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

July 12, 2006

TVA-SQN-TS-06-03 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 06-03 "ULTIMATE HEAT SINK (UHS) TEMPERATURE INCREASE AND ELEVATION CHANGES"

Pursuant to 10 CFR 50.90, Tennessee Valley Authority (TVA) is submitting a request for a TS change (TS-06-03) to Licenses DPR-77 and DPR-79 for SQN Units 1 and 2. The proposed TS change will revise the limiting condition for operation of TS Section 3.7.5, "Ultimate Heat Sink." This revision will change the minimum UHS water elevation in Section 3.7.5.a from 670 feet to 674 feet. The essential raw cooling water (ERCW) temperature requirement in Section 3.7.5.b will be increased from 83 degrees Fahrenheit (°F) to 87°F. The conditional requirements of Section 3.7.5.c are no longer required and are deleted by the proposed change. This change will also delete a footnote that established a temporary UHS temperature limit of 87°F until 1995. These proposed changes are supported by a combination of design basis re-analysis, bounding analysis, and sensitivity analysis of the ERCW system, the UHS, and supported systems.

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TVA has determined that there are no significant hazards considerations associated with the proposed change and that the TS change qualifies for categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and enclosures to the Tennessee State Department of Public Health.

This change is proposed to address future UHS river temperature and river level impacts due to ever changing UHS conditions, both operational and environmental. Therefore, TVA requests approval of this TS change to provide operating leeway and to avoid potential unnecessary UHS related unit shutdowns. TVA request the implementation of the revised TS be within 45 days of NRC approval.

There are no commitments contained in this submittal.

If you have any questions about this change, please contact Jim Smith at (423) 843-6672.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 12th day of July, 2006.

Sincerely,

P. L. Pace
Manager, Site Licensing and
Industry Affairs

Enclosures:
1. TVA Evaluation of the Proposed Changes
2. Response to General Request for Additional Information
3. Proposed Technical Specifications Changes (mark-up)
4. Proposed Technical Specification Bases (mark-up)

cc: See page 3

Enclosures
cc (Enclosures):

Framatome ANP, Inc.
P. O. Box 10935
Lynchburg, Virginia 24506-0935
ATTN: Mr. Frank Masseth

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

Mr. Douglas V. Pickett, Senior Project Manager
U.S. Nuclear Regulatory Commission
Mail Stop 08G-9a
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2739

ENCLOSURE 1

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

1.0 DESCRIPTION

This letter is a request to amend Operating Licenses DPR-77 and DPR-79 for SQN Units 1 and 2. The proposed technical specification (TS) change will revise the limiting condition for operation (LCO) of TS Section 3.7.5, "Ultimate Heat Sink." This proposal will eliminate the two different minimum river elevation level criteria and replace it with a single minimum river elevation level limit. Concurrently, the two respective minimum essential raw cooling water (ERCW) temperature limits are replaced with a single maximum ERCW temperature limit. These proposed changes are supported by a combination of design basis re-analysis, bounding analysis, and sensitivity analysis of the ERCW system, the ultimate heat sink (UHS), and supporting systems. Other administrative changes to TS Section 3.7.5 are proposed. The specific change details are discussed in the following section.

2.0 PROPOSED CHANGE

This amendment request will revise TS Section 3.7.5, "Ultimate Heat Sink." LCO 3.7.5.a will be revised to increase the minimum required UHS water elevation from 670 feet to 674 feet. The maximum ERCW temperature requirement in LCO 3.7.5.b will be changed from 83 degrees Fahrenheit (°F) to 87°F. This revision will eliminate the conditional requirement of LCO 3.7.5.c, which states,

> *When the water level is above 680 feet mean sea level USGS datum, the average ERCW supply header water temperature may be less than or equal to 84.5°F.**

This change will also delete the footnote that allowed a limited time increase of 87°F in the ERCW temperature requirements. The footnote expired in 1995 and is no longer applicable. Another administrative clean-up item is the correction of a typographical error in the heading "Surveillance Requirements." One letter "e" was left out of the word "Requirements" and this proposed revision will correct this omission.

In summary, a proposed revision to TS Section 3.7.5 is provided to establish a single year-round UHS minimum water elevation level of 674 feet and maximum ERCW temperature

requirement of 87°F for SQN Units 1 and 2. Administrative changes are proposed to clean up the LCO of a dated allowance and typographical error.

3.0 BACKGROUND

The UHS for a nuclear plant is that complex of water sources, including associated retaining structures, and any canals or conduits connecting the source with, but not including, the intake structures of the nuclear reactor units, used to remove waste heat from the plant. The UHS is designed to perform two principal safety functions: (1) dissipation of residual and auxiliary heat after reactor shutdown, and (2) dissipation of residual and auxiliary heat after an accident. The UHS achieves these functions through the ERCW system by providing the heat sink function for this system. The UHS for SQN is the Tennessee River and is required to be operable in Operating Modes 1, 2, 3, and 4 in accordance with TS Section 3.7.5. If the UHS function cannot be satisfied, unit shutdown is required in accordance with the associated action times.

The UHS was designed to comply with the regulatory position in NRC Regulatory Guide 1.27, Revision 0, dated March 23, 1972, as stated below:

1. The UHS should be capable of providing sufficient cooling for at least 30 days (a) to permit simultaneous safe shutdown and cooldown of all nuclear reactor units that it serves, and maintain them in a safe shutdown condition, and (b) in the event of an accident in one unit, to permit control of that accident safely and permit simultaneous safe shutdown and cooldown of the remaining units and maintain them in a safe shutdown condition. Procedures for assuring a continued capability after 30 days should be available.

2. The UHS should be capable of withstanding the effects of the most severe natural phenomena associated with this location, other applicable site-related events, reasonably probable combinations of less severe phenomena or events where this is appropriate to provide a consistent level of conservatism, and a single failure of man-made structural features without loss of the capability specified in Regulatory Position 1 above.

3. The UHS should consist of at least two sources of water, including their retaining structures, each with the capability to perform the safety function specified in Regulatory Position 1 above unless it can be demonstrated that there is an extremely low probability of losing the capability of a single source. There should be at least two canals or conduits connecting the source(s) with the

intake structures of the nuclear power units, unless it can be demonstrated that there is extremely low probability that a single canal can fail entirely from natural phenomena. All water sources and their associated canals or conduits should be highly reliable and should be separated and protected such that failure of any one will not induce failure of any other.

4. The TSs for the plant should include actions to be taken in the event that conditions threaten partial loss of the capability of the UHS or if it temporarily does not satisfy Regulatory Positions 1 and 3 above during operation.

No changes are made nor proposed to the capability or capacity of the UHS. TVA continues to satisfy the Regulatory Guide requirements as follows:

1. The UHS (i.e., Tennessee River) maintains sufficient water volume that provides sufficient cooling for at least 30 days. The cooling water requirements for the most demanding accident shutdown and cooldown of the plant's reactors are presented in Updated Final Safety Analysis Report (UFSAR) Subsection 9.2.2. The adequacy of the Tennessee River to provide this amount of water, and therefore to satisfy Regulatory Position 1, is confirmed in UFSAR Subsections 2.4.11.1 and 2.4.11.3. The SQN safe shutdown condition is Hot Standby (HSB) as described in UFSAR Sections 3.1.1 and 9.2.2.3, NUREG-0011 including Supplement 1, and NUREG-1231, Volume 2.

