UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

August 15, 1988

Docket Nos. 50-327/328

Mr. S. A. White
Senior Vice President, Nuclear Power
Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Mr. White:

SUBJECT: RIVER WATER LEVEL AND TEMPERATURE (TAC R00375, R00376) (TS 88-21)
SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

The Commission has issued the enclosed Amendment No. 79 to Facility Operating License No. DPR-77 and Amendment No. 70 to Facility Operating License No. DPR-79 for the Sequoyah Nuclear Plant, Units 1 and 2, respectively. These amendments are in response to your application dated June 20, 1988.

These amendments change Sequoyah (SQN) Units 1 and 2 Technical Specifications (TS). The changes revise the limiting condition for operation (LCO) 3/4.7.5, Ultimate Heat Sink, to (1) increase the maximum allowable ultimate heat sink (UHS) temperature from 83 degrees Fahrenheit (°F) to 84.5°F and (2) add a mimimum reservoir water-level requirement. The minimum river water elevation is 670 ft. msl. The UHS temperature is 83°F. When the river water elevation is above 680 ft., the UHS water temperature may be 84.5°F. This is a small change from your above application and does not change the substance of the notice of consideration of an amendment which the staff issued in the Federal Register on July 1, 1988 on your above application for TS 88-21. The Tennessee Valley Authority (TVA) agreed to this small change to the above application in a telephone conference call on August 11, 1988.

In addition, the wording of LCO 3.7.5 and surveillance requirement (SR) 4.7.5 are modified to clearly specify that the UHS temperature limit applies to the Essential Raw Cooling Water supply header water temperature, the action statement and surveillance requirements for LCO 3.7.5 are modified to be consistent with the addition of an LCO for the reservoir water level, and the Bases for TS 3.7.5 are modified to reflect these changes.

DF01
1/1

We also have a concern about ERCW availability which is not related to the proposed Technical Specification change. Our concern is about erosion and deposition of sediment as a result of high water velocities around and upstream of the ERCW intake structure as a result of the failure of the Chickamauga Dam. It is our understanding that these issues were evaluated by TVA but never reviewed by NRC. In order to make an independent evaluation we request a copy of the topographical cross sections plotted for the unsteady flow analysis, time varying water velocities in the cross sections near the ERCW, geologic cross sections through the reservoir, and the sediment scour and deposition calculations.

The reporting and/or recordkeeping requirements contained in this letter affect fewer then ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's Bi-Weekly Federal Register Notice.

Sincerely,

Original Signed by

Suzanne Black, Assistant Director
for Projects
TVA Projects Division
Office of Special Projects

Enclosures:
1. Amendment No. 79 to License No. DPR-77
2. Amendment No. 70 to License No. DPR-79
3. Safety Evaluation

cc w/enclosures:
See next page

Distribution

Docket File	F. Miraglia
NRC PDR	E. Jordan
Local PDR	D. Hagan
Projects Reading	T. Barnhart(4)
J. Partlow	W. Jones
S. Richardson	E. Butcher
S. Black	ACRS(10)
M. Simms	GPA/PA
J. Donohew	GPA/CA
J. Rutberg	ARM/LFMB
B. D. Liaw	
F. McCoy	SQN Rdg. File
Wanda Jones	

OSP:TVA/LA	OSP:TVA/PM	OSP:TVA/PM	OSP:TVA/BC	TVA:AD/TP
MSimms	JDonohew	RWescott	RPierson	BDLiaw
8/12/88	8/12/88	8/12/88	8/12/88	8/12/88
OGC	TVA:AD/P	RYW		
SHLewis	SBlack			
8/12/88	8/15/88			

cc:
General Counsel
Tennessee Valley Authority
400 West Summit Hill Drive
E11 B33
Knoxville, Tennessee 37902

Mr. R. L. Gridley
Tennessee Valley Authority
5N 157B Lookout Place
Chattanooga, Tennessee 37402-2801

Mr. John T. LaPoint
Tennessee Valley Authority
Sequoyah Nuclear Plant
P.O. Box 2000
Soddy Daisy, Tennessee 37379

Mr. M. Ray
Tennessee Valley Authority
Sequoyah Nuclear Plant
P.O. Box 2000
Soddy Daisy, Tennessee 37379

Mr. D. L. Williams
Tennessee Valley Authority
400 West Summit Hill Drive
W10 B85
Knoxville, Tennessee 37902

County Judge
Hamilton County Courthouse
Chattanooga, Tennessee 37402

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Resident Inspector/Sequoyah NP
c/o U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

Mr. Michael H. Mobley, Director
Division of Radiolohical Health
T.E.R.R.A. Building, 6th Floor
150 9th Avenue North
Nashville, Tennessee 37219-5404

