

October 28, 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, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS  
REGARDING CLOSURE OF THE CONTAINMENT BUILDING EQUIPMENT  
DOORS DURING MOVEMENT OF IRRADIATED FUEL (TAC NOS. MB7238 AND  
MB7239) (TS-02-08)

Dear Mr. Scalice:

The Commission has issued the enclosed Amendment No. 288 to Facility Operating License No. DPR-77 and Amendment No. 278 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 January 14, 2003.

The changes revise the Technical Specifications such that the containment building equipment door may remain open during movement of irradiated fuel that has decayed for at least 100 hours and revise related sections of Technical Specification 3.9.4, "Containment Building Penetrations." The requested changes will also modify the current licensing basis to replace the current accident source term used in the design basis fuel handling accident radiological analyses with an alternative source term (AST) pursuant to Title 10 to the *Code of Federal Regulations* (10 CFR) Section 50.67, "Accident Source Term."

This is a selective implementation of the AST as defined in Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors." Other uses of AST, and changes to a previously approved AST requires prior U.S. Nuclear Regulatory Commission (NRC) staff approval in the form of an amendment under 10 CFR 50.67. The selective use of the AST and the total effective dose equivalent criteria may not be extended to other aspects of the plant design or operation without prior NRC review and approval under 10 CFR 50.67.

J. Scalice

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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 by E.Brown for/***

Michael L. Marshall, Jr., 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. 288 to  
License No. DPR-77  
2. Amendment No. 278 to  
License No. DPR-79  
3. Safety Evaluation

cc w/enclosures: See next page

J. Scalice

-2-

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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. 288  
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 January 14, 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, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 288, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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 within 45 days and the licensee shall submit the revised description authorized by this amendment with the next update of the UFSAR.

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

Attachment: Changes to the Technical  
Specifications

Date of Issuance: October 28, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 288

FACILITY OPERATING LICENSE NO. DPR-77

DOCKET NO. 50-327

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

3/4 9-4  
B3/4 9-1

INSERT

3/4 9-4  
B3/4 9-1

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-328

SEQUOYAH NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 278  
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 January 14, 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, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-79 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 278, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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 within 45 days and the licensee shall submit the revised description authorized by this amendment with the next update of the UFSAR.

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

Attachment: Changes to the Technical  
Specifications

Date of Issuance: October 28, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 278

FACILITY OPERATING LICENSE NO. DPR-79

DOCKET NO. 50-328

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

3/4 9-5  
B3/4 9-1

INSERT

3/4 9-5  
B3/4 9-1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 288 TO FACILITY OPERATING LICENSE NO. DPR-77  
AND AMENDMENT NO. 278 TO FACILITY OPERATING LICENSE NO. DPR-79  
TENNESSEE VALLEY AUTHORITY  
SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-327 AND 50-328

**1.0 INTRODUCTION**

By application dated January 14, 2003, the Tennessee Valley Authority (TVA, the licensee) proposed amendments to the Technical Specifications (TSs) for Sequoyah Nuclear Plant (SQN) Units 1 and 2. The requested changes would revise the TS such that the containment building equipment door may remain open during movement of irradiated fuel that has decayed for at least 100 hours. The licensee indicated the changes will provide operational flexibility during outage periods to schedule activities that require the containment building equipment door to be open. The requested changes will also replace the current accident source term used in the design basis fuel-handling accident (FHA) radiological analyses with an alternative source term (AST) pursuant to Title 10, *Code of Federal Regulations* (10 CFR), Section 50.67, "Accident Source Term." This is a selective implementation of the AST as defined in Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors." TVA also proposed revisions to TS 3.9.4, "Containment Building Penetrations."

**2.0 REGULATORY EVALUATION**

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include TSs as part of the license. The U.S. Nuclear Regulatory Commission's (NRC's) regulatory requirements related to the content of the TSs are contained in 10 CFR 50.36. The TS requirements in 10 CFR 50.36 include the following categories: (1) safety limits, limiting safety systems settings and control settings, (2) limiting conditions for operation, (3) surveillance requirements, (4) design features, and (5) administrative controls. The requirements for system operability during movement of irradiated fuel are included in the TSs in accordance with 10 CFR 50.36(c)(2), "Limiting Conditions for Operation."

