January 10, 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 — STEAM GENERATOR COMPARTMENT ROOF MODIFICATION TOPICAL REPORT TECHNICAL ASSESSMENT (TAC NO. MB5387)

Dear Mr. Scalice:

On March 28, 2002, the Tennessee Valley Authority submitted a topical report to the U.S. Nuclear Regulatory Commission (NRC) for review and approval. The topical report provided an alternate methodology for the reconstruction of the steam generator compartment roof during the Sequoyah Nuclear Plant (SQN) Unit 1 steam generator (SG) replacement project. The proposed method involved cutting four pieces of concrete roof slabs and reattaching them to the remaining uncut concrete roof slabs by using "through-bolted splice-plate connections," located along the concrete cut line. Based on the information provided by the licensee, the NRC staff determined that the assumptions made for the analysis performed did not reflect the actual boundary condition at or near the concrete cut line. The NRC staff has, therefore, concluded that the proposed repair of the SG compartment roof is inadequate in that it degrades the capability of the roof to withstand its design loads. The NRC staff's assessment is enclosed.

As discussed with Mr. Pedro Salas on December 23, 2002, the NRC has scheduled a public meeting on January 16, 2003, to discuss in greater detail SQN's proposed alternatives.

If you have any questions, please feel free to call Ms. Eva Brown at (301) 415-2315 or Mr. Allen Howe at (301) 415-2024.

Sincerely,

/RA/

Raj Anand, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-327

Enclosure: See next page

cc w/enclosure: See next page

January 10, 2003

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 UNIT 1 — STEAM GENERATOR COMPARTMENT ROOF MODIFICATION TOPICAL REPORT TECHNICAL ASSESSMENT (TAC NO. MB5387)

Dear Mr. Scalice:

On March 28, 2002, the Tennessee Valley Authority submitted a topical report to the U.S. Nuclear Regulatory Commission (NRC) for review and approval. The topical report provided an alternate methodology for the reconstruction of the steam generator compartment roof during the Sequoyah Nuclear Plant (SQN) Unit 1 steam generator (SG) replacement project. The proposed method involved cutting four pieces of concrete roof slabs and reattaching them to the remaining uncut concrete roof slabs by using "through-bolted splice-plate connections," located along the concrete cut line. Based on the information provided by the licensee, the NRC staff determined that the assumptions made for the analysis performed did not reflect the actual boundary condition at or near the concrete cut line. The NRC staff has, therefore, concluded that the proposed repair of the SG compartment roof is inadequate in that it degrades the capability of the roof to withstand its design loads. The NRC staff's assessment is enclosed.

As discussed with Mr. Pedro Salas on December 23, 2002, the NRC has scheduled a public meeting on January 16, 2003, to discuss in greater detail SQN's proposed alternatives.

If you have any questions, please feel free to call Ms. Eva Brown at (301) 415-2315 or Mr. Allen Howe at (301) 415-2024.

Sincerely,
/RA/
Raj Anand, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-327

Enclosure: See next page

cc w/enclosure: See next page

Distribution: JZwolinski/LMarsh
PUBLIC PDII-2 R/F EBrown RAnand HBerkow KManoly
AHowe JMa SCahill, RII RTellson, RII BClayton (Hard Copy)
ADAMS Accession No. ML030100442

OFFICE	PDII-2/PM		PDII-2/PM		PDII-2/LA		PDII-2/SC	
NAME	RAnand for EBrown		RAnand		CHawes for BClayton		AHowe	
DATE	1/10/03		1/10/03		1/10/03		1/10/03	

OFFICIAL RECORD COPY

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

NRC STAFF'S ASSESSMENT OF TVA TOPICAL REPORT NO. 24370-TR–C-003, "STEAM GENERATOR COMPARTMENT ROOF MODIFICATION"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-327

1.0 INTRODUCTION

By a letter dated March 28, 2002, Tennessee Valley Authority (the licensee) of Sequoyah Nuclear Plant (SQN) submitted a topical report for an alternate methodology for the reconstruction of the steam generator (SG) compartment concrete roof. The U.S. Nuclear Regulatory Commission (NRC) staff and the licensee held meetings on October 24 and December 23, 2002, where the licensee provided handout information concerning this submittal.

