueled (full core off load to the spent fuel pool) how long will it take to reach the limiting temperature for the spent fuel pool? The licensee has committed to realign the component cooling water system from Unit 1 to Unit 2 to provide spent fuel pool cooling in the event of a load drop. What actions are necessary (automatic and manual) and how long will it take to complete the realignment?

29. The licensee has committed to develop and issue plant procedures to delineate specific actions required in case of a heavy load drop. What will be the principal attributes of the plant procedures? When will the procedures be completed, who will require training on these procedures, and how far in advance will training be completed relative to heavy lift operations?

30. The licensee has committed to isolate shared systems with Unit 2 or verify that they are capable of being isolated following a load drop, prior to handling a load over the containment with the outside lift system. What systems are shared between Unit 1 and Unit 2 that could be impacted from a load drop over/in the vicinity of the containment? What Unit 2 safety-related functions could be impacted from such a load drop? How much time do the plant operators have to isolate these systems and how long will it take to perform the isolation functions?

31. What compensatory measures will be taken to minimize leakage through the temporary Unit 1 pipe tunnel wall from affecting safety-related equipment in the auxiliary building?

32. What components are included in the weight of the lifted loads? List the loads to be lifted and whether the lifted loads are calculated or estimated. What means will be used to verify the weight of the lifted loads in the field?

33. In Appendix A to the TVA letter dated April 15, 2002, there is an item to ". . . develop and issue plant procedure(s) to delineate specific actions required in case of a heavy load drop." How will this condition, drop of the load, be communicated to the nuclear plant operators or site personnel?

34. Page 12 of the topical report states that "The input spectrum used for the horizontal direction is an amplified response spectrum at ground surface for an average soil depth to bedrock of 30 ft. soil deposit and reduced to correspond to the minimum design basis from Reference 27 which provides 5% damped free field top of soil response spectra curves for the Sequoyah Nuclear Plant for soil depths of 40 ft. and 20 ft." Define or explain the meaning of "the minimum design basis." Was the amplified response spectrum input at the ground surface or 30 ft below it? How was the amplified response spectrum "reduced to" as you stated? Explain in detail the way that you convolved the rock motion up through soil layers to obtain the amplified ground motion. Include details on the soil properties (seismic velocities, densities, soil modules and damping values, etc.) and soil layer thicknesses.

35. On page 13 it is stated that "Rigging operations will not be performed when wind speeds exceed the maximum operating wind speed for the OLS." What is the wind speed measured in miles per hour considered to be the maximum operating wind speed? How

was the maximum operating wind speed derived? Was there a stability analysis for the crane performed by considering the effects of the maximum operating wind speed on the crane and SG? If yes, provide the analysis results. If not, provide your justifications for the choice of the maximum operating wind speed.

36. What daily inspections will be performed for any of the cranes proposed to lift the heavy loads during the SGR?

37. How many qualified crane operators will there be on this project? During each heavy load lift discuss where the person-in-charge (PIC) will be positioned. Discuss any personnel who will be assisting the PIC and their training levels, include where these individuals will be positioned during each heavy load lift.

38. Discuss the OLS crane software qualification, include any industry standards or guidelines applicable.

39. The topical states that a postulated load drop from the OLS has the potential for disabling ERCW and other SSCs located in the load path. The analysis does not discuss the risk impact on core damage frequency or large early release frequency for heavy lift operations or of a heavy lift load drop. Using Regulatory Guides 1.174 and 1.177, as applicable, provide an evaluation of the risk of a random crane failure and crane failures in conjunction with applicable event initiators (i.e. loss of offsite power, high winds/tornado, or seismic as applicable). Provide a discussion on any compensatory measures, and/or operator actions that are assumed in the above analysis. Include the probability of a load drop from nonsingle failure proof cranes (outside lift system, mobile cranes (lattice boom and truck)) and the number of anticipated lifts. Also provide the total time that the old and RSGs, reactor shield building sections, SG compartment sections, containment dome steel sections and large crane components will be in a position to damage SSCs. Include a discussion of potential failure of SSCs during transport of the SGs to and from the staging area prior to heavy load lift activity.

Topical Report No. 24370-TR-C-003, "Steam Generator Compartment Roof Modification"

40. Page 25 of the topical report states that "Most of the connections consist of two splice plates, one at the top side and the other at the bottom side of the roof slab. The splice plates clamp the two roof slab sections together by means of a single threaded rod (with a nut and washer at the two ends running vertically through the plates and slab thickness in the core-bore holes)."

    a. Since the words "most of the connections" were used instead of "all of the connections," describe other types of connections that are used for connecting the cut out portion of concrete compartment roof to the remaining portion of the concrete compartment roof.

    b. What are the maximum, minimum, and average allowable distances (void) specified between the cut-out portion of concrete and the uncut portion of the concrete? Provide the brand name of the grout that will be used, its maximum size of aggregate and its long term property characteristics, such as shrinkage, creep, tensile strength, compressive strength, shear strength, bond strength, modulus of elasticity, and volume change, under the temperature and other environments the grout will be subjected to during the plant life.