2. No changes are made to the actual capability of the UHS. However, there is an evaluation change made to the dam failure size (breach) and resulting time consequences of a single failure of the downstream dam. As such, the loss of downstream dam breach size in the earthen-filled man-made structure has been reduced based on research of current hydrological methods and failure analysis. Basically, the instantaneous breach size in the Chickamauga Dam due to a seismic event has been reduced from 1000 foot wide to 400 foot wide. The tail water discharge flow has also changed to more closely correlate to test data for breach flows. The resulting pool drawdown (recession curves) demonstrates that the UHS water level decrease is less dramatic but results in the same end point later in time. The most severe natural phenomena (including flood, drought, tornado, wind, and earthquake) conceivable to occur at this site are discussed in UFSAR Chapter 2. The UHS's safety functions

are insured for all of the plant design basis events, including those extreme natural phenomenon credible to occur at this site.

No changes are made to the ERCW pumps. The ERCW pumps are protected from the design basis flood including the effects of wind waves; therefore, they will be capable of functioning in all flood conditions up to and including the design basis flood (see UFSAR Subsection 9.2.2). The water intake to the ERCW pumping station and the area outside the station intake was dredged to form a channel that will provide free access to the river. This channel was dredged to a sufficient width eliminating the possibility of channel blockage due to an earth or mud slide. The channel continues to be monitored and dredged as required to maintain free access to the river. Therefore, adequate water will be available to the ERCW pumps at all times, including the loss of downstream dam. The unlikely occurrence of a safe shutdown earthquake (SSE) could significantly affect the UHS only by causing failure of the downstream dam and/or upstream dams. For the resulting low and/or high water event, water will be available to the intake at all times. A seismically induced disturbance of the rock surfaces could only block a small percentage of the intake channel due to its highly conservative width. Also, a tornado cannot interrupt the ERCW supply to the station.

TVA regulation of the Tennessee River is such that drought will not jeopardize the UHS's capability required in Regulatory Position 1; this is historically confirmed by the data in UFSAR Subsection 2.4.11.3 showing that an ample water source has been and is available for cooling.

Historical information is provided in UFSAR Subsection 2.4.11.3 regarding minimum river flow during drought conditions.

The UHS is designed to withstand a 95 miles per hour basic wind or the most severe tornado, including the associated missile spectrum, without loss of the capability to provide an adequate supply of cooling water to the ERCW system.

The most severe combination of events considered credible to occur would be the simultaneous occurrence of the SSE, a loss-of-coolant accident (LOCA) in one unit and shutdown of the other, loss of offsite power, and loss of upstream and/or downstream dams either individually or concurrently. Under this extreme situation, the UHS retains the capability of Regulatory Position 1.

3. The Tennessee River is the common supply for all plant

cooling water requirements. Total interruption of this supply is incredible. Additionally, the integrity of the river's dams is not essential for safe reactor shutdown and cooldown.

4. The limiting conditions and surveillance requirements for the ERCW system are given in the SQN TSs. The limiting conditions for the plant's flood protection program are given in SQN Technical Requirements Manual Section 3/4.7.6.

The function of the UHS is described in Section 9.2.5 of the UFSAR as well as that of the ERCW found in Section 9.2.2.

This proposed change addresses future UHS river temperature and river level impacts due to ever changing UHS conditions, both operational and environmental. A UHS temperature of 87°F provides operating leeway and may avoid potential unnecessary UHS related unit shutdowns.

4.0 TECHNICAL ANALYSIS

NRC reviewed and approved the current UHS design basis analysis in 1988 (References 1 and 2), which kept the maximum 83°F UHS temperature limit for a river elevation at or above 670 feet and added the upper tier maximum UHS temperature limit of 84.5°F when river elevation is at or above 680 feet.

This proposed UHS change references and builds from the 1988 design basis discussion of Reference 1. TVA has provided additional information in regards to questions NRC has presented to SQN for past UHS licensing applications, as well as responses to questions received by other licensees requesting UHS temperature changes found to be relevant to this submittal.

4.1 License/Design Basis for Plant Analyses

The heat loads rejected to the UHS under postulated accident conditions are bounding for a normal plant cooldown. All of the stored and decay energy is released to the containment and ultimately rejected to the UHS for the worst-case accident scenario. Auxiliary feedwater; however, is used to remove a significant portion of the stored and decay energy for a normal plant cooldown. The heat load rejected to the UHS is not significantly increased until the residual heat removal (RHR) system is placed in service. To this end, the following discussion focuses on key plant analyses with respect to postulated accident conditions.

UFSAR Chapter 15 Analyses

Condition I and II events are not addressed because these conditions represent either normal operation or operational transients or faults of moderate frequency that, at worst, result in reactor shutdown with the plant being capable of returning to operation.

UFSAR analyses for Condition III and IV faults address transients and accidents that may cause core overcooling or overheating from reductions in shutdown margin, excessive or insufficient heat removal, or loss of or change in forced reactor coolant system (RCS) flow. Furthermore, only events which postulate radiological consequences are addressed. These postulated events addressed in the UFSAR are:

1. Major or minor secondary system ruptures (UFSAR Sections 15.3.2 and 15.4.2)

2. Complete loss of forced RCS flow or single reactor coolant pump locked rotor (UFSAR Sections 15.3.4 and 15.4.4)

3. Rod cluster withdrawal at full power (UFSAR Section 15.3.6)

4. Rod cluster control assembly ejection (UFSAR Section 15.4.6)

5. Steam generator tube rupture (UFSAR Section 15.4.3)

6. Fuel handling accident (UFSAR Section 15.4.5)

7. Waste gas decay tank rupture (UFSAR Section 15.3.5)

8. Inadvertent loading of a fuel assembly into an improper location (UFSAR Section 15.3.3)

9. Major and minor rupture of pipes containing reactor coolant up to and including double ended rupture of the largest pipe in the RCS LOCA (UFSAR Section 15.3.1 and 15.4.1)

The first four events listed above do not depend upon heat removal to the UHS for mitigation of the radiological consequences that occur early in the event. Because the major secondary system rupture does result in peak containment temperatures, an additional discussion is provided below. The consequences associated with a steam generator tube rupture (SGTR) are not dependent on UHS early within the event. Still, the last mitigative action item listed for the operator

in the UFSAR analysis for an SGTR is initiation of RHR for continued cooldown. The RHR heat exchanger does transfer its heat load to the UHS via the component cooling system (CCS). Therefore, cooldown of the RCS may be slightly extended; however, this does not represent any unacceptable consequences.

The consequences of the fuel handling accident and waste gas decay rupture are radiological, and are independent of the requirements for the UHS. The inadvertent loading of the fuel assembly into an improper location does not impact heat transfer to the UHS.

LOCAs are considered for a spectrum of pipe sizes and leakage rates. Small-break LOCA (SBLOCA) analyses results are less limiting than results from large-break LOCA (LBLOCA) events. Mitigation of the consequences for these events is independent of the UHS function in the early phase of an event. Because the UHS is relied upon later in the event, further discussion is provided in the following sections.

These events with exemption to the fuel handling accident, waste gas decay tank rupture, and inadvertent loading of fuel assemble have been analyzed with regards to SQN Unit 1 replacement steam generators (RSG). The analyses find that the parameters important to the consequences of the events are not adversely affected by the RSGs.

