TVA

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

MAY 28 1992

TVA-SQN-TS-92-01 10 CFR 50.90

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

Gentlemen:

In the Matter of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328

SEQUOYAH NUCLEAR PLANT (SQN) - REVISION 2 TO REQUEST FOR LICENSE AMENDMENT TO TECHNICAL SPECIFICATION (TS) CHANGE 92-01 - SPENT-POOL STORAGE CAPACITY INCREASE

The enclosed pages reflect revisions to Enclosure 3 of the subject licensing amendment request submitted on March 27, 1992. Actual changes to each page are reflected by revision bars. Please make the appropriate changes as indicated below.

1. Page 1: Added discussion to address the storage of additional fuel in the spent-fuel pool in regard to the potential accident scenarios which were considered.

2. Page 2: Added discussion to describe the effect upon the additional fuel stored in the spent-fuel storage racks in the event of a seismic event.

3. Pages 2 and 3: Added discussion to describe the effect of additional fuel stored in the spent-fuel pool would have in the event cooling flow was lost in the spent-fuel pool.

These revisions were discussed with members of your staff on May 11, 1992, and do not have a significant effect on any previous analysis or calculation performed.

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Please direct questions concerning this issue to C. R. Davis at (615) 751-7509.

Sincerely,

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ENCLOSURE 3

PROPOSED TECHNICAL SPECIFICATION CHANGE

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

(TVA-SQN-TS-92-01)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS

SIGNIFICANT HAZARDS EVALUATION

TVA has evaluated the proposed technical specification (TS) changes and has determined that they do not represent a significant hazards consideration based on criteria established in 10 CFR 50.92(c).

Operation of Sequoyah in accordance with the proposed amendment will not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

The following potential scenarios were considered:

1. A spent-fuel assembly drop.
2. Drop of the transfer canal gate or the divider gate in the spent-fuel pool.
3. A seismic event.
4. Loss of cooling flow in the spent-fuel pool.
5. Installation activities.

The effect of additional spent-fuel pool storage cells fully loaded with fuel on the first four potential accident scenarios listed above has been reviewed. It was concluded that after installation activities have been completed, the presence of additional fuel in the pool does not increase the probability of occurrence of these four events.

With regard to installation activities, the existing Sequoyah TSs prohibit loads in excess of 2100 pounds from travel over fuel assemblies in the storage pool and require the associated crane interlocks and physical stops be periodically demonstrated operable. During installation, racks and associated handling tools will be moved over the spent-fuel pool but movement over fuel will be prohibited. All installation work in the spent-fuel-pit area will be controlled and performed in strict accordance with specific written procedures.

NRC regulations provide that, in lieu of providing a single failure-proof crane system, the control of heavy loads guidelines can be satisfied by establishing that the potential for a heavy load drop is extremely small. Storage rack movements to be accomplished with the Sequoyah auxiliary building crane will conform with NUREG-0612 guidelines, in that the probability of a drop of a storage rack is extremely small. The crane has a tested capacity of 80 tons. The maximum weight of any existing or replacement storage rack and its associated handling tool is less than 15 tons. Therefore, there is ample safety factor margin for movements of the storage racks by the auxiliary building crane. Special lifting devices, which have redundancy or a rated capacity sufficient to maintain adequate safety factors, will also be utilized in the movements of the storage racks. In accordance with NUREG-0612, Appendix B, the safety margin ensures that the probability of a load drop is extremely low.

Load travel over fuel stored in the cask loading area of the cask pit will be minimized and, in any case, will be prohibited unless an impact shield, which has been specifically designed for this purpose, is covering the area. Loads that are permitted when the shield is in place must meet analytically determined weight, travel height, and cross-sectional area criteria that preclude penetration of the shield. A TS has been proposed that incorporates the previously mentioned load criteria.

A fuel movement and rack changeout sequence has been developed that illustrates that it will not be necessary to carry existing or new racks over fuel in the cask loading area or any region of the pool containing fuel. A lateral-free zone clearance from stored fuel shall be maintained. Accordingly, it is concluded that the proposed installation activities will not significantly increase the probability of a load-handling accident. The consequences of a load-handling accident are unaffected by the proposed installation activities.

The consequences of a spent-fuel assembly drop were evaluated, and it was determined that the racks will not be distorted such that they would not perform their safety function. The criticality acceptance criterion, $K_{eff} \leq 0.95$, is not violated, and the calculated doses are well within 10 CFR Part 100 guidelines. Thus, the consequences of this type of accident are not changed from previously evaluated spent-fuel assembly drops that have been found acceptable by NRC.

The existing TSs permit the transfer-canal gate and the divider gate in the spent-fuel pool to travel over fuel assemblies in the spent-fuel pool. Analysis showed that this drop caused less damage to the new racks than the fuel assembly drop when it impacts the top of the rack. Rack damage is restricted to an area above the active fuel region.