As stated in 10 CFR 50.59(c)(1)(i), a licensee is required to submit a license amendment pursuant to 10 CFR 50.90 if a change to the TSs is required. Furthermore, the requirements of 10 CFR 50.59 necessitate that NRC approve the TS changes before they are implemented. The licensee's submittal meets the requirements of 10 CFR 59(c)(1)(i) and 10 CFR 50.90.

Enclosure

The licensee proposes to revise the TSs in accordance with TS Task Force (TSTF) Traveler 51. TSTF-51, Revision 2, was approved by the NRC on October 15, 1999. TSTF-51 allows removal of the TS requirements for engineered safety features (ESF) to be OPERABLE after sufficient radioactive decay has occurred to ensure off-site doses remain below a small fraction of 10 CFR Part 100 limits and control room doses are 5 rem or less. Fuel that is not sufficiently decayed to allow relaxation of OPERABILITY requirements is referred to as "recently" irradiated fuel. Recently irradiated fuel could still be moved but the appropriate ESF systems would need to be OPERABLE. TSTF-51 also allows the deletion of OPERABILITY requirements for ESF mitigation features during CORE ALTERATIONS.

The Reviewer's Note in TSTF-51 requires that licensees adding the term "recently" make a commitment consistent with draft NUMARC 93-01, Revision 3, Section 11.2.6, "Safety Assessment for Removal of Equipment from Service During Shutdown Conditions," subheading "Containment - Primary (PWR)[Pressurized Water Reactor]/Secondary (BWR)[Boiling Water Reactor]." The commitment in the Reviewer's Note reads:

The following guidelines are included in the assessment of systems removed from service during movement of irradiated fuel:

- During fuel handling/core alterations, ventilation system and radiation monitor availability (as defined in NUMARC 91-06) should be assessed, with respect to filtration and monitoring of releases from the fuel. Following shutdown, radioactivity in the fuel decays fairly rapidly. The basis of the Technical Specification operability amendment is the reduction in doses due to such decay. The goal of maintaining ventilation system and radiation monitor availability is to reduce doses even further below that provided by the natural decay.
- A single normal or contingency method to promptly close primary or secondary containment penetrations should be developed. Such prompt methods need not completely block the penetration or be capable of resisting pressure.

The purpose of the "prompt methods" mentioned above is to enable ventilation systems to draw the release from a postulated fuel-handling accident in the proper direction, such that it can be treated and monitored.

Since TSTF-51, Revision 2, was approved, NUMARC 93-01, Revision 3, was issued. The requirements of the draft Section 11.2.6 are now located in the final Section 11.3.6, "Containment - Primary (PWR)/Secondary (BWR)."

In December 1999, the NRC issued a new regulation, 10 CFR 50.67, "Accident Source Term," which provided a mechanism for licensed power reactors to replace the traditional accident source term used in their design basis accident (DBA) analyses with an AST. Regulatory guidance for the implementation of these ASTs is provided in RG 1.183 with the accident dose criteria contained in Regulatory Position 4.4 of RG 1.183 and 10 CFR Part 50 Appendix A, General Design Criteria (GDC) Criterion 19. A licensee seeking to use an AST is required, pursuant to 10 CFR 50.67, to apply for a license amendment. An evaluation of the consequences of affected DBAs is required to be included with the submittal.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Fuel-Handling Accident Radiological Consequence Analysis

For the FHA within the containment, the fission products released from the pool are exhausted by the building purge system. On detection of increased radiation levels in the containment, the purge system automatically isolates. TVA assumes this occurs at 30 seconds following the accident. After the purge is isolated, the remaining fission products in the containment are assumed to leak into the environment within 2 hours with no credit for holdup, dilution, or filtration of the release. For the FHA outside the containment, the fission products released from the pool are assumed to enter the environment within 2 hours with no credit for holdup, dilution, or filtration of the release. The assumptions found acceptable to the staff are presented in Table 1.

TVA determined, and the NRC staff concurs, that the FHA within containment is the only DBA affected by the proposed change. Nonetheless, TVA considered an FHA within the containment, and an FHA in the auxiliary building spent fuel pool area. TVA also evaluated the potential total effective dose equivalent (TEDE) to control room personnel from these FHAs. For these two re-analyses, TVA determined the TEDE at the exclusion area boundary (EAB) for the worst 2-hour period and the 0-30 day low population zone (LPZ) TEDE.