c. Since only one single threaded rod is used to connect the two roof slab sections, there is a reliance on a friction force between the steel plates and concrete, generated by the clamping force as a result of the post-tensioned threaded rod, to tie the two sections together. Discuss the rationale of this type of connection utilizing frictional force to connect two pieces of concrete together, which is not a positive connection.

d. If the frictional force is not relied upon to connect the cut-out portion of concrete to the uncut portion of concrete, what anchors the cut-out portion of concrete in the horizontal direction during earthquakes? In the structural analysis during earthquakes, was it assumed that the cut-out portion of concrete would be an integral part of the uncut portion of concrete or it was a piece of concrete separated from the uncut portion of concrete? Provide technical justifications for the above assumption you chose.

e. Will the cut-out portion of concrete crush the grout when it expands due to high temperature? If not, provide calculations to substantiate it. Will the cut-out portion of concrete pull away from the grout when it shrinks due to cooling? If not, provide calculations to substantiate it. What is the value in inches that the cut-out portion of concrete will experience between the highest and lowest temperature the concrete will be subjected to during plant life?

f. Since a single threaded rod is placed between two pieces of concrete and is not solidly anchored in or bearing against either piece of the concrete, how can the rod be used as an anchor to form a steel cantilever support for the cut-out portion of concrete when the rod itself does not have a solid support because the grout cannot bond the rod and the two pieces of concrete together? Since a perimeter steel ring girder was not provided for the cut-out portion of concrete both at the top and bottom surfaces, provide the analysis results that demonstrate the edge of the cut-out portion of concrete will not fail, such as chipping, cracking, and spalling, due to stress concentration at the steel plates bolted by a rod during earthquakes?

g. Discuss the pressure retaining capability of the SG compartment roof modification as defined in the Updated Final Safety Analysis with proper consideration of shrinkage, cracking, crashing, and tearing of the grout. This discussion should include the assumptions used for the grout conditions, the justification for the assumptions, and quantification of any reduction in safety margin and discuss why the reduction is acceptable.

41. Page 25 of the report states that the bolt holes and annular space between the cut-out portion of the concrete compartment roof to the remaining portion of the concrete compartment roof would be sealed by nonshrink grout, and that “conservative estimates (Reference 8 [in the topical report]) of the flow path through these micro-cracks yield values that are 1.6 percent of the total design bypass leakage flow area of five square

feet discussed in Updated Final Safety Analysis Report Section 6.2.1.3.5." Reference 8 is TVA Calculation SCG-1S-609, "Evaluation of Steam Generator Compartment Modification - Finite Element Analysis Results," Revision 0. Clarify how the calculated leakage was obtained from the finite element analysis results. Describe how the micro-cracks of the grout were mathematically modeled and the amount of leakage calculated.

42. After reattaching the cut-out portion of the concrete compartment roof to the remaining portion of the concrete compartment roof, what type of tests will be performed to verify that the leakage is within the allowable limit?

43. Page 27 of the report states that "The nodes at the cut-line along which the splice-plate connections are located were realistically modeled to transmit vertical forces and in-plane compression only." Was a zero force assumed in the vertical direction to be taken by the grout? If not, provide the justification on the amount of force in the vertical direction to be attributed to the grout.

44. Provide the area of the flow path between the cut-out portion of the concrete and the uncut portion of the concrete by considering the effects as stated in Questions 40.b and 40.e above, as well as the effect of long-term grout property changes and the safe-shutdown earthquake effect.

Mr. J. A. Scalice
Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

cc:
Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. James E. Maddox, Acting Vice President
Engineering & Technical Services
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

General Counsel
Tennessee Valley Authority
ET 11A
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. Robert J. Adney, General Manager
Nuclear Assurance
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Pedro Salas, Manager
Licensing and Industry Affairs
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. D. L. Koehl, Plant Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, TN 37379

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

County Executive
Hamilton County Courthouse
Chattanooga, TN 37402-2801

Ms. Ann P. Harris
341 Swing Loop Road
Rockwood, Tennessee 37854

PD II-2 DOCUMENT COVER PAGE

DOCUMENT NAME:C:\ORPCheckout\FileNET\ML023380703.wpd

SUBJECT:

ORIGINATOR: E. Brown

SECRETARY: Marilyn Wohl

DATE: December 5, 2002

●●● ROUTING LIST ●●●

	NAME	**DATE**
1.	E. Brown	12/ /02
2.	B. Clayton	12/ /02
3.	S. Weerakkody	10/21/02
4.	M. Reinhart	10/15/02
5.	A. Howe	12/ /02
6.	Secretary/dispatch	12/ /02

ADAMS STEPS

Enter profile into ADAMS _________
Accession Number ___________
NRR Template Number NRR-064 (Mtg. Not.) _____
NRR-088 (RAI) __X__
NRR-028 (Relief) _____
NRR-106 (Letters, Memo, Sholly) ______
NRR- (Other) _____
Enter dates, concurrences, etc. (Secy) _______
QC Electronic copy against hard copy (LA) _______

QC profile and declare Official Record (RC) _______

Can Document be Deleted after Dispatch? ___No___