April 25, 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 - ISSUANCE OF AMENDMENT REGARDING STEAM GENERATOR COMPARTMENT ROOF MODIFICATION (TAC NO. M8054) (TS-03-03)

Dear Mr. Scalice:

The Commission has issued the enclosed Amendment No. 284 to Facility Operating License No. DPR-77 for the Sequoyah Nuclear Plant (SQN), Unit 1. This amendment is in response to your application dated February 28, 2003, which requested a revision to the methodology contained in the SQN Updated Final Safety Analysis (UFSAR) for restoration of the Unit 1 steam generator (SG) compartment roof during the SG replacement project.

On February 14, 2003, you submitted the methodology for restoration of the SG compartment roof in Bechtel Topical Report No. 24370-TR–C-003, "Steam Generator Compartment Roof Modification, Revision 1" (the Topical) for SQN, Unit 1. The Nuclear Regulatory Commission (NRC) staff reviewed Topical Report No. 24370-TR-C-003 and found the methodology presented acceptable in a letter to the licensee dated April 18, 2003. The enclosed NRC safety evaluation authorizes the use of the method as described in the previously approved Topical and concludes that the revision to the methodology to restore the SG compartment roof as described in the UFSAR is acceptable.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

***/RA/***

Michael L. Marshall, Jr., Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-327

Enclosures: 1. Amendment No. 284 to
License No. DPR-77
2. Safety Evaluation

cc w/enclosures: See next page

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Mr. J. A. Scalice
Tennessee Valley Authority

**SEQUOYAH NUCLEAR PLANT**

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TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-327

SEQUOYAH NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 284
License No. DPR-77

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Tennessee Valley Authority (the licensee) dated February 28, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, changes to the Sequoyah Unit 1 Updated Final Safety Analysis Report (UFSAR) that reflect a change to the methodology for restoration of the Unit 1 concrete shield building dome as part of the steam generator replacement project, as described in the NRC safety evaluation dated April 18, 2003, is authorized. The licensee shall submit the update of the UFSAR authorized by this amendment in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of its date of issuance and shall be implemented as specified in 2 above.

FOR THE NUCLEAR REGULATORY COMMISSION

***/RA/***

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

Date of Issuance: April 25, 2003

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 284 TO FACILITY OPERATING LICENSE NO. DPR-77

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-327

## 1.0 INTRODUCTION

By application dated February 28, 2003, the Tennessee Valley Authority (the licensee) proposed an amendment to the Sequoyah Nuclear Plant, Unit 1 (SQN1), Operating License DPR-77. Presently, the SQN licensing basis does not address the use of this type of reinforcing bar splice. This proposed request provides a revision of the SQN1 Updated Final Safety Analysis (UFSAR) to include a change to the methodology for restoration of the Unit 1 steam generator (SG) compartment roof during the SG replacement project. This modification to the SG compartment roof or divider is necessary to support removal of the original steam generators (OSGs) and installation of the replacement steam generators (RSGs).

In a letter dated March 28, 2002, the licensee requested the U.S. Nuclear Regulatory Commission (NRC) staff's approval of Topical Report No. 24370-TR–C-003, "Steam Generator Compartment Roof Modification, Revision 1," (the Topical) for an alternate methodology for the reconstruction of the SG compartment concrete roof. The NRC staff rejected the original proposed methodology by the licensee in a letter dated January 10, 2003. In a letter dated February 14, 2003, the licensee submitted Revision 1 of the subject topical report for NRC review and approval. Revision 1 of the topical report contained a new design and analysis of the reconstruction method for the Unit 1 SG compartment roof modification. The NRC staff reviewed the Topical and approved it in a letter to the licensee dated April 18, 2003.

## 2.0 REGULATORY EVALUATION

A description of the original design of the SG compartment roof is contained in the UFSAR in section 3.8.3, "Concrete Interior Structures."

NUREG-0800, Revision 1, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (SRP) Section 3.8.3, "Concrete and Steel Internal Structures of Steel or Concrete Containments," outlines the standards for use by the NRC staff during the review of concrete containment internal structures. The SG compartment roof or divider barrier is designed to contain the steam released from the reactor coolant system in the event of a loss-of-coolant accident, and to channel the steam through venting doors to the ice-condenser, temporarily serving as a pressure-retaining envelope.

ENCLOSURE

SRP Section 3.8.3, Subsection II.3.d, indicates that the loads and load combinations for the divider barrier are required to be evaluated against Article CC-3000 of the American Society of Mechanical Engineers (ASME) Broiler and Pressure Vessel Code, 1975 Edition (the Code) in accordance with Section III, Division 2, with some exceptions. The design and analysis of the modification are in Section III, Division 2 of the Code with the specified limits for stresses and strains requirements being contained in Subsection CC-3430.