2.0 SUMMARY OF SUBMITTALS

The topical report proposed an alternate methodology for the reconstruction of the SG compartment concrete roof that would be cut to enable the removal of the old SGs and installation of new SGs. The proposed method involved reattaching the original cut section of the concrete roof slab to the remaining uncut concrete roof slab by using 23 pieces of "through-bolted splice-plate connections," located along the concrete cut line.

The thickness of the roof slab varied from 2 feet (ft) 3 inches to 3 ft. The proposed detail of the through-bolted splice-plate connection involved (1) the use of two 3-inch thick steel plates, 2 ft long in the direction perpendicular to the cut line with varied widths along the cut line; one at the top side of the roof slab and the other at the bottom side, (2) maintaining a 1-inch gap space filled with grout between the cut section of the concrete roof slab and the uncut section of the concrete roof slab, and (3) placing a steel bolt vertically near the center of the plates through the 1-inch gap space and tying the two plates together by a nut and a washer at the bolt ends.

3.0 TECHNICAL ASSESSMENT

The licensee assumed that the proposed details of the through-bolted splice-plate connection could be modeled as a positive connection in one analysis and a cantilevered support in a second analysis. However, the NRC staff found the licensee's assumptions incorrect and the proposed details of the through-bolted splice-plate connection unacceptable. The staff's reasons are presented below.

A splice-plate is commonly used to join two separate structural members together. A splice is utilized when a single piece of steel is bolted to two separate pieces of steel or concrete roof slabs in this case. The splice transfers force from one structural member to the other through bolts and the splice plate. A splice is considered as a positive connection if it can reliably or positively transfer force from one structural member to the other. The licensee assumed the through-bolted splice-plate connection along the cut line would act as a “hinge” boundary condition in one analysis. The assumption in a hinge boundary condition is that the two structural members joined by the hinge may rotate around the hinge, but remain connected by the hinge so that in-plane forces will be positively transferred through the hinge. However, the bolt in the proposed detail of the through-bolted splice-plate connection is not installed through either piece of the structural concrete roof slabs, but, in the 1-inch gap space. Under such a condition, any horizontal force transfer between the two structural concrete roof slabs is through the frictional force between the steel plates and the concrete. This frictional force is unreliable and small, thus the hinge boundary condition assumption for the through-bolted splice-plate connections along the cut line is unrealistic because horizontal forces cannot reliably and positively transfer between the two structural concrete roof slabs.

The licensee performed another analysis by assuming that the proposed through-bolted splice-plate connection would function as a cantilevered support for the cut section of the concrete roof slab. A cantilevered support requires the support itself to be firmly anchored on one end so that its deformation or deflection under load can be reliably predicated. However, the bolt in the proposed detail is not through-bolted in the uncut portion of the structural concrete roof slab, but in the 1-inch grouted gap space. The grout acts as space filler only and cannot be counted as structural material because there is no reinforcing bars to bond the grout to the structural concrete roof slab. The grout is likely to shrink as the grout ages and would likely crack when subjected to thermal loads. Therefore, the grout cannot offer a solid bearing condition for the bolt, and the bolt may move within the 1-inch gap space in the radial direction and in the direction along the concrete cut line. Furthermore, the splice-plate can rotate freely in any direction once the small and unreliable frictional force between the steel and concrete is overcome by force generated due to seismic loads. The potential movement of the bolt and plates invalidates the analysis assumptions and disqualifies the proposed detail of the through-bolted splice-plate as being a cantilevered support.

4.0 CONCLUSION

Based on the above discussion, the NRC staff finds that the proposed location of the bolt in the 1-inch gap space to be unacceptable for reconnecting the cut portion of the roof slab since it does not provide positive connection to the other portion of the roof. The assumptions made for the analysis performed by the licensee do not reflect the actual boundary condition at or near the concrete cut line, because the actual condition is neither a positive connection nor a cantilevered support. The staff, therefore, concludes that the proposed repair of the SG compartment roof is inadequate in that it degrades the capability of the roof to withstand its design loads.