Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

March 9, 2001

TVA-SQN-TS-01-01 10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of ) Docket No. 50-327
Tennessee Valley Authority )

**SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 - TECHNICAL SPECIFICATION (TS) CHANGE NO. 01-01, "INSERTION OF LEAD TEST ASSEMLIES (LTAs) INTO THE UNIT 1 CORE"**

In accordance with the provisions of 10 CFR 50.4 and 50.90, TVA is submitting a request for an amendment to SQN's License DPR-77 to change the TSs for Unit 1. The proposed change revises the current SQN Unit 1 TSs to provide for insertion of a limited number of LTAs, beginning with the Unit 1 operating Cycle 12 core. The LTAs are described in the NRC approved Topical Report, BAW-2328, "Blended Uranium Lead Test Assembly Design Report," submitted on August 7, 1998 as supplemented by letter dated November 5, 1998. The Topical Report contains geometric, chemical, and neutronic information of the fuel isotopic composition and preliminary core reload pattern.

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the change is exempt from environmental review pursuant

D030

to the provisions of 10 CFR 51.22(c)(9). The SQN Plant Operations Review Committee and the SQN Nuclear Safety Review Board have reviewed this proposed change and determined that operation of SQN Unit 1, in accordance with the proposed change, will not endanger the health and safety of the public. Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter to the Tennessee State Department of Public Health.

Enclosure 1 to this letter provides the description and evaluation of the proposed change. This includes TVA's determination that the proposed change does not involve a significant hazards consideration, and is exempt from environmental review. Enclosure 2 contains copies of the appropriate TS pages from Unit 1 marked up to show the proposed change. Enclosure 3 forwards the revised TS pages for Unit 1, which incorporate the proposed change.

At TVA's request, NRC previously approved the application of the LTAs for the Unit 2 core on April 12, 1999 (TS 98-04, TAC NO. MA3527). During the April 1999 outage, LTAs were installed in the Unit 2 core for in-core testing and evaluation. However, early in the operating cycle, indications showed the possibility for one or more leaking fuel rods. During the October 2000 outage, TVA determined that one fuel rod in one of the four LTA assemblies was leaking. As a conservative measure, all four assemblies were removed from the core for inspection and evaluation. Assessment by TVA, the fuel manufacturer, and an independent reviewer concluded that highly-enriched uranium (HEU) was not a cause for the one fuel rod leak.

As discussed with NRC during a January 11, 2001 presentation, 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 our evaluation of the LTAs, TVA is now requesting application of the LTAs for the Unit 1 core. As such, NRC is requested to approve this TS change in time to support the Unit 1 refueling outage currently scheduled to start on October 21, 2001. TVA requests that the revised TS be made effective

within 45 days of NRC approval. If you have any questions about this change, please telephone me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

Pedro Salas
Licensing and Industry Affairs Manager

Subscribed and sworn to before me
on this 9th day of March

Peggy M. Billingsley
Notary Public

My Commission Expires October 9, 2002

Enclosures
cc: See page 4

cc (Enclosures):
Mr. R. W. Hernan, Project Manager
Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

Mr. Lawrence E. Nanney, Director (w/o Enclosures)
Division of Radiological Health
Third Floor
L&C Annex
401 Church Street
Nashville, Tennessee 37243-1532

NRC Resident
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy-Daisy, Tennessee 37384-2000

U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303-8931

**ENCLOSURE 1**

**TENNESSEE VALLEY AUTHORITY**
**SEQUOYAH NUCLEAR PLANT (SQN)**
**UNIT 1**
**DOCKET NO. 327**

**PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE 01-01**
**DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE**

## I. DESCRIPTION OF THE PROPOSED CHANGE

The proposed revision to the current SQN Unit 1 TSs would provide for insertion of a limited number of lead test assemblies (LTAs), beginning with the Unit 1 operating Cycle 12 core. The LTAs are described in Topical Report BAW-2328, "Blended Uranium Lead Test Assemblies design Report," prepared by Framatome Cogema Fuels (FCF) and approved by NRC on February 18, 1999. The specific change adds an additional sentence to Section 5.3.1, "Fuel Assemblies" of the Design Features that states: "Sequoyah is authorized to place a limited number of lead test assemblies into the reactor, as described in the FCF Report BAW-2328, beginning with the Unit 1 operating Cycle 12 core." No other TS sections or pages are affected by this revision.