Dr. Henry Myers, Science Advisor
Committee on Interior
and Insular Affairs
U.S. House of Representatives
Washington, D.C. 20515

Tennessee Valley Authority
Rockville Office
11921 Rockville Pike
Suite 402
Rockville, Maryland 20852

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-327

SEQUOYAH NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 79
License No. DPR-77

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Tennessee Valley Authority (the licensee) dated June 20, 1988, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-77 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 79 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Suzanne Black

Suzanne Black, Assistant Director
for Projects
TVA Projects Division
Office of Special Projects

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 15, 1988

ATTACHMENT TO LICENSE AMENDMENT NO. 79

FACILITY OPERATING LICENSE NO. DPR-77

DOCKET NO. 50-327

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf pages* are provided to maintain document completeness.

REMOVE	INSERT
3/4 7-13	3/4 7-13*
3/4 7-14	3/4 7-14
B 3/4 7-3	B 3/4 7-3*
B 3/4 7-4	B 3/4 7-4

3/4.7.4 ESSENTIAL RAW COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.4 At least two independent essential raw cooling water (ERCW) loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one ERCW loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.4 At least two ERCW loops shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. At least once per 18 months, during shutdown, by:

   Verifying that each automatic valve servicing safety related equipment actuates to its correct position on a Safety Injection test signal.

   2. Verifying that each ERCW pump starts automatically on a Safety Injection test signal.

3/4.7.5 ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.5 The ultimate heat sink shall be OPERABLE with:

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

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

4.7.5.1 The ultimate heat sink will 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.

3/4.7.1.4 ACTIVITY

The limitations on secondary system specific activity ensure that the resultant off-site radiation dose will be limited to a small fraction of 10 CFR Part 100 limits in the event of a steam line rupture. This dose also includes the effects of a coincident 1.0 GPM primary to secondary tube leak in the steam generator of the affected steam line. These values are consistent with the assumptions used in the accident analyses.

3/4.7.1.5 MAIN STEAM LINE ISOLATION VALVES

The OPERABILITY of the main steam line isolation valves ensures that no more than one steam generator will blowdown in the event of a steam line rupture. This restriction is required to 1) minimize the positive reactivity effects of the Reactor Coolant System cooldown associated with the blowdown, and 2) limit the pressure rise within containment in the event the steam line rupture occurs within containment. The OPERABILITY of the main steam isolation valves within the closure times of the surveillance requirements are consistent with the assumptions used in the accident analyses.

3/4.7.2 STEAM GENERATOR PRESSURE/TEMPERATURE LIMITATION

The limitation on steam generator pressure and temperature ensures that the pressure induced stresses in the steam generators do not exceed the maximum allowable fracture toughness stress limits. The limitations of 70°F and 200 psig are based on a steam generator RT_{NDT} of 25°F and are sufficient to prevent brittle fracture.

3/4.7.3 COMPONENT COOLING WATER SYSTEM

The OPERABILITY of the component cooling water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

3/4.7.4 ESSENTIAL RAW COOLING WATER SYSTEM

The OPERABILITY of the essential raw cooling water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident conditions within acceptable limits.

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 636.

3/4.7.6 FLOOD PROTECTION

The requirements for flood protection ensures that facility protective actions will be taken and operation will be terminated in the event of flood conditions. A Stage 1 flood warning is issued when the water in the forebay is predicted to exceed 697 feet Mean Sea Level USGS datum during October 1 through April 15, or 703 Feet Mean Sea Level USGS datum during April 15 through September 30. A Stage II flood warning is issued when the water in the forebay is predicted to exceed 703 feet Mean Sea Level USGS datum. A maximum allowed water level of 703 feet Mean Sea Level USGS datum provides sufficient margin to ensure waves due to high winds cannot disrupt the flood mode preparation. A Stage I or Stage II flood warning requires the implementation of procedures which include plant shutdown. Further, in the event of a loss of communications simultaneous with a critical combination flood, headwaters, and/or seismically induced dam failure the plant will be shutdown and flood protection measures implemented.

3/4.7.7 CONTROL ROOM EMERGENCY VENTILATION SYSTEM

The OPERABILITY of the control room ventilation system ensures that 1) the ambient air temperature does not exceed the allowable temperature for continuous duty rating for the equipment and instrumentation cooled by this system and 2) 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.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-328

SEQUOYAH NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 70
License No. DPR-79

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Tennessee Valley Authority (the licensee) dated June 20, 1988, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-79 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 70 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Suzanne Black

Suzanne Black, Assistant Director
for Projects
TVA Projects Division
Office of Special Projects

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 15, 1988

ATTACHMENT TO LICENSE AMENDMENT NO. 70

FACILITY OPERATING LICENSE NO. DPR-79

DOCKET NO. 50-328

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Overleaf pages* are provided to maintain document completeness.