This accident analysis postulates that a spent fuel assembly is dropped during refueling. All of the fuel rods in the assembly, including the 24 tritium producing burnable absorber rods, are assumed to rupture, releasing the radionuclides within the fuel rod to the fuel pool or reactor cavity water. Volatile constituents of the core fission product inventory migrate from the fuel pellets to the gap between the pellets and the fuel rod clad. The fission product inventory in the fuel rod gap of the damaged fuel rods is assumed to be instantaneously released because of the accident. Fission products released from the damaged fuel are decontaminated by passage through the pool water, depending on their physical and chemical form. TVA assumed no decontamination for noble gases, a decontamination factor of 200 for radioiodines, and retention of all aerosol and particulate fission products.

The NRC staff reviewed the technical analyses related to the radiological consequences of design basis FHAs inside and outside containment, which were performed in support of this proposed license amendment, and reviewed the assumptions, inputs, and methods used to assess these impacts. The NRC staff also had the benefit of the review and confirmatory analyses performed in support of Amendments 278 and 269 for the Tritium Production Core. The NRC staff performed independent calculations to confirm the conservatism of the TVA analyses. The NRC staff finds that analysis methods and assumptions used were consistent with the conservative regulatory requirements and guidance. Additionally, the NRC staff finds that the EAB, LPZ, and control room doses will continue to comply with the applicable regulatory criteria without credit being taken for containment isolation if the irradiated fuel has been allowed to decay for 100 hours prior to being moved.

Based on the above, the NRC staff finds the proposed change to replace the current accident source term used in the design basis FHA within containment radiological analyses with an AST is acceptable.

#### 3.2 TS 3.9.4, "Containment Building Penetrations"

The licensee proposed to revise the applicability of this TS, as it applies to the containment building equipment door (i.e., LCO [limiting condition for operation] 3.9.4.a), from "during

movement of irradiated fuel,” to “during movement of recently irradiated fuel within the containment.” The applicability of this TS, as it applies to the containment building airlock doors and penetrations (i.e., LCOs 3.9.4.b and 3.9.4.c), would remain as “during movement of irradiated fuel.”

The licensee also proposed revising the Action statement to reflect the revised language of LCO 3.9.4.a by creating a new Action 1 requiring immediate suspension of all operations involving movement of recently irradiated fuel if LCO 3.9.4.a is not met, and designating the current statement as Action 2 for LCOs 3.9.4.b and 3.9.4.c.

As a result of the LCO changes, and consistent with the TSTF, the licensee proposed to revise the BASES for TS 3.9.4 to define “recently irradiated fuel” as fuel that has occupied part of a critical reactor core within the previous 100 hours and to add a discussion that addresses the availability of a single normal or contingency method to promptly close the containment building equipment door when moving fuel that has not been recently irradiated.

The NRC staff has reviewed the proposal to modify TS 3.9.4 by adding a new applicability statement for the containment building equipment door (CBED) that will limit the containment closure function of the CBED to only apply during movement of “recently irradiated fuel.” In order to implement TS 3.9.4 APPLICABILITY statements, the LCO for OPERABILITY of the CBED need only apply when handling fuel that has recently been in the critical reactor core (i.e., “recently irradiated fuel”). The NRC staff notes that the proposed revision to the TSs does not result in changes to the design basis in any way other than those reviewed and approved above, and that the requirements for closure of the containment air lock doors and other penetrations are not being changed.

On the basis of the above regulatory and technical evaluations of the licensee’s justifications for TS changes, the NRC staff finds that the requested changes to the TSs for SQN Units 1 and 2 to amend the requirements for closure of the containment building equipment door during movement of irradiated fuel are acceptable.

The TS BASES will be revised to identify “recently irradiated fuel” as fuel that has occupied part of a critical reactor core within the previous 100 hours. The NRC staff determined that the 100 hour decay period is the basis for the definition of “recently” in the term “recently irradiated fuel.” In addition, consistent with the instructions in TSTF-51, Revision 2, regarding decreasing doses even further below those provided by natural decay, the licensee has committed to follow the guidelines of NUMARC 93-01, Revision 3, Section 11.3.6, “Assessment Methods for Shutdown Conditions,” Subsection 5, “Containment - Primary (PWR)/Secondary (BWR).”