From the above discussion, the current licensing and design basis does not consider the UHS a mitigating factor for radiological consequences nor is it considered in phases of early heat removal. In this regard, no changes have been made, since the previous review (Reference 2), that alter this conclusion. Furthermore, the proposed increase of UHS temperature also poses no change in the conclusion.

Emergency Core Cooling System (ECCS) Analysis

The primary function of the ECCS is to cool the reactor core by removing stored and fission product decay heat from the reactor core so that fuel rod damage remains within prescribed limits. The requirements for ECCS evaluation models are described in 10 CFR 50 Appendix K within subsections (1) Sources of Heat During a LOCA; (2) Swelling and Rupture of the Cladding and Fuel Rod Thermal Parameters; (3) Blowdown Phenomena; and (4) Post-Blowdown Phenomena, Heat Removed by the ECCS. Additional cooling performance criteria are presented in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors."

The UFSAR analyses demonstrate compliance to the requirements of 10 CFR 50.46, showing the peak clad temperatures and core reflood/quenching occur many minutes before any heat removal from the core to the UHS begins. The peak cladding temperature occurs at approximately 100 seconds into the ECCS event (for a discharge coefficient CD = 1.0) and core reflood is completed around 600 seconds. Heat removal to the UHS does not occur until switchover of the RHR system from the refueling water storage tank (RWST) to the emergency sump at approximately 1650 seconds. The ECCS analysis has been revised since 1988. The most recent ECCS analysis revision was because of a conversion of fuel assembles design. In the spring of 1997, NRC approved the use of Framatome Mark-BW fuel design for use at SQN (Reference 3). Never the less, the parameters that demonstrate compliance to 10 CFR 50.46 are not affected by a UHS temperature, and the UFSAR ECCS analyses (UFSAR Sections 15.3.1 and 15.4.1) remains bounding. Furthermore, the proposed increase in river temperature will not substantially impact the long-term cooldown.

Containment Pressure Analysis - Short Term

The peak sub-compartment pressures given in the UFSAR are within the range of 7.3 to 15.7 pounds per square inch gauge (psig). In order to obtain the maximum pressure, the analyses in UFSAR Section 6.2 assume an instantaneous, double-ended guillotine rupture of the largest pipe within a given sub-compartment (i.e., lower containment). The resulting flow, because of the rapid depressurization of the pipe or system, produces the peak sub-compartment pressure of 15.7 psig within a second. The results indicate a RCS cold leg break produces this pressure.

No changes have been made to plant parameters that affect the short-term pressure analysis. Revision of the UHS temperature will have no impact, because heat removal by the UHS is not assumed in the UFSAR analyses for this phase of the accident.

Peak Containment Temperature

The peak containment temperature of 325.5°F results from a small main steam line break (MSLB) at 30 percent reactor thermal power and occurs early in the transient during blowdown from the faulted steam generator. During this period, increases in containment temperature and pressure are mitigated by the ice condenser, the containment spray (CS), and passive heat sinks. The CS system is supplied with constant temperature water from the RWST, which is assumed to be at the maximum TS temperature, without any heat removal by the CS heat exchanger. The mass and energy releases from the faulted steam generator to the containment are terminated by steam generator dryout after 30 minutes (UFSAR Table 6.2.1-37). The ice bed does not melt out until many hours after a MSLB and continues to remove energy from the containment. By the time switchover of the CS system to the emergency sump occurs and heat removal to the UHS begins, temperatures in containment have been decreased substantially because of heat removal from flow through the ice condenser caused by the air return fans. Therefore, peak containment temperature is not affected, because heat rejected to the UHS is not credited in the analyses during the time of the peak containment temperature.

Containment Pressure Analysis - Long Term

Peak containment pressure is a result of a large-break LOCA. During a large-break LOCA, heat transfer from containment to the UHS begins at approximately 1650 seconds via the coupled RHR and CCS heat exchangers. This occurs during re-circulation mode. The CS system heat exchanger begins to transfer its heat to the UHS at approximately 3000 seconds following switchover from the RWST to the emergency sump. Ice bed meltout occurs at approximately 3300 seconds. Following the ice bed meltout, containment pressure and temperature begins to increase noticeably, although containment temperature is limited by MSLB. In accordance with operating procedures, at 3600 seconds, the RHR pumps are aligned to RHR spray to increase the total containment heat removal capability. The containment pressure continues to increase until the heat removal to the UHS via the RHR and CS heat exchangers and through the containment shell exceeds heat addition to the containment atmosphere. UFSAR Section 6.2 list all of the major assumptions used for these analysis which in part include:

1. Minimum containment safeguards are employed in all calculations, e.g., one of two spray pumps and one of two spray heat exchangers; one of two RHR pumps and one of two RHR heat exchangers providing flow to the core; one of two safety injection pumps and one of two centrifugal charging pumps; and one of two air recirculation fans.

2. Initial ice weight in the ice condenser is the minimum value of 1.916×10^6 pounds (lbs) with no bypass and even distribution of steam flow into the ice beds.

3. Nitrogen from the accumulators in the amount of 3676 lbs is included in the calculations. Additionally, hydrogen from post-LOCA sources of approximately 94 lbs two hours after event initiation is included in the calculations.

4. ERCW temperature of 87°F is used on the CS heat exchanger and the CCS heat exchanger.

5. A containment air return fan is assumed to be effective approximately 10 minutes into the transient with flow rate of 40,000 cubic feet per minute from upper to lower containment.

6. Low heat transfer rates are used for structural heat sinks.

7. Assumed heat exchanger and flow rates are included in the following table. Heat exchangers are shell and tube, and are modeled as counterflow heat exchangers. Heat exchanger flow rates for the tube side (ts) include a minimum 10 percent tube plugging, and the shell side (ss) uses conservative reduced flow rates.

Heat Exchanger	**Flow Rates (gallons per minute)**	**Heat Transfer Coefficient 10^6 BTU/hr-°F**
RHR ts (@3600sec) ss (CCS)	 2337 5000	1.402 (counterflow)
CS ts (spray) ss (ERCW)	 4750 3400	2.953 (counterflow)
CCS ts (CCS) ss (ERCW)	 5000 4000	2.793 (counterflow)

The results of this analysis, performed with LOTIC-1 code, show that the maximum calculated peak containment pressure is 11.44 psig at approximately 7000 seconds, which is within SQN's containment vessel design pressure of 12.0 psig.

The above discussion provides the current containment pressure analysis results, which are bounding but different from those in 1988. In 1988, the peak containment pressure was determined to be 11.50 psig. Containment analyses were revised in 2001 to support a LAR for the correction of ice weight necessary to maintain containment integrity during a LOCA. This LAR also proposed, including the contribution to containment pressure of accident-generated hydrogen in the containment pressure calculations, increasing the effectiveness of the CS heat exchangers, increasing the UHS temperature, and decreasing the ERCW flow to the CS heat exchanger. NRC approved the LAR in September 2002 (Reference 4). As a result of the evaluations to support this LAR, peak containment analysis will remain unaffected by the proposed change.