REMOVE	INSERT
3/4 7-13	3/4 7-13*
3/4 7-14	3/4 7-14
B 3/4 7-3	B 3/4 7-3*
B 3/4 7-4	B 3/4 7-4

PLANT SYSTEMS

3/4.7.4 ESSENTIAL RAW COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.4 At least two independent essential raw cooling water (ERCW) loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one ERCW loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.4 At least two ERCW loops shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. At least once per 18 months, during shutdown, by:

    1. Verifying that each automatic valve servicing safety related equipment actuates to its correct position on a Safety Injection test signal.

    2. Verifying that each ERCW pump starts automatically on a Safety Injection test signal.

3/4.7.5 ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.5 The ultimate heat sink shall be OPERABLE with:

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

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

4.7.5.1 The ultimate heat sink will 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.

3/4.7.1.5 MAIN STEAM LINE ISOLATION VALVES

The OPERABILITY of the main steam line isolation valves ensures that no more than one steam generator will blowdown in the event of a steam line rupture. This restriction is required to 1) minimize the positive reactivity effects of the Reactor Coolant System cooldown associated with the blowdown, and 2) limit the pressure rise within containment in the event the steam line rupture occurs within containment. The OPERABILITY of the main steam isolation valves within the closure times of the surveillance requirements are consistent with the assumptions used in the accident analyses.

3/4.7.2 STEAM GENERATOR PRESSURE/TEMPERATURE LIMITATION

The limitation on steam generator pressure and temperature ensures that the pressure induced stresses in the steam generators do not exceed the maximum allowable fracture toughness stress limits. The limitations of 70°F and 200 psig are based on a steam generator RT_{NDT} of 25°F and are sufficient to prevent brittle fracture.

3/4.7.3 COMPONENT COOLING WATER SYSTEM

The OPERABILITY of the component cooling water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

3/4.7.4 ESSENTIAL RAW COOLING WATER SYSTEM

The OPERABILITY of the essential raw cooling water system ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident conditions within acceptable limits.

Basis Change

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 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 636.

3/4.7.6 FLOOD PROTECTION

The requirements for flood protection ensures that facility protective actions will be taken and operation will be terminated in the event of flood conditions. A Stage 1 flood warning is issued when the water in the forebay is predicted to exceed 697 feet Mean Sea Level USGS datum during October 1 through April 15, or 703 Feet Mean Sea Level USGS datum during April 15 through September 30. A Stage II flood warning is issued when the water in the forebay is predicted to exceed 703 feet Mean Sea Level USGS datum. A maximum allowed water level of 703 feet Mean Sea Level USGS datum provides sufficient margin to ensure waves due to high winds cannot disrupt the flood mode preparation. A Stage I or Stage II flood warning requires the implementation of procedures which include plant shutdown. Further, in the event of a loss of communications simultaneous with a critical combination flood, headwaters, and/or seismically induced dam failure the plant will be shutdown and flood protection measures implemented.

3/4.7.7 CONTROL ROOM EMERGENCY VENTILATION SYSTEM

The OPERABILITY of the control room ventilation system ensures that 1) the ambient air temperature does not exceed the allowable temperature for continuous duty rating for the equipment and instrumentation cooled by this system and 2) 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.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

SUPPORTING AMENDMENT NO. 79 TO FACILITY OPERATING LICENSE NO. DPR-77

AND AMENDMENT NO. 70 TO FACILITY OPERATING LICENSE NO. DPR-79

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

By letter dated June 20, 1988, the Tennessee Valley Authority (TVA) has requested a change to the Sequoyah Units 1 and 2 (SQN) Technical Specification 3/4.7.5 regarding the Ultimate Heat Sink (UHS) reservoir water level and temperature limits. The present limiting condition for operation (LCO) is 83°F as measured in the Essential Raw Cooling Water (ERCW) supply header. TVA proposes to increase the LCO to 84.5°F. TVA also proposed an LCO on river water level of 670 ft. msl.

In addition, TVA proposed that the wording of LCO 3.7.5 and surveillance requirement (SR) 4.7.5 be modified to clearly specify that the UHS temperature limit applies to the ERCW supply header water temperature, the action statement and surveillance requirements (SR) for LCO 3.7.5 be modified to be consistent with the proposed addition of the LCO for the reservoir water level, and the bases for TS 3.7.5 be modified to reflect these changes.

