May 9, 2001

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 LEAD TEST ASSEMBLIES (TAC NO. MB1393) (TS 01-01)

Dear Mr. Scalice:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 268 to Facility Operating License No. DPR-77 for the Sequoyah Nuclear Plant (SQN), Unit 1. This amendment is in response to the Tennessee Valley Authority application dated March 9, 2001. The amendment revises the SQN Unit 1 Technical Specifications (TSs) for the reactor core by adding a sentence at the end of TS Section 5.3 authorizing installation of a limited number of lead test assemblies (LTAs) containing downblended uranium in accordance with Framatome Cogema Fuels Topical Report BAW-2328. The NRC has found the proposed change to be acceptable. Accordingly, TVA is authorized to insert up to four LTAs containing this material in the SQN Unit 1 core. The NRC authorized insertion of these same LTAs in the SQN Unit 2 core in Unit 2 License Amendment No. 234, dated April 12, 1999.

A copy of the Safety Evaluation is also enclosed. A Notice of Issuance will be included in the next Commission's biweekly *Federal Register* notice. Please direct any questions you or your staff should have to me at (301) 415-2010.

Sincerely,

/RA/

Ronald W. Hernan, 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. 268 to License No. DPR-77
2. Safety Evaluation

cc w/enclosures: 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. 268
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 9, 2001, 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. 268, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance, to be implemented no later than 45 days after issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Richard P. Correia, 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: May 9, 2001

ATTACHMENT TO LICENSE AMENDMENT NO. 268

FACILITY OPERATING LICENSE NO. DPR-77

DOCKET NO. 50-327

Revise the Appendix A Technical Specifications by removing the page identified below and inserting the enclosed page. The revised page is identified by the captioned amendment number and contains a marginal line indicating the change.

REMOVE	INSERT
5-4	5-4

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of zircaloy or M5 clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with NRC-approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff-approved codes and methods, and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. Sequoyah is authorized to place a limited number of lead test assemblies into the reactor as described in the Framatome-Cogema Fuels report BAW-2328, beginning with the Unit 1 Operating Cycle 12.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 53 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 12,612 + 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 268 TO FACILITY OPERATING LICENSE NO. DPR-77

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-327

1.0 INTRODUCTION

By letter dated March 9, 2001, the Tennessee Valley Authority (TVA) proposed a change to the Technical Specifications (TSs) for the Sequoyah Nuclear Plant (SQN), Unit 1. The proposed change would allow TVA to insert a limited number of lead test assemblies (LTAs) as described in Framatome Cogema Fuels (FCF) Topical Report BAW-2328, "Blended Uranium Lead Test Assembly Design Report," dated July 1998, into the SQN Unit 1 core beginning with the Cycle 12 core. These LTAs contain downblended uranium (U) that has a higher amount of the isotopes U-232, U-234, and U-236 than standard commercial nuclear reactor fuel. These LTAs are part of a joint TVA/Department of Energy (DOE) project to demonstrate the feasibility of using downblended uranium as commercial nuclear power plant fuel and to verify the accuracy of the analytical tools in predicting the LTA behavior.

2.0 BACKGROUND

TVA submitted Topical Report BAW-2328 for U.S. Nuclear Regulator Commission (NRC) approval on August 7, 1998. The NRC staff reviewed the report and approved its use, with certain specific conditions imposed, for installation of up to four LTAs in SQN Unit 2, in a letter dated February 18, 1999. The topical report highlighted the fact that the downblended uranium contains high quantities of U-236 which is not a naturally occurring isotope of uranium, but only produced from the fission process. The source of the uranium used for the LTAs is from DOE tritium-producing reactors (Savannah River, Oak Ridge). The topical report included a chemical and isotopic analysis by Oak Ridge National Laboratory, which stated that the material used for the LTAs was a combination of scrap, floor sweepings, and casting dross from the uranium/aluminum metal processing at the Savannah River site. The material was shipped to Nuclear Fuel Services in Erwin, Tennessee, where it was dissolved and processed through a multi-stage solvent extraction column into uranyl nitrate.

TVA had previously provided a history of the LTA material in a letter of March 19, 1999. The LTA material has been downblended from highly enriched uranium (HEU) from the DOE's production reactors, which is part of the fissile material declared to be excess to national security needs by the President of the United States in March 1995. DOE determined to downblend this material to low-enriched uranium (LEU) to make it non-weapons usable and convertible to commercial use. In April 1996, Congress enacted the United States Enrichment Corporation (USEC) Privatization Act, which authorized DOE to transfer off-specification uranium to a federal agency (such as TVA) for its own use.

At TVA's request, NRC previously approved a License Amendment on April 12, 1999, (SQN Unit 2 License Amendment No. 234) allowing insertion of these same LTAs in the SQN Unit 2 core. During the April 1999 outage, the LTAs were installed in the Unit 2 core for in-core testing and evaluation. However, early in the Unit 2 operating cycle, indications showed the possibility of one or more leaking fuel rods in the core. During the October 2000 outage, TVA determined that one fuel rod in one of the four LTA assemblies (one rod out of 1056) was leaking. Leaks were also found in several older Westinghouse fuel assemblies that were scheduled to be removed from the core anyway. As a conservative measure, TVA elected to remove all four LTA assemblies from the core for inspection and evaluation. Assessment by TVA, the fuel manufacturer (FCF), and an independent reviewer concluded that highly-enriched uranium (HEU) was not a cause for the one fuel rod leak.