Long-Term Containment Cooling

Long-term cooldown involved in recovery from a postulated accident scenario or normal cooldown with the RHR system will involve heat transfer to the UHS. Although the MSLB results in a higher initial containment temperature, the total amount of energy release from the LOCA event will result in a longer containment cooldown period. The LBLOCA analyses, as discussed above, results in maximum lower containment temperature of approximately 235°F within a minute. At the time RHR is realigned from RWST to the emergency sump, upper and lower containment temperatures are less than 200°F. The UFSAR (Section 6.2) provides temperature plots for nearly 28 hours following the start of the event. Upper and lower containment temperatures are within 40 degrees of each other at 28 hours, with the higher lower containment temperature approximately 165°F.

The long-term containment cooldown is affected by the postulated loss of downstream dam (LODD) assumed concurrent with the design basis LOCA as presented in the 1988 submittal. The postulated dam failure will result in a reduction on total flow capacity of the ERCW system of 7 percent. TVA continues to performe flow balance testing of the ERCW safety-related equipment and components served by ERCW. The testing is performed for two states of the UHS level. For equipment related to containment integrity such as CS heat exchangers and CCS

heat exchangers that are needed after ice meltout, those portions of the ERCW system are balanced to a system configuration with ERCW pumps operating at river elevation of 670 feet. The test method establishes that the ERCW pumps are compensated for minimum performance. For the remainder of the engineered safety feature (ESF) equipment tied to the ERCW system, that is needed long-term following an accident, the system is balanced to the long-term river elevation of 639 feet. In general, this method ensures containment integrity following ice meltout well before river elevations stabilize near 639 feet. However, the rate of the long-term heat removal is decreased and the containment temperature is marginally increased. The increased long-term containment temperature will not affect the qualified postaccident degradation equivalency calculations for 10 CFR 50.49 equipment. Equipment Qualification (EQ) Temperature Profiles are further discussed below. No other parameters are affected by the increased long-term containment temperatures.

The proposed increase in river temperature is considered to have a negligible affect on long-term containment cooldown. Additionally, sensitivity studies were performed with ERCW temperatures at 90°F with little effect on containment pressure (Reference 5). However some structures, systems, and components (SSCs) may experience shortcomings at ERCW temperature of 90°F.

Long-Term Cooling for Pipe Breaks Outside Containment

Long-term cooling for pipe breaks outside containment is not affected by the proposed increase to UHS temperature because the UHS increase is offset by an increase in the cooling water supply for ESF room coolers. Previous performance of the ESF room coolers were modeled assuming a maximum UHS temperature of 84.5°F. Those evaluations determine that the coolers will maintain their respective areas at or below the 100-day postaccident average EQ temperature.

The proposed increase in river temperature will not affect the 100-day postaccident average EQ temperatures. TVA has re-evaluated the performance of the coolers based on a maximum UHS temperature of 87°F. The evaluation credited the excess ERCW flow rates to ensure that the existing heat loads and discharge temperatures are maintained. As a result, there are no impacts against the EQ program. The evaluations determined new minimum ERCW flow rates to maintain average area temperature at or below the maximum acceptable values. The evaluations indicated that the 100-day average temperature profiles are neither increased nor exceeded.

EQ Temperature Profiles

The EQ temperature profile conservatively represents the worst possible containment accident temperatures versus time. The EQ profile is a composite profile constructed from a short-term MSLB profile and a long-term LOCA profile. As in Reference 2, the short-term MSLB temperatures are unaffected by the UHS temperature. Therefore, the short-term EQ profile still remains valid and bounding.

The long-term LOCA with LODD EQ profile is dependent on river elevation and water temperature. It is assumed that the river temperature remains at TS level for the entire cooldown period and the river is at its post-LODD elevation. As discussed in Reference 1, the long-term EQ temperature profile increases as result of the UHS temperature change and LODD event. This change could be as much as 4.5°F two days after the two events. The 4.5°F is accounted for by a 1.5°F increase in river temperature (heat exchange correlation between UHS temperature and containment temperature is one-to-one) and a 3°F increase from the reduction in ERCW flow to the CS and CCS when river elevation drops below 670 feet.

As mentioned in the previous section, TVA has eliminated the impact on the EQ program by using established margins in plant systems to maintain equipment within the current qualification limits. By this approach, the long-term containment temperature profile is not affected by the proposed increase to the UHS temperature. The LODD event no longer affects the long-term containment EQ profile, as a result of flow balancing equipment, necessary for long-term cooling, at a river elevation of 639 feet.

The most likely scenario is that the average long-term containment temperature during the 30 days following an accident will be less than currently assumed. This is based upon the historical ERCW temperature data where the long-term UHS temperature has not remained at an elevated temperature for more than 30 day at any one time. To this end, TVA has chosen 100 days for equipment qualification purposes, so the UHS/ERCW is available for that same duration to ensure that environmental qualifications are met. TVA realizes the

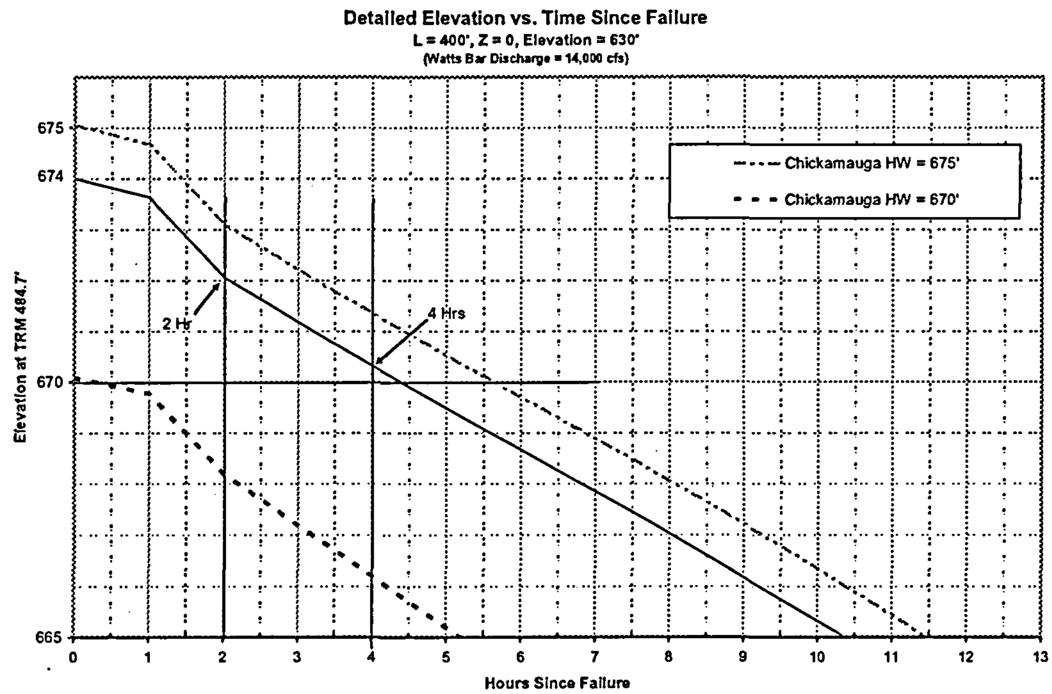
Tennessee River has a potential to operate at higher elevated temperatures than it has done in the past. However, the summer-time peak and duration temperature profile are not expected to be dramatically different. Therefore, future river changes would require re-evaluation for possible impacts on EQ program parameters, as necessary.