The reason for this change is that the reservoir water temperatures at the plant above Chickamauga Dam are running considerably higher than normal because of extended drought conditions. It is TVA's position that the proposed 1.5°F change in the LCO will allow continued plant operation throughout the summer without affecting the ability to safely shut down the plant under design basis conditions.

This amendment also deletes the current SR 4.7.5.2 for Unit 1 to resolve a clerical error by the staff, as described below. SR 4.7.5.2 was removed from the Unit 1 TS in Amendment 8 dated July 15, 1981. The requirement was removed because the ERCW pumping station eliminated the plant's dependence upon the intake forebay and SR 4.7.5.2 was no longer needed. The Safety Evaluation for Amendment 8 stated that Section 9.2.2 of NUREG-0011 which licensed Sequoyah acknowledged that the ERCW pumping station was designed and located to eliminate the dependence upon the intake forebay. Therefore, the surveillance on components of the makeup water system and the forebay portable makeup pump and drives were not needed. TVA stated in a telephone conference call on August 11, 1988 that this equipment no longer exists at the plant.

In Amendment 12 dated March 25, 1982, SR 4.7.5.2 was inadvertently reissued by the staff. However, because the ERCW eliminated the plant's dependence upon the intake forebay, the equipment no longer exists and the surveillance requirement was inavertently reissued, the surveillance requirements should be deleted from the TS. TVA stated in the telephone call on August 11, 1988 that it had requested by letter dated July 22, 1982 that the Staff reissue the TS 3/4.7.5 which was issued in Amendment 8. The staff has researched the amendments issued on TS 3/4.7.5 and concludes that the valid TS 3/4.7.5 is that one issued in Amendment 8. Based on the above, the staff concludes that SR 4.7.5.2 was inadvertently reissued in Amendment 12 after being deleted in Amendment 8. Therefore, SR 4.7.5.2 will be deleted from the Unit 1 TS.

2.0 EVALUATION

2.1 Background

The UHS for Sequoyah is the Tennessee River Reservoir above the Chickamauga Dam. The Chickamauga Dam is not considered to be capable of serving the plant during either the design basis flood or the design basis earthquake. Hence, TVA has considered the declining water level of the UHS after failure of Chickamauga Dam along with the transient heat load conditions of either unit after an accident.

The current 83°F water temperature limit was developed during the initial licensing of Sequoyah. It represented a maximum river water temperature measured over a 25-year period, with all other maximum temperatures measured at below 80°F. The LCO of 83°F was coupled with the assumption that, in the event of downstream dam failure, the water level in the reservoir would drop instantaneously from an operating level of over 675 ft. msl to a minimum level of 636 ft. msl. The immediate reduction of available Net Positive Suction Head (NPSH) on the pumps would mean an immediate reduction in available flow from the ERCW pumps.

The ERCW is the system between the UHS for Sequoyah and the safety-grade cooling systems for the plant. The ERCW is described in Section 9.2.2 of the SQN Final Safety Analysis Report (FSAR). The system services the essential plant heat loads that exist for both normal plant operation and for accident mitigation.

2.2 UHS Water Temperature Evaluation

TVA stated in its application that the original calculated ERCW flows were for a water level of elevation (el.) 636 ft. mean sea level (msl) and were based on design assumptions that did not reflect as-built plant conditions. TVA has recalculated ERCW flows for the Containment Spray (CS) and Component Cooling System (CCS) flows based on a reservoir level of el. 670 ft. msl. TVA justified this on the basis that the primary heat loads on the CS and CCS systems would occur early in the Loss-of-Coolant Accident (LOCA) when the water level may be expected to be above el. 670 ft. msl. Figure 14 in the application shows the Chickamauga Reservoir drawdown at Sequoyah in terms of water level elevation and time following the postulated failure at the dam. From Figure 9.2.2-21 of the SQN FSAR, it can be seen that the LOCA heat rejection rates to the CS and CCS systems fall off sharply after about 3.5 hours into the accident and decrease by about one third by 24 hours into the accident. By the end of 30 days, CS and CCS heat rejection rates have dropped by more than 70% and are only slightly greater than the constant heat rejection rate of the station auxiliaries.

According to TVA's submittal, the decrease in water level from el. 670 to el. 636 ft. will result in a 7% reduction in available ERCW flow. If the reservoir water temperature is 83°F and the water level stays above el. 670 ft. msl for 10 hours, the increase in the long term temperature profile inside the containment after about two days will be about 3°F over the maximum temperature in the FSAR Chapter 6 analysis.

