January 31, 2005

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 — ISSUANCE OF AMENDMENTS REGARDING SEISMIC QUALIFICATION OF THE MAIN CONTROL ROOM AIR DELIVERY COMPONENTS AND SUSPENDED CEILING (TAC NOS. MC2458 AND MC2459)

Dear Mr. Singer:

The Commission has issued the enclosed Amendment No. 298 to Facility Operating License No. DPR-77 and Amendment No. 287 to Facility Operating License No. DPR-79 for the Sequoyah Nuclear Plant, Units 1 and 2, respectively. These amendments are in response to your application dated March 3, 2004 (TVA-SQN-TS-03-10).

The amendments will revise the Updated Final Safety Analysis Report for the Sequoyah Nuclear Plant, Units 1 and 2, by modifying the licensing basis for the seismic qualification of round flexible ducting, triangular ducting, and associated air bars installed as part of the suspended ceiling air delivery system in the main control room.

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/

Douglas V. Pickett, 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

Enclosures: 1. Amendment No. 298 to
License No. DPR-77
2. Amendment No. 287 to
License No. DPR-79
3. Safety Evaluation

cc w/encls: See next page

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TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-327

SEQUOYAH NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 298
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 March 3, 2004, 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, the license is amended to authorize revision of the Updated Final Safety Analysis Report (UFSAR) as set forth in the application for amendment by the licensee dated March 3, 2004. The licensee shall update the UFSAR by modifying the licensing basis for the seismic qualification of round flexible ducting and triangular ducting, and associated air bars installed as part of the suspended ceiling air delivery system in the main control room.

3. This license amendment is effective as of the date of its issuance. Implementation of the amendment is the incorporation into the next UFSAR update made in accordance with 10 CFR 50.71(e), of the changes to the description of the facility as described in TVA's application dated March 3, 2004, and evaluated in the staff's Safety Evaluation attached to this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA BMozafari for/

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

Date of Issuance: January 31, 2005

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-328

SEQUOYAH NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 287
License No. DPR-79

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

   A. The application for amendment by Tennessee Valley Authority (the licensee) dated March 3, 2004, 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, the license is amended to authorize revision of the Updated Final Safety Analysis Report (UFSAR) as set forth in the application for amendment by the licensee dated March 3, 2004. The licensee shall update the UFSAR by modifying the licensing basis for the seismic qualification of round flexible ducting and triangular ducting, and associated air bars installed as part of the suspended ceiling air delivery system in the main control room.

3. This license amendment is effective as of the date of its issuance. Implementation of the amendment is the incorporation into the next UFSAR update made in accordance with 10 CFR 50.71(e), of the changes to the description of the facility as described in TVA's application dated March 3, 2004, and evaluated in the staff's Safety Evaluation attached to this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA BMozafari for/

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

Date of Issuance: January 31, 2005

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 298 TO FACILITY OPERATING LICENSE NO. DPR-77

AND AMENDMENT NO. 287 TO FACILITY OPERATING LICENSE NO. DPR-79

TENNESSEE VALLEY AUTHORITY (TVA)

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

By a letter dated March 3, 2004 (ADAMS accession number ML040760204), and pursuant to Title 10, Code of Federal Regulations (10 CFR) Section 50.59(c)(2) and 10 CFR 50.90, Tennessee Valley Authority (TVA, the licensee) requested operating license amendments to license Nos. DPR-77 and DPR-79 for the Sequoyah Nuclear Plant, Units 1 and 2, respectively. The amendments will revise the Updated Final Safety Analysis Report (UFSAR) for the Sequoyah Nuclear Plant, Units 1 and 2, by modifying the licensing basis for the seismic qualification of round flexible ducting, triangular ducting, and associated air bars installed as part of the suspended ceiling air delivery system in the main control room.

The proposed revisions are provided in response to TVA's Corrective Action Program and identification of an issue that determined the main control room air delivery components at Sequoyah are not qualified to the level currently described in the Sequoyah UFSAR. The proposed UFSAR revisions for the qualification of the ductwork were reviewed under the requirements of 10 CFR 50.59, "Changes, Tests and Experiments," and it was concluded that a license amendment request was necessary.