## II. REASON FOR THE PROPOSED CHANGE

On April 12, 1999, NRC issued an license amendment allowing SQN to insert a limited number of LTAs into the Unit 2 operating Cycle 10 core. The purpose of placing the LTAs in the Unit 2 core was to verify that the effect of the LTAs on the core reactivity and power distributions is accurately calculated for a commercial light water reactor. This would ensure that the analytical methods that predict the behavior of LTAs are as accurate as the current methods used for predicting the behavior of enriched uranium fuel assemblies derived from natural uranium. Reactor startup and low-power physics testing indicated that the LTAs performed as expected including power distributions and critical boron concentrations. At the end of the Unit 2 operating cycle, the LTAs were removed from the core for inspection and evaluation. Based on the conclusion of the evaluation, TVA does not find reason to halt plans to use Department Of Energy (DOE) highly enriched uranium (HEU) material for fueling one or more TVA reactors.

The purpose of this change is to allow up to four of the LTAs to be inserted into the Unit 1 core (i.e., the next available unit) for continued irradiation for up to two

fuel cycles for each fuel assembly. The insertion of the LTAs into the Unit 1 core will allow for:

1. Continued benchmarking of the HEU LTAs to demonstrate the feasibility of using downblended uranium as commercial nuclear power plant fuel.

2. The verification of accuracy of the analytical tools in predicting LTA behavior.

3. Additional operating experience to assist in the licensing the use of the downblended HEU material at Browns Ferry Nuclear Plant (BFN).

4. Completion of the LTA demonstration program before the probable involvement of SQN's Unit 1 in the DOE sponsored tritium production beginning in the Fall of 2004.

## III. SAFETY ANALYSIS

In January 1997, TVA and the DOE entered into a Memorandum of Understanding to utilize excess DOE nuclear materials. On August 7, 1998, TVA submitted to NRC a Topical Report (prepared by Framatome-Comgema Fuels) detailing the LTA mechanical design, neutronic models, fuel pellet properties, thermal-hydraulic design, loss-of-coolant and Final Safety Analysis Report (FSAR) accident analysis, and accident radiological consequences. Subsequently on August 27, 1998, TVA submitted to NRC a request for an amendment of its operating license to allow insertion of LTAs into the Unit 2 core. Both the Topical Report and license amendment request were approved by NRC on February 18, 1999, and April 12, 1999, respectively. Upon completion of the first cycle operation in October 2000, the LTA were removed for inspection and evaluation. In a public meeting, held on January 11, 2001, with NRC and representatives of TVA's BFN and SQN, TVA stated its intent to seek approval by the TVA Board of Directors to proceed with a full core reload of HEU at BFN starting in 2005.

Evaluations in the NRC approved Topical Report, were based on the preliminary fuel cycle design of SQN Unit 2 operating Cycle 10 core. In light of the close likeness to its sister unit, the Topical Report stated actual implementation of the LTAs could have occurred in Unit 1.

TVA proposes the use of the NRC approved Topical Report for justification to allow insertion of the LTAs into the SQN Unit 1 core. The use of the Topical Report will be subject to the conditions stated in the NRC safety evaluation:

1. The downblended uranium lead test assemblies 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.

The proposed revision to allow for insertion of up to four LTAs in the Unit 1 core are identical to those previously approved for Unit 2. The approved Topical Report provides geometric, chemical, and neutronic information of the fuel isotopic composition nonspecific to either of SQN's cores. In addition, the Topical Report shows that the anticipated core load pattern will not result in the LTAs becoming the most limiting fuel assemblies in the core during the first fuel load cycle or the most limiting peak pin at any time during residence in the core. The final core operating limits evaluations with LTAs will ensure that the fuel design criteria and specified acceptable fuel design limits are met for Unit 1 in-core conditions.

## IV. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

TVA has concluded that operation of SQN Unit 1, in accordance with the proposed change to the technical specifications [ or operating license(s)], does not involve a significant hazards consideration. TVA's conclusion is based on its evaluation, in accordance with 10 CFR 50.91(a)(1), of the three standards set forth in 10 CFR 50.92(c).