Current projections by TVA indicate that a maximum river temperature of 84.4°F in the reservoir above Chickamauga Dam may be reached this summer. Therefore, TVA has proposed that the LCO on reservoir temperature be changed to 84.5°F to be consistent with the original basis for the maximum UHS water temperature. TVA has evaluated the effect of elevated UHS temperature on the FSAR Chapter 6 analysis. TVA has concluded that the effect of elevating the UHS temperature to 84.5°F will result in an increase of 1.5°F for temperatures inside containment. For the combined decrease in flow and increase in temperature, TVA has estimated a maximum long term temperature inside the containment of 4.5°F over the FSAR Chapter 6 analysis.

The change in the UHS temperature potentially affects the heat removal rate from many areas of the plant. In order to demonstrate the acceptability of the proposed change. TVA stated that it has performed an evaluation of the effect of the increased temperature on the following key plant analyses:

Emergency core cooling system (ECCS)
Other FSAR Chapter 15 accident analyses
Containment subcompartment pressure analysis
Peak containment temperature
Peak containment pressure
Long-term containment cooling
Long-term cooling for pipe breaks outside containment
Equipment qualification (EQ) temperature profiles

2.2.1 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 and 10 CFR 50.46.

The FSAR accident analyses, which demonstrate compliance with the requirements of 10 CFR 50.46, show 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 180 seconds into the ECCS event and core reflood is completed around 500 seconds. Heat removal to the UHS does not occur until switchover of the Residual Heat Removal (RHR) system from the Refueling Water Storage Tank (RWST) to the emergency sump at approximately 1600 seconds. Because the parameters that demonstrate compliance to 10 CFR 50.46 are not affected by an increase in the UHS temperature, TVA stated that the FSAR ECCS analyses (FSAR Sections 15.3.1 and 15.4.1) will not be changed.

2.2.2 Other FSAR Chapter 15 Analyses

The remaining FSAR 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. Condition I and II events were 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.

These other events which are addressed in the FSAR are the following:

1. Major or minor secondary system ruptures (FSAR Sections 15.3.2 and 15.4.2).
2. Complete loss of forced RCS flow or single reactor locked rotor (FSAR Sections 15.3.4 and 15.4.4).
3. Rod cluster withdrawal at full power (FSAR Section 15.3.6).
4. Rod cluster control assembly ejection (FSAR Section 15.4.6).
5. Steam generator tube rupture (FSAR Section 15.4.5).
6. Fuel handling accident (FSAR Section 15.4.5).
7. Waste gas decay tank rupture (FSAR Section 15.3.5); and
8. Inadvertent loading of a fuel assembly into an improper location (FSAR Section 15.3.3).

The first four events listed above do not depend upon heat removal to the UHS for mitigation of the consequences that occur early in the event. TVA stated that, therefore, the FSAR analyses for these events will not be altered by the proposed change. TVA stated that the the consequences associated with a steam generator tube rupture (SGTR) will not be altered by the proposed change. However, the last mitigative action item listed for the operator in the FSAR analysis for an SGTR is initiation of RHR for cooldown. The RHR heat exchanger does transfer its heat load to the UHS via the CCS. Therefore, cooldown of the RCS may be slightly extended but the extended cooldown does not represent any unacceptable consequences. The consequences of the waste gas decay and fuel handling accident are not affected by the proposed change. The inadvertent loading of the fuel assembly into an improper location does not impact heat transfer to the UHS.

2.2.3 Subcompartment Pressure Analysis

TVA stated that the peak subcompartment pressures given in the FSAR will not change because of an increase in UHS temperature. In order to maximize pressure, the subcompartment pressure analyses in FSAR Section 6.2 assume an instantaneous, double-ended guillotine rupture of the largest pipe within a given subcompartment. The resulting flow because of the rapid depressurization of the pipe or system produces the peak subcompartment pressure in a matter of seconds. No heat removal to the UHS is assumed in the FSAR analyses. Therefore, they are unaffected by changes in UHS temperature.

2.2.4 Peak Containment Temperatures

The peak containment temperature results from a main steam line break (MSLB) and occurs very 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 CS, and passive heat sinks. The CS system is supplied with constant temperature water from the refueling water storage tank (RWST) without any heat removal by the CS heat exchanger to the UHS. The mass and energy releases from the faulted steam generator to the containment are terminated by steam generator dryout within 30 minutes (even for small breaks). The ice bed does not melt out until many hours after an 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. Thus, peak containment temperatures will not be affected by the proposed changes because heat is not transferred to the UHS during the time of peak containment temperature.

Peak Containment Pressure

The 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 1600 seconds via the coupled RHR and CCS heat exchangers. Thus, the containment temperatures and pressures predicted in the FSAR analysis for a design basis LOCA before 1600 seconds will not change regardless of the UHS temperature.