2.0 REGULATORY EVALUATION

The Control Building Heating, Ventilating, and Air Conditioning (HVAC) system (including ducting) is designed to maintain the temperature and humidity of the main control room, and is designed to function during normal plant operation, accident conditions, and postaccident recovery conditions. The regulatory requirements directly applicable to the seismic qualification of this system are 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records," and General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena"; 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"; and 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants."

General Design Criterion 1 requires that structures, systems and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. This criterion requires that a

quality assurance (QA) program be established and implemented to provide assurance that these structures, systems and components will perform satisfactorily in service. Appendix B to 10 CFR Part 50 establishes QA requirements that apply to activities affecting safety-related functions of structures, systems and components.

General Design Criterion 2 requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, et al., without loss of capability to perform their safety functions. The earthquake for which these plant features are designed is defined as the safe shutdown earthquake (SSE). It is based upon an evaluation of the maximum earthquake which produces the maximum vibratory ground motion for which structures, systems, and components important to safety are designed to remain functional.

Appendix A to 10 CFR Part 100 contains the requirements for the determination of the SSE. The regulations specify that certain structures, systems, and components important to safety be designed to withstand the SSE and remain functional. The engineering method used to ensure the required safety functions are maintained involves either a suitable dynamic analysis or qualification test, except where it can be demonstrated that use of an equivalent static load method provides adequate conservatism.

Section 3.2.1 of NUREG-0800, “Standard Review Plan,” describes the review process used by U.S. Nuclear Regulatory Commission (NRC) staff for reviewing an applicant’s proposed seismic classification of structures, systems, and components which are important to safety and designed to withstand, without loss of function, the effects of an SSE. The review also covers identification of structures, systems and components that are not required to remain functional following a seismic event, but whose failure could reduce the functioning of any Category I structure, system or component to an unacceptable safety level, or result in incapacitating injury to control room occupants.

To meet the requirements of General Design Criterion 2 and 10 CFR Part 100, Regulatory Guide 1.29, “Seismic Design Classification,” is used. It provides guidance for seismic qualification of components. It describes an acceptable method of identification and classification of those structures, systems and components that should be designed to withstand an SSE. Regulatory Guide 1.61, “Damping Values for Seismic Design of Nuclear Power Plants,” provides damping values acceptable to the NRC staff to be used in the elastic modal dynamic seismic analysis of Seismic Category I structures, systems, and components.

Compliance with the above requirements and guidance assures that the structures, systems and components important to safety that are required to function during an SSE are properly classified as seismic Category I and will function during such events enabling accomplishment of the safety functions described above.

3.0 TECHNICAL EVALUATION

The licensee stated the safety-related ducting for the Control Building HVAC System is classified as Seismic Category I in accordance with Regulatory Guide 1.29. The seismic classification for this system is discussed in the UFSAR. The licensee determined that the round flexible ducting, triangular ducting (constructed of duct board) and associated air bars installed as part of the suspended ceiling air delivery system in the main control room were not qualified to the Seismic Category I classification described in the UFSAR for the HVAC System. The licensee stated that the procurement documents for the flexible and triangular ducting did not specify seismic requirements for the components. This led to the conclusion that the air delivery components had not been seismically qualified per the guidance in Regulatory Guide 1.29, and had not been procured and installed in accordance with QA requirements applicable to Seismic Category I components.

In its submittal dated March 3, 2004, the licensee proposed a change to the UFSAR to state that the air delivery components are qualified to an SSE, and that the components have been analyzed to ensure the ducting will remain in place, the physical configuration will be maintained such that flow will not be impeded, and the ducting pressure boundary will not be lost.