The consequences of a seismic event have been evaluated. The new racks are designed and will be fabricated to meet the requirements of applicable portions of the NRC regulatory guides and published standards. Design margins have been provided for rack tilting, deflection, and movement such that the racks do not impact each other or the spent-fuel-pit walls in the active fuel region during the postulated seismic events. The new free-standing racks are designed to maintain their integrity during and after a seismic event. The fuel assemblies also remain intact and therefore no criticality concerns exist.

The spent-fuel pool system is a passive system with the exception of the fuel pool cooling train and heating, ventilating, and air-conditioning (HVAC) equipment. Redundancies in the cooling train and HVAC hardware are not reduced by the planned fuel storage densification. The potential increased heat load resulting from any additional storage of spent fuel is well within the existing system cooling capacity. Therefore, the probability of occurrence or malfunction of safety equipment leading to the loss of cooling flow in the spent-fuel pool is not significantly affected. Furthermore, the consequences of this type incident are not significantly increased from previously evaluated cooling system loss of flow malfunctions. Thermal-hydraulic scenarios assume the reracked pool is approximately 85 percent full with spent fuel assemblies. From this starting point, the remaining storage capacity is utilized by analyzing both normal back-to-back and unplanned full core offloads using conservative assumptions and previously established methods. Calculated values include maximum pool water bulk temperature, coincident maximum pool water local temperature, the maximum fuel cladding temperature, time-to-boil after loss of cooling paths, and the effect of flow blockage in a storage cell.

Although the proposed modification increases the pool heat load, results from the above analyses yield a maximum bulk temperature of approximately 180 degrees Fahrenheit which is below the bulk boiling temperature. Also the maximum local water temperature is below nucleate boiling condition values. Associated results from corresponding loss of cooling evaluations give minimums of 3.4 hours before boiling begins and 30 hours before the pool water level drops to the minimum required for shielding spent fuel. This is sufficient time to begin utilization of available alternate sources of makeup cooling water. Also, the effect of the increased thermal loading on the pool structure was evaluated and determined to be acceptable.

(2) Create the possibility of a new or different kind of accident from any accident previously analyzed.

The proposed modification has been evaluated in accordance with the guidance of the NRC position paper entitled, "OT Position for Review and Acceptance of Spent-Fuel Storage and Handling Applications"; appropriate NRC regulatory guides; appropriate NRC standard review plans; and appropriate industry codes and standards. Proven analytical technology was used in designing the planned fuel storage expansion and will be utilized in the installation process. Basic reracking technology has been developed and demonstrated in over 80 applications for fuel pool capacity increases that have already received NRC staff approval.

The TSs for the existing spent-fuel storage racks use burnup credit and fuel assembly administrative placement restrictions for criticality control. The change to three-zone storage in the spent-fuel pool is described in the proposed change to the design features section of the TSs. Additional evaluations were required to ensure that the criticality criterion is maintained. These include the evaluation for the limiting criticality condition, i.e., the abnormal placement of an unirradiated (fresh) fuel assembly of 4.95 weight percent enrichment into a storage cell location for irradiated fuel meeting the highest rack design burnup criterion. The evaluation for this case shows that the reactivity would exceed the limit in the absence of soluble boron. Soluble boron, for which credit is permitted under these abnormal conditions, ensures that reactivity is maintained substantially less than the design requirement. Calculations indicate that a soluble poison concentration of 685 parts per million (ppm) boron would be required to limit the maximum reactivity to a k_{eff} of 0.95, including uncertainties. This is less than the existing and proposed TS requirements of 2000 ppm.

It is not physically possible to install a fuel assembly outside and adjacent to a storage module in the spent-fuel storage pool. However, for a storage module installed in the cask loading area of the cask pit, there would be sufficient room for such an extraneous assembly. The module in this area is administratively limited by the proposed TS change to spent fuel only, and calculations show that the maximum k_{eff} remains well below the 0.95 limit under this postulated accident condition, even in the absence of soluble boron. To provide reactivity control assurance for the abnormal placement of a fresh assembly in the cask loading area module, a modification to the existing TS has been proposed that requires boron concentration measurements while handling fuel in that area.

Although these changes required addressing additional aspects of a previously analyzed accident, the possibility of a previously unanalyzed accident is not created. It is therefore concluded that the proposed reracking does not create the possibility of a new or different kind of accident from any previously analyzed.

(3) Involve a significant reduction in a margin of safety.