As discussed during a January 11, 2001 public presentation to the NRC, TVA proposes to use the downblended HEU material in its Browns Ferry Nuclear Plant (BFN) reactors instead of SQN's reactors for full scale application. Thus, this proposed TS change will enable TVA to continue the evaluation of HEU derived material as commercial reactor fuel. To expedite their evaluation of the LTAs, TVA has requested application of the LTAs for the Unit 1 core.

3.0 EVALUATION AND CONCLUSION

3.1 Evaluation

Topical Report BAW-2328 noted that the radiation exposure rates associated with the blended fuel are estimated to be as much as 20% higher than the exposure rates for standard uranium fuel assemblies. The report further states that procedures for the unloading, inspection, and storage of the LTAs during receipt at the site have been reviewed to determine the impact of the estimated increase in exposure rates. While the fundamental procedural steps do not have to be changed, consideration will be given to the potential for increases in exposure of fuel handlers and inspectors. Application of standard techniques (i.e., time, distance, and shielding) will be useful in minimizing the increase in exposure during handling of blended fuel assemblies. However, the main thrust of the enclosed license amendment is assembly and use of the special LTAs in the SQN Unit 1 core for up to two fuel cycles for each fuel assembly. Since all fuel handling operations involving insertion into and removal from the core will be performed under at least 23 feet of water in the spent fuel pool, transfer canal, and reactor vessel, the difference in radiation levels will be very, very low.

The revised TS change would allow TVA to insert a limited number of LTAs that contain amounts of U-234, U-232, and U-236 that are higher than normal commercial reactor fuel into the SQN Unit 1 core. The LTAs are described in the July 1998 Topical Report BAW-2328. The report contained the neutronic, chemical, mechanical, geometrical, and material properties of the proposed fuel assemblies. The significant effect of the uranium isotopic change from the standard uranium fuel is the increased U-235 enrichment needed for the downblended fuel. Increased enrichment is needed to offset the thermal neutron absorbing characteristic of the U-236 isotope and its subsequent transition chain. The increased LTA enrichment value is between the two enrichment values of the other new standard fuel assemblies being introduced into the core during this fuel reload and less than the TS limit of 5 weight-percent U-235.

The isotopic difference between the downblended fuel and standard fuel induces changes in the neutronic behavior of the fuel; however, the chemical, mechanical, and material properties of the fuel are not affected by the different mix of isotopes. The differences noted in these parameters are introduced from the increased enrichment. Thus, these parameter differences are properly accounted for in the fuel models and are bounded by the original safety analysis performed for the plant.

The greatest neutronic difference introduced with the use of the downblended uranium fuel is the increased thermal neutron absorption of the additional uranium isotopes. This increased neutron absorption results in a different fuel reactivity for the LTAs. Analysis performed for the fuel in BAW-2328 demonstrated that the core-wide reactivity difference of 7 per cent milli-rho was acceptable for the addition of four LTAs although additional benchmarking should be performed before an entire reload core of blended fuel is used.

The associated topical report, BAW-2328, provided the specific information on the fuel isotopic composition and specifications and was approved for use for the addition of four LTAs into the core. If the use of more than four LTAs is desired, a new topical report supporting the additional assemblies must be submitted and approved before use of additional fuel assemblies will be allowed by the license.

Based on our review, the NRC staff has found that the addition of four LTAs as described in BAW-2328 is acceptable for SQN Unit 1. The acceptance is based on the findings of the February 1999 Safety Evaluation (SE) for the topical report supporting the insertion of lead test assemblies containing U-236 into the SQN Unit 2 core, the SE issued by the staff on April 12, 1999, for use of these LTAs in the SQN Unit 2 core, and the staff's finding that the core designs for SQN Units 1 and 2 are almost identical. Accordingly, the staff's evaluations regarding use of LTAs in SQN Unit 2 also apply to use of LTAs at SQN Unit 1, and the staff's determinations in its evaluations indicate that such use is acceptable, specifically, the previous SE found a negligible impact on the fuel neutronics of SQN Unit 2 for the insertion of four LTAs containing downblended uranium fuel. The use of the Topical Report will be subject to the conditions stated in the NRC safety evaluation on the report, which are:

1. The downblended uranium LTAs may not be the most limiting fuel assemblies in the core at any time during their use in the core.

2. A final core operating limits evaluation must be performed prior to core reload to verify that the fuel design criteria and specified acceptable fuel design limits are met for the lead test assemblies for the anticipated specific in-core conditions.

3. The use of the topical report is valid for the insertion of a maximum of four lead test assemblies into the core at any time during their residence in the core as described in the supplementary letter from TVA dated November 5, 1998.

Due to the slightly higher expected radiation dose rates from the LTA assemblies, TVA will take appropriate precautions to limit worker radiation doses during fuel handling operations.

3.2 Conclusion

Based on our review, the staff concludes that the proposed TS change for SQN Unit 1 is acceptable for incorporation because the LTAs have been previously approved for use in the SQN Unit 2 in the associated topical report and by the previous Unit 2 License Amendment, which provided the fuel assembly and core physics information specific to the use of these LTAs in an SQN core. The addition of four LTAs containing downblended uranium fuel affects the core neutronics, most notably the fuel assembly reactivity. However, TVA has demonstrated analytically that the total core reactivity difference with the addition of four LTAs is acceptable. Furthermore, the LTAs have already been irradiated for one operating cycle in Unit 2 with satisfactory results.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments. 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 (66 FR 17970). 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.

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Dated: May 9, 2001

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SEQUOYAH NUCLEAR PLANT

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