## 3.0 TECHNICAL EVALUATION

As the technical issues relevant to the review and approval of the Topical are similar to the arguments used to support approval of this amendment request, the information from the associated Topical's Safety Evaluation is reproduced in this evaluation.

### 3.1 Description of Modification

The four SGs of the SQN1 will be replaced during the spring of 2003. To support the replacement of the OSGs with the RSGs, access openings will be created in the roof of the SG compartments. Each access opening will be sized and cut to allow the removal and replacement of the SG in the compartment.

To provide an access opening for SG replacement, a section of the compartment concrete roof over each SG will have to be cut out. Cutting of the concrete will be accomplished by, first, core-boring holes around the perimeter of the cut, then using wire saws to cut straight lines between the cores. The cores also serve as holes for the through-bolts used to connect the concrete section back to the existing compartment roof concrete. After removal, the edges of the concrete section will be bush-hammered to provide a gap that ranges from 3/4 inch to 1-1/4 inches between the cut-out portion of the concrete and the existing compartment roof concrete.

### 3.2 Evaluation of Proposed Modification

The cut-out portion of the concrete will be reattached to the existing compartment roof concrete once the RSG and associated piping are placed inside the compartment. A top and bottom steel connecting frame will sandwich the cut-out portion of the concrete. The steel frames will be through-bolted by four 2-inch diameter threaded rods and span over the existing compartment roof concrete. The steel frames will also be through-bolted by six 2-1/2 inch and eighteen 2-inch diameter threaded rods along the perimeter of the cut line.

Approximately 30 tapered steel shim sets will be installed along the perimeter of the cut line. Each tapered shim set will comprise a tapered shim attached to the sectional surface of the cut out portion of the concrete with anchor bolts and a loose tapered shim that

will be driven into the gap between the fixed tapered shim and the existing compartment roof concrete. The loose tapered shim will be welded to the fixed shim to prevent movement. The bolt holes and the remaining annular space will be grouted using nonshrink grout.

The licensee analyzed the roof of the SG compartments using a finite element computer code (STRUDL). Manual calculations were performed at various locations to confirm results obtained from the computer analysis. The analysis results indicated that the maximum concrete and rebar stresses in the modified roof are within the allowable stress limits for normal and abnormal/extreme environmental conditions as specified in Section CC-3000 of ASME Section III, Division 2 of the Code. The maximum calculated bending stress in the connecting frame beams and the maximum calculated bearing stress on concrete and the tapered steel shims were determined to be below the allowable limits.

Vertical loads generated by the vertical seismic inertia of the cut-out portion of the concrete roof and the maximum design basis accident pressure would be transferred through the steel frame to the existing compartment roof concrete. This force transfer would occur because the cut-out portion of the concrete roof is not only sandwiched between two steel frames, but, also through-bolted to the frames that span over the existing compartment roof concrete and are connected to it by through-bolts along the perimeter of the cut line. Horizontal loads generated by the horizontal seismic inertia of the cut-out portion of the concrete roof would be transferred through steel shims to the existing compartment roof concrete. The steel frames, in conjunction with the through-bolts and the steel shims, eliminate any significant movement between the cut-out portion of the concrete roof and the existing compartment roof concrete and provide a positive connection between the two. The NRC staff finds that the proposed modification method provides a positive connection between the cut-out portion of the concrete roof and the existing compartment roof concrete and is, therefore, reasonable and acceptable.

The licensee used the STRUDL computer code to analyze the structure of the proposed roof modification and verified the adequacy of the computer results by manual calculations at several locations. The analysis results indicate that the stresses in concrete and steel of the roof modification structure, under all loading combinations prescribed by Section III, Division 2 of the ASME Code, are within the allowable specified stress limits. The STRUDL computer code is a recognized program in the public domain and has had sufficient history of use to justify its applicability and validity for evaluating structural frames. As the STRUDL computer code satisfies the guidelines provided in SRP 3.8.1 for computer codes, the NRC staff finds the licensee has used appropriate analysis methods and criteria to analyze the modified roof compartment. Based on the stress limits not exceeding Code requirements, the NRC staff finds that the structural modification conforms to the design code requirements as prescribed by Section III, Division 2 of the ASME Code.

Based on the information provided by the licensee, the NRC staff finds that the load and load combinations proposed are

conservative, the design and analysis were completed consistent with appropriate industry standards, and the allowable stresses and strains are reasonable and acceptable. As the proposed modification satisfies the Section III of the Code design requirements delineated by the SRP, the NRC staff authorizes the use of the method as described in the previously-approved Topical and concludes that the revision to the methodology to restore the SG compartment roof as described in the UFSAR is acceptable.

## 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendment. The State official had no comments.

## 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (68 FR 12718). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: John S. Ma, NRR
Eva A. Brown, NRR

Dated: April 25, 2003