The design and technical review process applied to the reracking modification included addressing the following areas:

1. Nuclear criticality considerations.

2. Thermal-hydraulic considerations.

3. Mechanical, material, and structural considerations.

The established acceptance criterion for criticality is that the neutron multiplication factor shall be less than or equal to 0.95, including all uncertainties. The results of the criticality analysis for the new rack design demonstrate that this criterion is satisfied. The methods used in the criticality analysis conform to the applicable portions of NRC guidance and industry codes, standards, and specifications. In meeting the acceptance criteria for criticality in the spent-fuel pool and the cask loading area, such that k_{eff} is always less than 0.95 at a 95/95 percent probability tolerance level, the proposed amendment does not involve a significant reduction in the margin of safety for nuclear criticality.

Conservative methods and assumptions were used to calculate the maximum fuel temperature and the increase in temperature of the water in the spent-fuel-pit area. The thermal-hydraulic evaluation used methods previously employed. The proposed storage modification will increase the heat load in the spent-fuel pool, but the evaluation shows that the existing spent-fuel cooling system will maintain the bulk pool water temperature at or below 180 degrees Fahrenheit. Thus it is demonstrated that the worst-case peak value of the pool bulk temperature is considerably lower than the bulk boiling temperature. Evaluation also shows that maximum local water temperatures along the hottest fuel assembly are below the nucleate boiling condition value. Thus there is no significant reduction in the margin of safety for thermal hydraulic or spent-fuel cooling considerations.

The mechanical, material, and structural design of the new spent-fuel racks is in accordance with applicable portions of "NRC OT Position for Review and Acceptance of Spent-Fuel Storage and Handling Applications," dated April 14, 1978 (as modified January 18, 1979), as well as other applicable NRC guidance and industry codes. The primary safety function of the spent-fuel racks is to maintain the fuel assemblies in a safe configuration through all normal and abnormal loading conditions. Abnormal loadings that have been evaluated with acceptable results and discussed previously include the effect of an earthquake and the impact because of the drop of a fuel assembly. The rack materials used are compatible with the fuel assemblies and the environment in the spent-fuel pool. The structural design for the new racks provides tilting, deflection, and movement margins such that the racks do not impact each other or the spent-fuel-pit walls in the active fuel region during the postulated seismic events. Also the spent-fuel assemblies themselves remain intact and no criticality concerns exist. In addition, finite element analysis methods were used to evaluate the continued structural acceptability of the spent-fuel pit. The analysis was performed in accordance with "Building Code Requirements for Reinforced Concrete" (ACI 318-63, 77). Therefore, with respect to mechanical, material, and structural considerations, there is no significant reduction in a margin of safety.

In summary, the proposed spent-fuel storage modifications do not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated; or

2. Create the possibility of a new or different kind of accident from any accident previously evaluated; or

3. Involve a significant reduction in a margin of safety.

Therefore, TVA has determined that the proposed amendments as described do not involve significant hazard considerations and that the criteria of 10 CFR 50.91 have accordingly been met.

TVA has also reviewed the NRC examples of licensing amendments considered not likely to involve significant hazards considerations as provided in the final adoption of 10 CFR 50.92 published on page 7751 of the Federal Register, Volume 51, No. 44, March 6, 1986. Example (X) provides four criteria that, if satisfied by a reracking request, indicate that it is likely no significant hazards considerations are involved. The criteria and how TVA's amendment request for Sequoyah complies are indicated below.

Criterion (1):

The storage expansion method consists of either replacing existing racks with a design that allows closer spacing between stored spent-fuel assemblies or placing additional racks of the original design on the pool floor if space permits.

Proposed Amendment:

The Sequoyah Nuclear Plant reracking involves replacing the existing racks with a design that allows closer spacing between stored fuel assemblies and also provides additional rack storage on the pool floor where space permits.

Criterion (2):

The storage expansion method does not involve rod consolidation or double tiering.

Proposed Amendment:

The Sequoyah racks are not double tiered, and all racks will sit on the floor of the spent-fuel pool. Additionally, the amendment application does not involve consolidation of spent fuel.

Criterion (3):

The k_{eff} of the pool is maintained less than or equal to 0.95.

Proposed Amendment:

The design of the new spent-fuel racks contains a neutron absorber, Boral, to allow close storage of spent-fuel assemblies while ensuring that the k_{eff} remains less than 0.95 under all normal operating conditions with unborated water in the pool and less than 0.95 under abnormal conditions with soluble boron in the pool.

Criterion (4):

No new technology or unproven technology is utilized in either the construction process or the analytical techniques necessary to justify the expansion.

Proposed Amendment:

The construction processes and analytical techniques used in the fabrication and design are substantially the same as those of numerous other rack installations. Thus, no new or unproven technology is utilized in the construction or analysis of the high-density, spent-fuel racks at Sequoyah. TVA's Contractor, Holtec International, has previously supplied licensable racks of very similar design for about 10 other reracking projects.

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