TVA stated in its application that, after RHR switchover to the emergency sump at 1600 seconds, the temperature of the injection flow to the core is affected by the proposed change. The increased core inlet temperature would result in a slight increase in mass release to containment from core boiloff. However, containment conditions are still controlled by the CS system, air return fan, and ice condenser; and the design basis containment analysis presented in the FSAR is not significantly impacted. The CS heat exchanger system begins to transfer its heat to the UHS at approximately 2800 seconds following switchover from the RWST to the emergency sump. But until ice condenser bed meltout at approximately 3000 seconds, switchover of the containment spray does not appreciably change the FSAR analysis. Following ice condenser bed meltout, the pressure and temperature in the containment begin to increase noticeably. At 3600 seconds, the RHR spray is initiated 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. In order to quantify the effect on containment peak pressure because of a change in the UHS temperature, TVA stated that it performed a series of containment analyses using a MONSTER model benchmarked against the FSAR design basis analysis.

The benchmark analysis was performed using the FSAR Chapter 6 model and associated data (i.e., volumes, flow paths, ice weight, and heat sinks), blowdowns, pump flows, and UHS temperature of 83°F. The heat exchanger parameters from FSAR Section 9.2.2.2 were used in this analysis for the CS, CCS, and RHR heat exchangers. A peak pressure of 11.03 pounds per square inch gauge (lb/in^{2}g) was calculated for the lower compartment. The FSAR peak pressure is 11.09 lb/in^{2}g calculated with the LOTIC containment code. The difference between the two codes is less than 1 percent. Using 85°F as the UHS temperature increased the peak lower compartment pressure by approximately 0.13 lb/in^{2}g.

The distribution of flows in the ERCW has been revised by TVA since the FSAR analysis was performed. A new containment analysis was performed using the FSAR model but with measured flow rates and revised heat exchanger coefficients for CCS, CS, and RHR heat exchangers. The containment analysis shows that the pressure profile predicted by the analysis (peak pressure 10.91 lb/in^{2}g) was bounded by the design basis FSAR analysis. TVA stated that, in order to ensure that the heat removal from containment is conservatively modeled, the ERCW flow rates to the heat exchangers were reduced by 10 percent.

A containment LOCA analysis using the revised ERCW flows (with a 10-percent margin reduction), 83°F UHS temperature, and heat exchanger duties was performed by TVA. TVA stated that the peak pressure for the lower compartment in this analysis was 11.36 lb/in^{2}g and a parametric study of this model, using an 85°F UHS temperature, increased the peak lower compartment pressure by approximately 0.14 lb/in^{2}g to 11.50 lb/in^{2}g. The results of these analyses showed that the design basis LOCA analysis with an 85°F ultimate heat sink temperature does not exceed the containment design pressure of 12 lb/in^{2}g. Thus, TVA stated that the peak containment pressure will not be unacceptably increased by the proposed change. The staff agrees with this conclusion.

2.2.5 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 and therefore, any increase in the UHS temperature will decrease the rate of cooldown. Because heat is transferred to the UHS via heat exchangers with given duties based on specified temperature differentials, heat removal would not be changed if the source temperature (i.e., CS and RHR and ultimately the containment atmosphere) increased by the same amount as the sink temperature (assuming that the heat exchangers are 100 percent efficient). Therefore, for an increase of 1.5°F in the UHS temperature, an increase of 1.5°F can be expected (in the limit) in the source temperature profile. Therefore, using this rationale, the lower compartment coolers that are initiated within four hours after a postulated MSBL would remove less energy from containment than predicted by the current analysis yielding a containment temperature increase of 1.5°F. Also, during a design basis LOCA, the CS and RHR heat exchangers would not remove the energy predicted in the FSAR analysis unless the containment temperature eventually increased in the limit by 1.5°F. Therefore, the long-term containment temperature profile can be expected to increase by a maximum of 1.5°F as a result of the proposed change. The increased temperature will extend the predicted amount of time required to reach normal temperature provided that the elevated temperatures exist for the entire cooldown period. TVA stated that historical data on river water temperature at the ERCW pump intake indicates that this is extremely unlikely.