UHS Water Level Evaluation

By Reference 2, a two-tier UHS elevation requirement was employed to match the limiting UHS temperatures for the assumed accident analyses. TVA had found that the original ERCW design assumptions did not match the as-built plant conditions, and as a result, proposed an UHS elevation safety limit of 670 feet in addition to 1.5°F UHS temperature increase. TVA's proposal took credit for additional ERCW flow margins when the UHS elevation was above 670 feet to essential heat loads for normal operation and accident mitigation. However, NRC pointed out an inconsistency in the proposal and a compromise was reached that established a two-tier UHS LCO. The compromise concluded that an UHS temperature of 83°F at an UHS elevation of 670 feet was adequate, because the original design assumed the UHS elevation of 636 feet for 83°F. Furthermore, an UHS elevation of 680 feet is conservative at 84.5°F to support essential heat loads following the accident events (i.e., 10 hours of river elevation above 670 feet following a LODD event).

TVA has reviewed the recent ERCW flow balance and flow modeling (performance data). The review concludes that the components flow balanced at a river elevation of 670 feet are capable of supplying cooling water flow to support both short-term and long-term cooling needs following a LOCA and LODD. Also, a lower river level can supply the required minimum safety-related flows to the CCS and CS system heat exchangers without loss of net positive suction head; however, less operating margin exists which impacts operating fouling factors and requires removing equipment from service more frequently for flushing and biocide injections. TVA proposes a minimum river level of 674 feet for this UHS change request. An UHS elevation of 674 feet is conservative at 87°F, with regards to current analyzes and equipment performance data, to support essential heat loads following the accident events and provides at least 4 hours of river level above 670 feet following a LODD event (References 6 and 7). The below figure shows the river elevation change after the LODD. These

results are from Reference 8 with an overlay drawn-down curve for a river elevation starting point of 674 feet. A provision of 4 hours above the 670-foot system flow balance is adequate for compliance with the TS action statement, where the plant would be placed into Hot Standby (Mode 3) and in Cold Shutdown (Mode 5) within the following 30 hours, because lower river levels can supply the required minimum safety-related flow rates.



4.2 Additional License/Design Basis Evaluations

The following information on system, structures, component, and analyses were considered for impacts against the propose UHS temperature increase. This information was not present in References 1 and 2; however, is provided hereafter to support the current proposed change.

Appendix R Safe Shutdown Analysis

The Appendix R safe shutdown is adequately accomplished and remains within the 72-hour requirement for an assumed UHS temperature of 87°F. This was evaluated and submitted to NRC in Reference 9. NRC has approved this LAR by Reference 10. The submittal included WCAP-15726, "Sequoyah Units 1 and 2 1.3-Percent Power Uprate Program Licensing Report," which addressed the plant-specific evaluations of the higher power level on various plant systems, reactor trip system setpoint, core safety

limits, and accident analysis that could be affected by the higher power level.

Emergency Sump Temperature Limit

The containment sump functions to collect any water that is released inside the crane wall. Analysis results using Lotic-1 show that at the beginning of the LOCA event, containment sump temperature is approximately 190°F. This temperature begins to decline within the first 100 seconds and continues to decline until the RWST is realigned to the sump at approximately 1650 seconds and 160°F. At this time, a sharp temperature decline occurs followed by a similar increase until the energy input is overcome by energy rejected to the UHS via the RHR system. At approximately 28 hours following the event, the active sump temperature has declined to less than 140°F. The actual post-LOCA long-term inactive containment sump temperature is 160°F. Therefore, based on an assumed maximum of 87°F UHS temperature, sufficient margin exists to meet net positive suction head (NPSH) requirements for the RHR and CS pumps. Further discussion regarding the NPSH for ECCS pumps is provided next.

NPSH for ECCS Pumps

RHR and CS system (CSS) pump NPSH conditions are most limiting during the sump recirculation phase following a LBLOCA due to the temperature of the sump water and sump conditions. The safety injection pumps and centrifugal charging pumps are supplied by the RHR pump discharge and have sufficient NPSH (Reference 11). The pump configuration is described in UFSAR Section 6.3. As provided by the current analyses, with the assumption of 87°F UHS temperature, SQN has a minimum NPSH margin of 14.3 feet for the ECCS and CSS pumps with an unblocked sump strainer (Reference 12). Containment overpressure is not credited in establishing the NPSH margins. TVA is currently developing a new strainer and analysis for the containment sump in response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (PWR)." TVA has committed in Reference 12 to provide NRC with information regarding the new strainer, including NPSH margin. It is expected that NPSH will remain unchanged and improve margin due to the increased surface area.

ERCW pumps' NPSH are not challenged by the increase of the UHS temperature. The pumps remain functional, even with low river level following the LODD event.

The auxiliary feed water pumps (AFWPs) are supplied by the ERCW system following a switchover for the non-safety-related condensate storage tanks (CSTs). The CST provides a minimum amount of water, at an assumed temperature of 120°F, to reduce RCS temperatures to hot shutdown condition within 8 hours from a reactor trip. If during a plant transient the CST cannot supply the AFWPs, the ERCW will supply an adequate head of water at 87°F.

Emergency Diesel Generator (EDG) Cooling

The UHS supplies cooling water to each emergency diesel engine jacket water heat exchanger. An increase in UHS temperature has a potential to affect the EDG performance. TVA has developed a calculation to evaluate the EDG thermal performance and demonstrate the available cooling capacity of the engine jacket water heat exchangers at a river temperature of 87°F to ensure that the EDG neither overheats nor is its mechanical horsepower or electrical generating capacity de-rated. The evaluation considers normal and overload kilowatt electrical (kWe) loadings, tube plugging allowances, fouling factors, and minimum ERCW flows. Actual performance data is used to determine fouling factors and for comparison of heat exchanger performance results. The calculation also determines the minimum cooling water flow needed for a single EDG set to operate at various kWe loadings in order to recover from an extended Station Blackout (SBO) coincident with a loss of all ERCW events. In the cases considered, there is significant operating margin available with a UHS temperature of 87°F. Therefore, EDG do not require mechanical or electrical de-rating nor will they overheat due to an increase in UHS temperature.

Piping Impacts

The effects of a higher UHS temperature on all impacted piping systems have been considered and evaluated to ensure piping and piping support stresses remain within American Society of Mechanical Engineers (ASME) code allowable limits. Systems included the ERCW, CCS, auxiliary feedwater (AFW), and CSS, as well as other safety-related SSCs cooled by the ERCW. The RHR system is cooled by the CCS and does not receive ERCW water. The evaluation showed the CCS and ERCW do not exceed any piping design temperature limit. The ERCW system supplies secondary side plant equipment having no

safety-related functions and will be evaluated later for support of secondary side power generating SSC's.

Control Room Air Conditioning

The main control room (MCR) air conditioning chillers are supplied cooling water by the ERCW system. The most adverse conditions considered in the MCR habitability system design basis include LOCA events on either a calm hot day with the UHS at its highest temperature value with summer condition existing for the extent of the accident or a calm cold day with the UHS at its lowest temperature value with winter condition existing for the extent of the accident. Also considered are performance requirements capable of maintaining the environment in the MCR in accordance with Part 50 General Design Requirement (GDC) Criterion 19. It is determined that sufficient ERCW flow is available to the MCR chillers to account for the UHS peak temperature increase without altering chiller performance. Sufficient flow is maintained by eliminating non-safety-related station air compressor loads in the turbine building.

