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

February 28, 2003

TVA-SQN-TS-02-06 10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Gentlemen:

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

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2- TECHNICAL SPECIFICATIONS (TS) CHANGE NO. 02-06, RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) (TAC NO. MB7205 AND MB7206)

References:

1. TVA letter to NRC dated November 15, 2002, "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Technical Specification (TS) Change 02-06, Increase Condensate Storage Tank (CST) Minimum Volume"

2. NRC letter to TVA dated February 14, 2003, "Sequoyah Nuclear Plant Units 1 and 2 – Request for Additional Information (RAI) Regarding Technical Specification (TS) Change Request No. 02-06, Increase Condensate Storage Tank (CST) Minimum Volume' (TAC Nos. MB7205 and MB7206)' "

TVA submitted TS Change 02-06 to NRC (Reference 1) to propose an increase in the minimum amount of inventory stored in the CST. NRC requested additional information regarding the proposed TS change in Reference 2. The questions in Reference 2 were clarified in a telephone conversation between NRC, Framatome, and TVA personnel on February 10, 2003.

This letter and the attached enclosure provides the responses to the NRC RAI. There are no commitments contained in this letter. TVA requests NRC approval to support the Sequoyah refueling outage scheduled for March 2003.

This letter is being sent in accordance with NRC RIS 2001-05, "Guidance on Submitting Documents to the NRC by Electronic Information Exchange, CD-ROM, or Hard Copy."

If you have any questions about this change, please contact me at 843-7170 or Jim Smith at 843-6672.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 28 day of February, 2003

Sincerely,

Pedro Salas
Manager of Licensing
and Industry Affairs

Enclosure:
Response To Request For Additional Information (RAI)
TS Change 02-06

cc: See page 3

Enclosure
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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
TECHNICAL SPECIFICATION (TS) CHANGE 02-06

RAI Question 1.

In a conference call on February 10, 2003, you stated that the required condensate storage tank (CST) water volume is based upon the same cooldown curve as in your original analysis. Since the plant conditions changed such as increased auxiliary feedwater (AFW) temperature, increased steam generator (SG) metal volume, and a new decay heat standard, please address the following comments/questions.

A. Provide an analysis to show that the cooldown curve is applicable to the new plant conditions considering the requirements of Branch Technical Position RSB 5-1.

B. Compare the calculated CST water level determined using the methods above to the steady state analysis results as described in your report. Verify that your proposed CST water volume is acceptable for the plant cooldown.

Response

Branch Technical Position RSB 5-1, "Design Requirements of the Residual Heat Removal System" establishes functional requirements for the residual heat removal (RHR) system to take the reactor from normal operating conditions to cold shutdown using only safety grade systems (Section A). The document also establishes source requirements for the seismic Category I water supply for the AFW system (Section G). For the purposes of applicability, Sequoyah is a Class 2 plant as defined in Section H of the Branch Technical Position. The Sequoyah licensing basis establishes hot standby as the plant safe shutdown condition (i.e., NUREG-0011 and NUREG-0011, Supplement 1 and NUREG-1232, Volume 2, page 2-7) such that no credit is taken for a safety grade cooldown to cold shutdown conditions. As discussed in Section 10.4.7.2.2 of the Sequoyah Safety Analysis Report (SAR), the CST is the preferred AFW source rather than the safety grade source. An unlimited source of safety grade (Seismic Category I) AFW is provided by a separate train of essential raw cooling water (ERCW) which can be tied in to the suction of each AFW pump. Given theses considerations, the requirements of Branch Technical Position RSB

5-1 are not directly applicable to the proposed CST protected volume change.

The intent of Branch Technical Position RSB 5-1 is to demonstrate the capability to cool the reactor to cold shutdown conditions in a reasonable time with either onsite or offsite power available and the assumption of a single component failure. The original technical specification (TS) basis for the Sequoyah minimum contained CST volume indicates that, subsequent to reactor trip, the plant progresses to hot shutdown conditions in a two-hour period. Cooldown continues to RHR cut-in conditions in six hours. The total time from reactor trip to RHR cut-in is eight hours.

In performing the revised cooldown calculations, the original timing of the cooldown was assumed without a specific evaluation of the timing to hot shutdown and subsequent RHR cut-in. For the fixed time period, First Law considerations dictate that the energy removal requirement for transition from one plant state to the next (for example, from hot shutdown to RHR cut-in) is unaffected by the rate of the cooldown. The energy removal requirement is an integrated effect. As such, the length of cooldown is not significantly affected by either the plant changes or changes to the calculation assumptions.

The proposed TS revision makes no changes to the plant or plant systems that could affect the progression of plant cooldown with the exception of steam generator replacement. Analyses were performed which demonstrate that the proposed protected CST volume is adequate to accommodate any added heat transfer associated with the replacement steam generators.

No changes to the core or power rating (considering the base rated thermal power plus calorimetric uncertainty) or full power conditions have been made since the original CST required volume calculation was performed. Post-trip core decay (ANS 1994 standard) and actinide heating (B&W heavy actinide) were conservatively modeled in the revised calculations. In addition to determining the minimum CST volume required to cool the plant, the cooldown calculation was updated, accounting for steam generator level recovery and an increase in AFW temperature (from nominal 100 degree Fahrenheit [°F] to a maximum 120°F), commensurate with current plant operating practice and system limits.