TVA stated that the long-term containment cooldown for the proposed 84.5°F will also be affected by the postulated loss of downstream dam assumed concurrent with the design basis LOCA. TVA explained that the postulated dam failure will result in a reduction the total flow capacity of the ERCW system. The total ERCW flow capacity at normal reservoir levels (see FSAR Figure 2.4.1.3, Sheet 1 of 14) is greater than design flows used in the containment analyses and will remain so for approximately 10 hours after the postulated LOCA and dam failure. After approximately 10 hours, the reservoir level will drop below the 670 foot level used to determine ERCW design flow rates for the various analyses. The reservoir level will stabilize at the minimum level in approximately two days, causing a 7 percent reduction in the total ERCW flow rate. The 7 percent flow reduction would cause a decrease in the heat removal capability of the ERCW system and would result in increases on the order of 3°F in the long-term containment temperature after two days. Therefore, in conjunction with the increased river water temperature, the long-term temperature inside containment would increase by no more than 4.5°F starting at two days after the accident and continuing through the remaining duration of the accident. The increased long-term containment temperature will affect the qualified post-accident degradation equivalency calculations for 10 CFR 10.49 equipment. This effect is addressed in Section 2.2.7 below on EQ Temperature Profiles. No other parameters are affected by the increased long-term containment temperatures.

2.2.6 Long-Term Cooling for Pipe Breaks Outside Containment

Long-term cooling for pipe breaks outside containment is affected by an increased UHS temperature because the UHS serves as the cooling water supply for ESF room coolers and cooling water temperature dominates the performance of the room coolers. TVA stated that the performance of the ESF room coolers was modeled assuming a maximum UHS temperature of 84.5°F. The evaluation was to determine if the coolers would maintain their respective areas at or below the 100 day post-accident average Environmental Qualification (EQ) temperature. TVA's application provided a typical profile of the time varying river and room temperatures which TVA states is based on a 10-year average profile normalized to the worst-case UHS temperature of 84.5°F. A typical room temperature profile is also shown against the 100-day EQ temperature, which is assumed to remain constant. TVA stated that evaluations of the profiles indicate that the 100 day average temperature profiles are not exceeded.

2.2.7 EQ Temperature Profile

In regard to pipe breaks outside containment, the staff had questions concerning the typical room temperature profile relative to the 100 day environmental qualification (EQ) temperature and the methods used by TVA to ensure the qualification of required safety-related equipment. The staff discussed this with SQN personnel, and was informed that the qualification was based on assuming a maximum temperature value (115°F for the example in Figure 13 of the TS submittal) for the areas of consideration. This temperature was assumed by TVA for the entire 100 day period for calculating equipment degradation in determining plant equipment qualification. For the TS change, TVA calculated new area temperatures and the new averages for the 100 days. In all cases, TVA found the averages to be equal to or below the assumed temperatures used for calculating degradation for equipment qualification. However, since comparison of numeric averages is not considered valid for determining equivalent equipment degradation, TVA determined new equipment degradation values in the cases where new temperatures exceeded the assumed temperatures used for establishing equipment qualification previously. The new degradation values considered the temperatures which exceeded the previously assumed values.

Except for four cases, the new degradation values were equal to or below the previous values and TVA considered the equipment to be qualified for operation during the 100 day period. For these four cases, TVA increased the ERCW flow to four room coolers and made changes to the EQ binders to reflect adequate qualification of the equipment. TVA stated that they were able to gain this extra flow (approximately 12 gallons per minute total) by balancing flow requirements during the 100 days and taking advantage of the lake elevation being at 670 feet initially during the outside containment pipe break event and prior to the lake reaching an el. of 636 feet for a downstream dam break. TVA stated that they had calculations to support the availability of water and the assumptions made.

Even though TVA increased the cooler flows as described above for the equipment located in the above areas, qualification was not established for the 100 days. Therefore, new equipment degradation calculations were required and put in the plant qualification binders to demonstrate adequate qualification for the affected equipment with the increased cooler flows. Based on the new calculations, TVA was able to establish qualification of the equipment for the required 100 days.

2.2.8 Conclusion

Based on the staff's review of available information and discussions with TVA, the staff finds the handling of this specific issue to be acceptable to support the proposed TS change.

In Licensee Event Report (LER) 87-037-1 dated March 10, 1988, on Sequoyah Units 1 and 2, TVA stated that the corrective actions in the LER "will ensure that the subject ESF coolers provide adequate cooling as long as the ultimate heat sink temperature remain belows its 83 degrees F." TVA stated in the telephone call on August 11, 1988 that the engineered safety feature (ESF) coolers which are the subject of the LER were included in the calculations submitted in its application dated June 20, 1988 for the proposed TS change 88-21.

The staff concludes that, based on the above, the results of the analyses presented by TVA justify an increase in the LCO on river water temperature to the proposed 84.5°F. Therefore, the proposed TS change for the UHS maximum temperature is acceptable.

2.3 UHS Water Level Evaluation

Based on the discussion in Section 2.2 above on the UHS water temperature, the staff concludes that the proposed minimum UHS water level of el. 670 msl is not consistent with the UHS water temperature of 84.5°F. It is consistent with the UHS temperature of 83°F. This is discussed further below.