Spent Fuel Pool Cooling

Spent fuel pool (SFP) cooling is evaluated as part of the CCS heat load for all modes and accidents. The design limitations imposed upon the CCS require that in response to a LOCA, the SFP cooling load be transferred to the non-accident unit and is added to the hot standby loads. The CCS and ERCW adequately remove this heat at the new UHS temperature because excess ERCW flow is available to the non-accident unit at the CCS heat exchanger.

Measurement Equipment and Uncertainties

Uncertainties in the ERCW flow rates have been incorporated into the engineering analysis.

5.0 REGULATORY SAFETY ANALYSIS

The proposed technical specification (TS) change will revise the limiting condition for operation (LCO) for the ultimate heat sink (UHS). The proposed change will establish a single maximum temperature limit of 87 degree Fahrenheit (°F) and limiting minimum river elevation of 674 feet mean sea level. This compares to the current two stage river

temperature/elevation criteria of equal to or less than 84.5°F with a 680 feet above mean sea level river elevation or less than or equal to 83°F with river elevation at or above 670 feet mean sea level. This change will also delete a temporary footnote that allowed a limited time increase in the essential raw cooling water (ERCW) temperature requirements and correct a typographical error. These proposed changes are based on evaluations of the ERCW system and the UHS functions and maximum temperatures and minimum river elevations that will satisfy the associated safety functions. The proposed changes will minimize the likelihood of a required unit shutdown as a result of slightly higher river temperatures in the summer.

5.1 No Significant Hazards Consideration

TVA has evaluated whether or not a significant hazards consideration is involved with the proposed amendments by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change to increase the UHS maximum temperature and the minimum water level does not alter the function, design, or operating practices for plant systems or components. One exception is the elimination of non-safety-related station air compressor loads located in the turbine building. The UHS is utilized to remove heat loads from plant systems during normal and accident conditions. This function is not expected or postulated to result in the generation of any accident and continues to adequately satisfy the associated safety functions with the proposed changes. Therefore, the probability of an accident presently evaluated in the safety analyses will not be increased because the UHS function does not have the potential to be the source of an accident. The heat loads that the UHS is designed to accommodate have been evaluated for functionality with the higher temperature and elevation requirements. The result of these evaluations is that there is existing margins associated with the systems that utilize the UHS for normal and accident conditions. These margins are sufficient to accommodate the postulated normal and accident heat loads with the proposed

changes to the UHS. Since the safety functions of the UHS are maintained, the systems that ensure acceptable offsite dose consequences will continue to operate as designed. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The UHS function is not an initiator of any accident and only serves as a heat sink for normal and upset plant conditions. By allowing the proposed change in the UHS temperature and elevation requirements, only the parameters for UHS operation are changed while the safety functions of the UHS and systems that transfer the heat sink capability continue to be maintained. The UHS function provides accident mitigation capabilities and does not reflect the potential for accident generation. Therefore, the possibility for creating a new or different kind of accident is not created because the UHS is only utilized for heat removal functions that are not a potential source for accident generation. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change has been evaluated for systems that are needed to support accident mitigation functions as well as normal operational evolutions. Operational margins were found to exist in the systems that utilize the UHS capabilities such that these proposed changes will not result in the loss of any safety function necessary for normal or accident conditions. The ERCW system has excess flow margins that will accommodate the increased flows necessary for the proposed temperature increase. While operating margins have been reduced by the proposed changes, safety margins have been maintained as assumed in the accident analyses for postulated events. Additionally, the proposed changes do not require

the modification of component setpoints utilized for automatic mitigation of accident conditions or other equipment necessary for accident mitigation. Therefore, a significant reduction in the margin to safety is not created by this proposed change. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, TVA concludes that the proposed amendment(s) present no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include technical specifications (TSs) as part of the license. The Commission's regulatory requirements related to the content of the TS are contained in Title 10, Code of Federal Regulations (10 CFR), Section 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) LCO; (3) surveillance requirements; (4) design features; and (5) administrative controls. The water temperature and elevation requirements for the UHS are included in the TS 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 TS is required. Furthermore, the requirements of 10 CFR 50.59 necessitate that U.S. Nuclear Regulatory Commission (NRC) approve the TS changes before the TS changes are implemented. TVA's submittal meets the requirements of 10 CFR 50.59(c)(1)(i) and 10 CFR 50.90.

10 CFR Part 50 General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," requires that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. SQN structures, systems, and components (SSCs) important to safety are designed to either withstand the effects of natural phenomena

without loss of capability to perform their safety functions, or to fail in the safest condition. Those SSCs vital to the shutdown capability of the reactor are designed to withstand the maximum probable natural phenomenon expected at the site, determined from recorded data for the site vicinity, with appropriate margin to account for uncertainties in historical data.

GDC 5, "Sharing of Structures, Systems, and Components," provides the assurance that sharing important to safety SSCs among nuclear power units is prohibited unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units. The structures important to safety are the Auxiliary/Control Building, Diesel Generator Building, CCW pumping station, the ERCW pumping station, and a few miscellaneous structures. Shared safety-related systems in part include the ERCW, component cooling water, fire protection, fuel handling/storage and cooling, preferred and emergency electric power, and control and auxiliary building ventilation systems. In no case does the sharing inhibit the safe shutdown of one unit while the other unit is experiencing an accident. All shared systems are sized for all credible initial combinations of normal and accident states for the two units, with appropriate isolation to prevent an accident condition in one unit from carrying into the other.

GDC 44, "Cooling Water," requires a system to transfer heat from SSCs important to safety, to an UHS shall be provided and capable of performing its function under normal and accident conditions. Regulatory Guide 1.27 provides an acceptable approach for satisfying these criteria.

The guidance provides four criteria for an acceptable UHS function. These criteria include recommendations for sufficient cooling capability, integrity during postulated events, function availability and redundancy, and control by the TSs. TVA has evaluated the proposed changes and their impact on the UHS design based on the criteria in Regulatory Guide 1.27 and has determined that these recommendations continue to be met. The cooling ability of the UHS, with the proposed increase in temperature, has been evaluated and verified to satisfy the recommendations for heat removal considerations. The integrity and availability

recommendations have not been affected by the proposed changes as the features are not being altered physically. The proposed water elevation change has been evaluated and verified to continue to meet the recommendations for integrity and availability of the UHS. The TS provisions are proposed to be changed but continue to meet the recommendation to provide actions in the event the function of the UHS cannot be satisfied. Therefore, operation of the SQN units with the proposed TS changes will not result in a deviation from the recommendations of Regulatory Guide 1.27.

GDC 45, "Inspection of Cooling Water System," requires that cooling water system be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system. SQN's component cooling water system and ERCW system components can be visually inspected on a periodic basis. Those components that cannot be inspected with the unit in operation can be inspected during shutdown. The CCS and ERCW pumps are arranged such that any pump may be isolated for inspection and maintenance.

GDC 46, "Testing of Cooling Water System," specifies that cooling water systems shall be designed to permit appropriate periodic pressure and functional testing to assure integrity, operability, and performance for operation during normal and postulated events. The CCS and ERCW systems are normally pressurized during plant operations. The systems/components are subject to tests per the ASME Section XI InService Inspection/Testing programs. The emergency functions of the systems are periodically tested out to the final actuated device.