The increase in AFW temperature (from 100°F to 120°F) is the only parameter that can affect cooldown timing as it represents a slight reduction in heat removal capability. In response to this question, a calculation of the effect of increased AFW temperature on plant heat removal was performed at both hot shutdown and RHR cut-in plant states. The calculation demonstrates that, with the increased AFW temperature, the plant does have sufficient steam relief capacity to remove core decay (and actinide) heat production during plant cooldown. In addition, an examination of the AFW pump capacity indicates the capability to provide sufficient condensate fluid to meet the requirements for plant cooldown with a failure of any one pump.

It has been demonstrated that the timing associated with plant cooldown utilized in the CST volume requirement calculation is reasonable given the capacity of existing components and heat removal systems at Sequoyah. The CST water volume requirement generated in the updated calculation, therefore, provides sufficient basis for the proposed TS revision.

RAI Question 2.

In Section 2.3, "Main Feedwater Line Piping" (page 14), you state, "Only the volume of main feedwater piping from the entry-point of the AFW line is considered in calculations leading to the CST water volume requirement." Only considering the volume from the entry-point of the AFW line would neglect any water volume upstream of this entry point. How much water volume is upstream of this entry point that could mix with the AFW?

Response

The volume of the main feedwater (MFW) piping upstream of the AFW entry was neglected in the calculation because the effect of this volume on the CST volume requirement for plant cooldown was considered negligible. The actual volume of MFW piping upstream of the AFW entry to the MFW isolation valve is approximately 247 ft^3 . Assuming the complete replacement of this volume with colder AFW fluid, an added energy requirement equivalent to 435 gallons of CST inventory will be imposed. This is well within the difference between the proposed and calculated CST volume requirement of 12,000 gallons.

RAI Question 3.

Page E1-1 of your submittal, states that the minimum CST water volume of 190,000 gallons will be increased to 240,000 gallons. You then state that this value reflects the minimum amount of feedwater required to assist in SG recovery of Unit 1, including a 12,000 margin. Given the net positive suction head requirements for the AFW pumps, vortexing, switchover level instrument uncertainty, level of the CST suction nozzle, et cetera, how many gallons of the CST are unuseable? How do you account for the unuseable volume in your calculations?

Response

The 12-inch diameter AFW suction pipe protrudes approximately 3 inches into the bottom of the tank, such that approximately 3,100 gallons are not available to the AFW pumps. Additionally, the CST level instrumentation channel scaling range (0 to 100 percent[%]) is based on CST elevations from 1-1/2 ft to 32 ft above the bottom of the tank. Based on this level instrumentation scaling, approximately 18,600 gallons will remain in the CST when the level instrumentation reads 0% full.

The height of the AFW suction pipe above the bottom of the CST has been evaluated to adequately prevent vortexing in the CST.

The ability of the AFW system to automatically switchover from the CST to the ERCW supply in the event of a seismic event is discussed in Section 10.4.7.2.3 of the Sequoyah SAR. The automatic transfer to the ERCW supply takes advantage of the amount of water stored in the seismically qualified suction piping to allow the transfer to take place without loss of net positive suction head (NPSH) to the three AFW pumps. The eight transfer valves are seismic Category I, and the transfer system with associated controls meets the requirements of IEEE-279. Numerical analysis and actual plant tests have been performed to verify the proper operation of this transfer scheme. To ensure that the AFW pumps are not suction-starved during automatic switchover, combinations of suction pressure switches and time-delay devices are used. The pressure setpoint and timer coordinated valve actions are set so that the pumps will have adequate NPSH under all conditions. The switchover setpoint and function are not altered by the proposed change.

The subject TS change proposes to establish 240,000 gallons as the new CST volume operability limit. Each CST has a minimum capacity of 385,000 gallons. Demonstrated accuracy calculations for the level instrumentation establish instrument channel uncertainties of approximately 3% of the instrument span. The minimum CST level setpoint (and associated alarm setpoint) will be based on the 240,000 gallon operability limit and will conservatively account for level instrument inaccuracies and the unusable CST volume discussed above. The new limit will not alter any functional requirements or impose any restrictions on the condensate or feedwater system during normal operation.

RAI Question 4.

How do you consider AFW pump heat and reactor coolant pump coastdown work in your CST volume requirement calculations? If they are not considered, why is this acceptable?

Response

Energy addition by AFW and reactor coolant pumps (RCPs) was not considered in the CST volume requirement calculations because it is considered insignificant.

AFW pumps operate at full flow initially, but the flow is throttled back as the cooldown progresses. Conservatively assuming full flow operation of both motor-driven AFW pumps over an eight hour period produces an increased heat load equivalent to an additional 1435 gallons of CST volume. Heat addition by the turbine-driven AFW pumps can be ignored because the steam extraction for the turbine is conservatively not accounted for in the CST volume requirement calculation. Given the inefficiencies of (1) the turbine and (2) the AFW pump, the turbine-driven AFW pump system represents a net energy reduction. The combined heat load of the AFW pumps is well within the heat removal capability of the 12,000 gallon difference between the calculated and proposed CST volume limit.

The analysis of the loss of offsite power to the station auxiliaries indicates that the RCPs coast down within a time frame of approximately six minutes. Sequoyah safety analyses conservatively assume a pump heat of 12 Megawatts for all four pumps. As the RCPs coast down, this heat addition will rapidly degrade. Conservatively assuming full pump heat addition for the entire coastdown period, the additional AFW required to remove this heat is about 449 gallons. The combined heat load of the RCPs is well within the heat removal capability of the 12,000 gallon difference between the calculated and proposed CST volume limit.