The Control Building HVAC system is designed to maintain the temperature and humidity of the main control room, and function during normal plant operation, accident conditions, and postaccident recovery conditions. Supply air ducts, located above the main control room suspended ceiling, consist of rectangular sheet metal ducts, round flexible ducts, triangular-shaped ducts (constructed of fiberglass duct board), and linear diffusers (air bars). The sheet metal ducts are qualified to the seismic Category I criteria described in UFSAR Section 3.7.3, “Seismic Subsystem Analysis.” Supply air from each rectangular duct flows into flexible round ducts prior to entering triangular-shaped ducts that are attached directly to the linear diffuser air bars. The round flexible ducts and triangular-shaped ducts were not designed, procured, and installed in accordance with 10 CFR, Part 50, Appendix A, QA Program. Therefore, qualification of the round flexible ducts and triangular ducts is required to satisfy the licensing basis for the plant.

The round flexible duct is made of lightweight, spiral-wire wound, commercial grade material. Seismic tests and industry precedents indicate that the only credible seismic failure mode for this type of flexible ducts is due to large relative movements of the end attachment points. The triangular ducts were made of commercial grade fiberboard material that is light weight but strong relative to its weight. In this design configuration, the triangular ducts are supported by redundant load paths and are protected from significant distortion due to seismic loads. The most significant seismic loading is due to the inertial response of the fiberboard duct material itself.

ABS Consulting performed seismic qualification of the suspended ceiling and air delivery components by performing a nonlinear time history analysis using the ANSYS computer program. [ANSYS is a general-purpose finite element software, with extensive modeling and solver capabilities. ANSYS, Inc., supports a 10 CFR Part 50 Appendix B compliant QA verification program (including verification problems and error notices). ANSYS has been widely used in nuclear, aerospace, maritime, oil and gas, and electronics industries to solve

linear and nonlinear structural stress and dynamics problems. Such wide use of the software over the last several decades provides a level of additional assurance of the quality and verification of the software.] This nonlinear time history analysis methodology was approved by the NRC for other Sequoyah seismic qualifications, such as ice condensers, and loss-of-coolant accident analysis. Member and material properties used in the analysis were based on data from existing documentation (suspended ceiling contracts, calculations, and drawings) and field examination of the installed ceiling air delivery system and components. TVA Nuclear Engineering reviewed and approved the ABS Consulting mathematical model and results. Seismic time histories for the analysis were generated based on the applicable floor response spectra, and the time history accelerations were multiplied by 1.3 to provide a minimum safety factor of 1.3.

The analysis results indicate that critical members in the air delivery system remain stable and structurally intact during a postulated SSE. The calculated stresses and loads are less than half of member yield stresses and buckling loads. The air bars provide a stable continuous support for the triangular ducts and do not distort in a manner that could cause damage to the triangular-shaped ducts or flexible round ducts. The luminous panels and other ceiling components remain intact in place. The seismic movements for the flexible duct ends are much less than the flexible duct relative movement capacity.

The staff finds that the licensee has used a proper methodology to analyze the suspended ceiling and air delivery system components. The staff finds that the seismic qualification proposed by the licensee, as supported by the licensee's analysis, satisfies the regulatory requirements for ensuring the components are designed to withstand the effects of a seismic event, as required by 10 CFR Part 50, General Design Criterion 2, and 10 CFR Part 100, Appendix A. The analysis results indicate that the suspended ceiling and air delivery system components, including the round flexible ducts and triangular-shaped fiberboard ducts, remain intact and functional when subjected to a postulated design basis SSE. Therefore, the staff finds the licensee's proposed UFSAR changes 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 amendments change 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 amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (69 FR 22883). Accordingly, the amendments meet 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 amendments.

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 these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: John Ma

Dated: January 31, 2005

Mr. Karl W. Singer
Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

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

Mr. Larry S. Bryant, General Manager
Nuclear Engineering
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Randy Douet
Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37384-2000

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

Mr. John C. Fornicola, Manager
Nuclear Assurance and Licensing
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Fredrick C. Mashburn
Senior Program Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Paul L. Pace, Manager
Licensing and Industry Affairs
ATTN: James D. Smith
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37384-2000

Mr. David A. Kulisek, Plant Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37384-2000

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 Mayor
Hamilton County Courthouse
Chattanooga, TN 37402-2801

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