Technical Specification Task Force (TSTF)-330 Revision 3 to the improved TSs was approved in October 2000. The TSTF provides a methodology that permits averaging the UHS temperature. The TSTF specifies four conditions that form the basis for acceptance of the temperature averaging format. Licensees adopting this change to the standard TSs must confirm that these four conditions are satisfied.

TVA has considered the provisions in TSTF-330 as part of this TS change but has concluded that there is no benefit in pursuing these provisions. This conclusion is based on:

1. The current and historical TVA UHS analysis has always provided a single upper UHS temperature limit.
2. There is no intermediate UHS temperature limit (as proposed by the TSTF).
3. The four criteria (required by the TSTF) have not been specifically addressed in this submittal but are generically addressed in part by the existing design and SBO commitments.
4. A temperature averaging scheme (Reference 2) has been part of the SQN licensing basis and has been applied since 1988 as delineated in the 1988 SER.
5. Detailed UHS analyses demonstrate that ERCW cooling water flow margins are available to offset the proposed 2.5°F UHS temperature increase.

In conclusion, based on the considerations discussed above, (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.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 50.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the proposed amendment.

7.0 REFERENCES

1. TVA letter to NRC dated June 20, 1988, "Sequoyah Nuclear Plant (SQN) Units 1 and 2 - Technical Specification (TS) Change 88-21"

2. NRC letter to TVA dated August 15, 1988, "River Water Level and Temperature (TAC R00375, R00376) (TS 88-21) Sequoyah Nuclear Plant, Units 1 and 2"

3. NRC letter to TVA dated April 21, 1997, Issuance of Technical Specification Amendments for the Sequoyah Nuclear Plant, Units 1 and 2 (TAC Nos. M95144 and M95145)(TS 96-01)"

4. NRC letter to TVA dated September 30, 2002, "Sequoyah Nuclear Plant, Units 1 and 2 - Issuance of Amendments Regarding Ice Condenser Basket Weight (TAC Nos. MB3682 and MB3683)(TS 01-04)"

5. Westinghouse Electric Company letter to Dennis Lundy, dated May 10, 2001, "LOCA Containment Integrity - Effect of a Failure in the Control Air System Header and Increased ERCW Temperatures on Containment Peak Pressure"

6. Letter to Janet C. Harris from Richard T. Purcell dated May 24, 2003, "Sequoyah Nuclear Plant - Ultimate Heat Sink - Technical Specification 3.7.5"
Rims No. B25030524001

7. Email from Stephens J Adams to Penny Walker date June 22, 2006, with attachment, "TVA Memorandum from Williams, Godwin, Jr. to Elliot Reed A. dated March 4, 1969, Water Control Memorandum #930"

8. "Updated Predictions of Chickamauga Reservoir Recession Resulting from Postulated failure of the South Embankment at Chickamauga Dam," June 2004, Tennessee Valley Authority- River System Operation and Environment, River Operations, and River Scheduling

9. TVA letter to NRC dated November 15, 2001, "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Technical Specification (TS) Change No. 01-08, 'Increase Maximum Allowed Reactor Power Level to 3455 Mega-Watt Themal (MWt)'"

10. NRC letter to TVA dated April 30, 2002, "Sequoyah Nuclear Plant, Units 1 and 2 Issuance of Amendments RE: 1.3-Percent Power Uprate (TAC Nos. MB3435, and MB3436)(TSC No.01-08)"

11. Sequoyah Nuclear Plant - Safety Injection System, Design Criteria, No. SQN-DC-V-27.3

12. TVA letter to NRC dated September 1, 2005, "Sequoyah Nuclear Plant (SQN) Units 1 and 2 - Nuclear Regulatory Commission (NRC) Generic Letter (GL) 2004-02, Potential Impact Of Debris Blockage On Emergency Recirculation During Design Basis Accidents At Pressurized-Water Reactors (PWR) - Second Response (TAC Nos. MC4717 , MC4718)"

ENCLOSURE 2

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

Response to General Request for Additional Information

NRC Question	SQN Response
1) Identify any equipment/components where the equipment qualification (EQ) temperatures were exceeded by the revised EQ temperature profile resulting from the proposed increase in ultimate heat sink (UHS) temperature. Discuss how the temperature increase status of EQ was dispositioned.	1) No EQ temperatures were changed or increased as a result of the SQN proposed 2.5 degree Fahrenheit (°F) UHS temperature increase. The TVA methodology maintains the existing design basis EQ limits and profiles. Under this boundary condition, the various essential raw cooling water (ERCW) heat exchangers and coolers are required to remove the same amount of heat with a slightly lower cold side temperature difference. This was accomplished by crediting the respective excess ERCW (cold side) mass flow in the thermal balance equations. This resulted in new ERCW minimum design flows.
2) Was heat exchanger performance data obtained from the Generic Letter 89-13 program utilized in any of the heat transfer calculations supporting this TS change submittal?	2) SQN performs visual inspections in lieu of performance testing for plant heat exchangers included in the Generic Letter (GL) 89-13 Program, with exception to the component cooling heat exchangers which undergo performance testing.
3) Confirm that any changes in assumptions due to the proposed increase in the UHS Temperature limit have been reflected in the appropriate plant procedures and test acceptance criteria.	3) All changes, as approved by the NRC, will be incorporated into site documents in accordance with Standard Programs and Processes Procedure 9.3, "Plant Modifications and Engineering Change Control."

NRC Question	SQN Response
4) For the 10 CFR 50 Appendix R safe shutdown analysis, provide the actual number of hours required to achieve cold shutdown under the most limiting conditions. Include discussion of the sequence of events and the recovery actions credited in making this determination.	4) The 10 CFR 50 Appendix R safe shutdown time is within the 72-hour requirement and is unchanged. The latest evaluation was part of the 1.3-Percent Power Uprate, which was presented under Westinghouse WCAP-15725. This evaluation assumed 87°F ERCW.
5) Explain how equipment qualification is met for the main steam line break (MSLB) when temperature in containment reaches above 300°F.	5) This is unchanged. System components are environmentally qualified per the requirements of 10 CFR 50.49 to function during the conditions resulting from a design basis accident (DBA) loss-of-coolant accident (LOCA) or MSLB. These conditions, as well as the normal and abnormal operating conditions, are defined in appropriate EQ design criteria. During accident conditions, the system is capable of operating continuously with containment temperatures ranging up to 327°F for the first hour, and at 250°F and 100 percent relative humidity for 100 days, with a total radiation dose of up to 108 Rads. Refer to Updated Final Safety Analysis Report (UFSAR) Sections 3.11.2 and 6.6.2, and Environmental Design Criteria SQN-DC-V-21.0.

NRC Question	SQN Response
6) Impact due to seismic event?	6) Design basis (seismic event) is unchanged. The impact and consequences to a loss of down stream dam has been re-evaluated and reanalyzed. The original earthen fill dam breach size was determined to be 1000 foot wide with sharp vertical sides. The current evaluation is 400 foot wide with sharp vertical sides based on published research methods for earthen dam failures. The overall impact and consequences remain the same; however the reservoir drawdown duration is extended.

ENCLOSURE 3

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

Proposed Technical Specification Changes (mark-up)

I. AFFECTED PAGE LIST

Unit 1

3/4 7-14

Unit 2

3/4 7-14

II. MARKED PAGES

See attached.