TVA's analysis is based on a river water elevation of 670 ft. during the initial part of the LOCA. This is based on the assumption that at least 10 hours would be available for pumping with the water level over el. 670 ft. msl. Ten hours is based on a dam failure occurring at the operating pool level of el. 681 ft. msl. A figure of reservoir water level versus the months of the year is given in the calculation enclosed with TVA's application dated June 20, 1988. The pool elevation may vary between el. 675 and 682.5 ft. for hydropower generation with the lower elevations being less likely but still possible. If a dam failure is assumed to occur at el. 675 ft. msl, the water level may drop to el. 670 ft. msl in just over 4 hours. This is not consistent with the proposed action statement for the minimum reservoir water level where the plant would be in Hot Standby (Mode 4) within 6 hours and in Cold Shutdown (Mode 5) within the following 30 hours.

The licensee has an Abnormal Operating Instruction (AOI-22) which requires initiation of shutdown when the water level reaches el. 675 and failure of Chickamauga Dam is confirmed at the TVA load center. This AOI, however, does not require plant shutdown at low reservoir water levels which are not associated with a dam failure such as for the preflood season storage. This drawdown, however, would only be expected during the winter.

Based on TVA's application, the river water elevation consistent with an UHS water temperature of 84.5 degrees F is a minimum of 680 ft.

Therefore, TVA's proposed reservoir water elevation of 670 ft. is acceptable for the current water temperature of 83°F and a reservoir water elevation of 680 ft. is acceptable for TVA's proposed UHS water temperature of 84.5°F. This is a small change from the application made by TVA and the Notice of Consideration of issuance of an amendment in the Federal Register on July 1, 1988 (53 FR 25023). In a telephone conference on August 11, 1988, TVA agreed to the above relationship between river water elevation and temperature.

2.4 Location To Measure The UHS Water Temperature

The current TS 3.7.5 states that the ERCW system suction is where the water temperature is measured. The proposed TS change states that the temperature is measured at the ERCW supply header. TVA stated that the reservoir water temperature is measured with instrumentation installed in the ERCW intake structure because this represents the temperature of the ERCW cooling water to the critical heat exchangers. The staff has reviewed the ERCW and concludes that TVA's statement is correct. Therefore, the proposed change is acceptable.

2.5 Action Statement For LCO 3.7.5

TVA has proposed to revise the action statement for the UHS so that the statement would include provisions for actions required to be taken for unacceptably low reservoir water levels. The proposed actions for plant shutdown are the same as the current TS. Therefore, the staff concludes that the proposed TS change is acceptable.

2.6 Surveillance Requirements

TVA has proposed to keep the current SR 4.7.5 for the water temperature. It has proposed to verify the reservoir water level once per 24 hours. TVA did not provide a justification for applying the current 24 hour surveillance period for water temperature to water level. Based on the staff's review of TVA's application including the Abnormal Operating Instruction AOI-22 and because there is no current requirement in the TS to verify the UHS water elevation, the staff concludes that the proposed change is acceptable.

The TS 3/4.7.5 refers to the "average" ERCW supply heater water temperature. This temperature may be averaged over a period of not more than 24 hours. This is consistent with the NRC Standard Technical Specifications for this specification.

2.7 Bases For TS 3.7.5

The staff has reviewed the proposed changes by TVA to the bases for TS 3/4.7.5. The staff concludes from its review of TVA's application that the proposed changes to the bases are correct and, therefore, acceptable.

2.8 Conclusion

Based on the above, the staff concludes that the proposed changes to TS 3/4.7.5, Ultimate Heat Sink, in TVA's application TS 88-21 dated June 20, 1988 are acceptable for the maximum allowed UHS water temperature in that the units will have the proposed minimum allowed river water elevation of 670 ft. for the current UHS water temperature of 83 degrees F and will have a mimimum allowed river water elevation of 680 ft. for the proposed UHS water temperature of 84.5°F.

We have a concern about ERCW availability which is not related to the proposed Technical Specification change. The concern is about erosion and deposition of sediment as a result of high water velocities around and upstream of the ERCW intake structure as a result of the failure of Chickamauga Dam. It is our understanding that these issues were evaluated by TVA but never reviewed by NRC. In order to make an independent evaluation, we will request from TVA a copy of the topographical cross sections plotted for the unsteady flow analysis, time varying water velocities in the cross sections near the ERCW, geologic cross sections through the reservoir, and the sediment scour and deposition calculations.

3.0 ENVIRONMENTAL CONSIDERATION

These amendments involve a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of these amendments.

4.0 CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of these amendments will not be inimical to the common defense and security nor to the health and safety of the public.

Principal Contributors: R. Wescott, G. Hubbard, J. Donohew

Dated: August 15, 1988