### A. The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The lead test assemblies (LTAs) are identical to the other Mark-BW fuel assemblies with the exception of the initial uranium isotopic composition change. This composition change does not effect the chemical properties or affect the thermal-hydraulic performance of the fuel. The change in composition does change the neutronic response of the fuel. However the operational behavior of the fuel is accurately

predicted by the NRC approved methodologies used for reload core design and analysis as demonstrated in the Topical Report, and the successful operation during SQN Unit 2 Cycle 10. Therefore, the LTAs do not significantly increase the probability of accidents while in the reactor.

A preliminary reload design analysis performed, based upon the tentative use of the LTAs in SQN Unit 1 operating Cycle 12 fuel load pattern, shows that the LTAs will not become the most limiting fuel assemblies in the core during the cycle. Additionally, the peak pin criteria will be analyzed for each reload pattern to ensure that the LTAs do not become the most limiting peak pin at any time during their residence in the core.

The potential effects of the LTAs on plant operation and safety are evaluated for each reload core design. The key core safety analysis parameters are examined each cycle to ensure each parameter remains bounded by the more limiting values used in the safety analysis of record and that there is no increase in the probability of occurrence for any design basis accident described in the Final Safety Analysis Report (FSAR).

The impacts of the LTAs on the radiological consequences for all postulated events have been evaluated. The total calculated source term and the source-term activity of isotopes, which significantly contribute to operator and off-site accident exposure levels, were shown to be less than standard fuel assemblies with the same burnup, therefore, it will not increase the consequences of any accident previously evaluated.

**B. The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The fuel assembly design for the LTAs is identical to the standard fuel assemblies. The main difference between the LTAs and the production fuel is that the initial concentration of the $U^{234}$ and $U^{236}$ isotopes will be higher in the LTA fuel pellets than that typically found in standard fuel. These isotopic differences will not affect the chemical, mechanical, or thermal properties of the fuel pellet.

The LTAs meet the same design criteria and licensing basis criteria as the standard fuel assemblies and were manufactured with the same processes. The LTA skeleton is identical to the standard skeleton, which ensures that the loadings associated with normal operation, seismic events, loss-of-coolant accident (LOCA) events, and shipping and handling are not affected.

Pressure and temperature safety limits will be maintained the same as those for the current operating cycle, thus ensuring that the fuel will be maintained within the same range of safety parameters that form the basis for previous accident evaluations. No new performance requirements are being imposed on any system or component that exceed design criteria or cause the core to operate in excess of design basis operating limits. No credible scenario has been identified, which could jeopardize equipment that could cause or intensify an accident sequence or mitigate events. Therefore, the LTAs will not create the possibility of accidents or equipment malfunctions of a different type than previously evaluated while in the reactor.

C. **The proposed amendment does not involve a significant reduction in a margin of safety.**

The LTAs will not adversely affect reactor neutronic or thermal-hydraulic performance. The LOCA acceptance criteria with LTAs installed in the core will continue to be met. The acceptance criteria for departure from nucleate boiling (DNB) events with the LTAs installed in the core will also continue to be met. Other acceptance criteria have also been demonstrated to remain within acceptable limits. The total calculated source-term activity and the source-term activity of isotopes, which significantly contribute to operator and off-site accident exposure levels of the LTAs, was determined to be less than that for the standard fuel assembly with the same burnup. All previously evaluated events remain bounding and valid. For these reasons, the proposed amendment does not involve a significant reduction in a margin of safety.

## V. ENVIRONMENTAL IMPACT CONSIDERATION

The proposed change does not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.

**ENCLOSURE 2**

**TENNESSEE VALLEY AUTHORITY**
**SEQUOYAH PLANT (SQN)**
**UNIT 1**

**PROPOSED TECHNICAL SPECIFICATION CHANGE 01-01**
**MARKED PAGE**

---

## I. AFFECTED PAGE LIST

Unit 1

page 5-4

## II. MARKED PAGES

See attached.

## 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.

### 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 $\pm$ 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.

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.

**ENCLOSURE 3**

**TENNESSEE VALLEY AUTHORITY**
**SEQUOYAH PLANT (SQN)**
**UNIT 1**

**PROPOSED TECHNICAL SPECIFICATION CHANGE 01-01**
**REVISED PAGE**

---

## I. AFFECTED PAGE LIST

Unit 1

page 5-4

## II. MARKED PAGES

See attached.

## 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 $\pm$ 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.