3/4.7.5 ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.5 The ultimate heat sink shall be OPERABLE with: 674

a. A minimum water level at or above elevation ~~670~~ feet mean sea level USGS datum, and 87

b. An average ERCW supply header water temperature of less than ~~or~~ equal to ~~83~~°F~~, and~~ .

~~c. When the water level is above 680 feet mean sea level USGS datum, the average ERCW supply header water temperature may be less than or equal to 84.5°F.*~~

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the requirements of the above specification not satisfied, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN ~~within~~ the following 30 hours.

SURVEILLANCE REQUIRMENTS E

4.7.5.1 The ultimate heat sink shall be determined OPERABLE at least once per 24 hours by verifying the average ERCW supply header temperature and water level to be within their limits.

~~*87°F is allowed until September 30, 1995.~~

3/4.7.5 ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.5 The ultimate heat sink shall be OPERABLE with: 674

a. A minimum water level at or above elevation ~~670~~ feet mean sea level USGS datum, and 87

b. An average ERCW supply header water temperature of less than ~~or~~ equal to ~~83°F, and~~.

~~c. When the water level is above 680 feet mean sea level USGS datum, the average ERCW supply header water temperature may be less than or equal to 84.5°F.*~~

APPLICABILITY: Modes 1, 2, 3 and 4.

ACTION:

With the requirements of the above specification not satisfied, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS E

4.7.5.1 The ultimate heat sink shall be determined OPERABLE at least once per 24 hours by verifying the average ERCW supply header temperature and water level to be within their limits.

~~*87°F is allowed until September 30, 1995~~

ENCLOSURE 4

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

Changes to Technical Specifications Bases Pages

I. AFFECTED PAGE LIST

Unit 1

B 3/4 7-4

Unit 2

B 3/4 7-4

II. MARKED PAGES

See attached.

Insert

~~3/4.7.5 ULTIMATE HEAT SINK (UHS)~~

~~The limitations on UHS water level and temperature ensure that sufficient cooling capacity is available to either 1) provide normal cooldown of the facility, or 2) to mitigate the effects of accident conditions within acceptable limits.~~

~~The limitations on the maximum temperature are based on providing a 30 day cooling water supply to safety related equipment without exceeding their design basis temperature and is consistent with the recommendations of Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Plants", March 1974.~~

~~The limitations on minimum water level are based on providing sufficient flow to the ERCW serviced heat loads after a postulated event assuming a time-dependent drawdown of reservoir level. Flow to the major transient heat loads (CCS and CS heat exchangers) is balanced assuming a reservoir level of elevation 670. The time-independent heat loads (ESF room coolers, etc.) are balanced assuming a reservoir level of elevation 639.~~

3/4.7.6 FLOOD PROTECTION

This specification is deleted.

3/4.7.7 CONTROL ROOM EMERGENCY VENTILATION SYSTEM

The OPERABILITY of the control room ventilation system ensures that the control room will remain habitable for operations personnel during and following all credible accident conditions. The OPERABILITY of this system in conjunction with control room design provisions is based on limiting the radiation exposure to personnel occupying the control room to 5 rem or less whole body, or its equivalent. This limitation is consistent with the requirements of General Design Criteria 19 of Appendix "A", 10 CFR 50. ANSI N510-1975 will be used as a procedural guide for surveillance testing.

3/4.7.5 ULTIMATE HEAT SINK

Insert

The limitations on the ultimate heat sink water level and temperature ensure that sufficient cooling capacity is available to either 1) provide normal cooldown of the facility, or 2) to mitigate the effects of accident conditions within acceptable limits.

The limitation on maximum temperature is based on providing a 30 day cooling water supply to safety related equipment without exceeding their design basis temperature and is consistent with the recommendations of Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Plants", March 1974.

The limitations on minimum water level are based on providing sufficient flow to the ERCW serviced heat loads after a postulated event assuming a time dependent drawdown of reservoir level. Flow to the major transient heat loads (CCS and CS heat exchangers) is balanced assuming a reservoir level of el. 670. The time independent heat loads (ESF room coolers, etc.) are balanced assuming a reservoir level of el. 639.

3/4.7.6 FLOOD PROTECTION

This specification is deleted.

3/4.7.7 CONTROL ROOM EMERGENCY VENTILATION SYSTEM

The OPERABILITY of the control room ventilation system ensures that the control room will remain habitable for operations personnel during and following all credible accident conditions. The OPERABILITY of this system in conjunction with control room design provisions is based on limiting the radiation exposure to personnel occupying the control room to 5 rem or less whole body, or its equivalent. This limitation is consistent with the requirements of General Design Criteria 19 of Appendix "A", 10 CFR 50. ANSI N510-1975 will be used as a procedural guide for surveillance testing.

B 3/4.7 Plant Systems

B 3/4.7.5 Ultimate Heat Sink (UHS)

BASES

BACKGROUND

The UHS provides a heat sink for processing and operating heat from safety-related components during a transient or accident, as well as during normal operation and shutdown. This is done by utilizing the Essential Raw Cooling Water (ERCW) System and the Component Cooling System (CCS). The UHS has been defined as that complex of water sources, including necessary retaining structures (e.g., a river with its dam), and the canals or conduits connecting the sources with, but not including, the cooling water system intake structures as discussed in the UFSAR, Section 9.2.5 (Ref. 1).

The two principal functions of the UHS are the dissipation of residual heat after reactor shutdown, and dissipation of residual heat after an accident. Chickamauga Lake (Tennessee River system) qualifies as a single source. The basic performance requirements are that a 30-day supply of water be available, and that the design basis temperatures of safety-related equipment not be exceeded.

APPLICABLE SAFETY ANALYSES

The UHS is the sink for heat removed from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation.

SQN uses the UHS as the normal heat sink for condenser cooling via the Circulating Water System so, unit operation at full power is its maximum heat load. Its maximum post accident heat load occurs 20 minutes after a design basis loss-of-coolant accident (LOCA). Near this time, the unit switches from injection to recirculation and the containment cooling systems and RHR are required to remove the core decay heat. The operating limits are based on conservative heat transfer analyses for the worst-case LOCA. Reference 1 provides the details of the assumptions used in the analysis, which include worst-expected meteorological conditions, conservative uncertainties when calculating decay heat, and worst-case single active failure (e.g., single failure of a manmade structure). The UHS is designed in accordance with Regulatory Guide 1.27 (Ref. 2), which requires a 30-day supply of cooling water in the UHS. The UHS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The UHS is required to be OPERABLE and is considered OPERABLE if it contains a sufficient volume of water at or below the maximum temperature that would allow the ERCW to operate for at least 30 days following the design basis LOCA without the loss of net positive suction

SURVEILLANCE REQUIREMENTS (continued)

exists at the initiation of a LBLOCA concurrent with loss of downstream dam to meet the short-term recovery. NPSH of the ERCW pumps are not challenged with loss of downstream dam. The 24-hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR verifies that the average water temperature of the UHS is ≤ 87°F and that the UHS water level is ≥ 674 feet mean sea level.

REFERENCES

1. UFSAR, Section 9.2.5, Ultimate Heat Sink

2. Regulatory Guide 1.27 R0, "Ultimate Heat Sink For Nuclear Power Plants," 1972

3. NUREG/CR-3659, "A Mathematical Model For Assessing The Uncertainties Of Instrumentation Measurements For Power And Flow Of PWR Reactors," February 1985.