### 3.3 Design Basis

The licensee proposed to modify the SQN design basis to replace the current accident source term used in the design basis FHA analysis with an AST and to replace the previous whole body and thyroid accident dose guidelines with the TEDE criteria of 10 CFR 50.67(b)(2). TVA has supplemented the source term provided in RG 1.183 with tritium to reflect the tritium production core authorized for use at SQN.

This licensing action is considered a selective implementation of the AST. TVA addressed the use of AST described in RG 1.183 as the DBA source term in the evaluation of the radiological consequences of FHAs at SQN. As part of the implementation of the AST, the TEDE acceptance criterion of 10 CFR 50.67(b)(2) replaces the previous whole body and thyroid dose guidelines of 10 CFR 100.11 and 10 CFR Part 50, Appendix A, GDC 19, as the SQN licensing

basis, with regard to the radiological consequences of the design basis FHAs inside and outside the containment.

With this approval, the selected characteristics of the AST and TEDE criteria become the design basis for the DBA FHA within the containment and outside the containment. This approval is limited to this specific implementation. Subsequent modifications based on the selected characteristics incorporated into the design basis by this action may be possible under the provisions of 10 CFR 50.59. However, use of other characteristics of an AST, and changes to previously approved AST characteristics, require prior staff approval under 10 CFR 50.67. The selected characteristics of the AST and the TEDE criteria may not be extended to other aspects of the plant design or operation without prior NRC review and approval under 10 CFR 50.67. All future radiological analyses performed to demonstrate compliance with regulatory requirements must address the selected characteristics of the AST and the TEDE criteria as described in the SQN design basis.

#### 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 (68 FR 7822). 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 the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Attachment: Analysis Assumptions Table

Principal Contributors: S. LaVie, NRR  
E. Forrest, NRR

Dated: October 28, 2003

TABLE 1

**ANALYSIS ASSUMPTIONS**

Source Term	Core <i>C<sub>i</sub></i>	
Kr-83m	1.15E7	
Kr85m	2.39E7	
Kr-85	1.03E6	
Kr-87	4.81E7	
Kr-88	6.66E7	
Kr-89	8.28E7	
Xe-131m	1.04E6	
Xe-133m	6.15E6	
Xe-133	1.91E8	
Xe-135m	4.05E7	
Xe-135	6.43E7	
Xe-138	1.67E8	
I-131	9.45E7	
I-132	1.39E8	
I-133	1.95E8	
I-134	2.17E8	
I-135	1.86E8	
Te-131m	1.86E7	
Te-132	1.36E8	
Dose conversion factors		ICRP30
Offsite breathing rate, m <sup>3</sup> /sec (0-8 hours)		3.47E-4
Control room volume, ft <sup>3</sup>		260,000
Normal ventilation makeup flow, cfm		3200
Control Room HVAC system		
Filtered air makeup, cfm		1000
Filtered recirculation, cfm		2600
Unfiltered inleakage, cfm		51
Filter efficiency, all iodine species, %		95
Control room breathing rate, m <sup>3</sup> /sec		3.47E-4
Control room occupancy factors		
0-24 hours		1.0
1-4 days		0.6
4-30 days		0.4
Offsite $\chi/Q$ , sec/m <sup>3</sup>		
EAB: 0-2 hr		8.59E-4
LPZ: 0-2 hr		1.39E-4

Control room $\chi/Q$ , sec/m <sup>3</sup>	Outside Containment	Within Containment
0-30 sec	1.80E-3	5.63E-4
30 sec-2 hours	1.80E-3	1.80E-3
Time after shutdown, hours		100
Fuel damage		one assembly
Number of fuel assemblies		193
Radial peaking factor 1.		1.70
Gap fraction inventory		
I-131		0.08
Kr-85		0.10
others		0.05
Iodine species fractions		
Elemental		0.9985
Organic		0.0015
Iodine pool decontamination		
Elemental		200
Noble gases		1
Tritium release, Ci		84000
CNMT building mixing volume, ft <sup>3</sup>		3.26E5
CNMT building purge flow rate, cfm		16,000
CNMT purge isolation, sec		30
Release duration, hours		2