From:	Hon, Andrew
Sent:	Wednesday, February 11, 2015 2:57 PM
To:	Shea, Joseph W (jwshea@tva.gov)
Cc:	Purciarello, Gerard; Helton, Shana; Hess, Thomas A (tahess@tva.gov)
Subject:	SEQUOYAH NUCLEAR STATION, UNIT 1 – REQUEST FOR ADDITIONAL INFORMATION RELATED TO LAR to Revise Ultimate Hear Sink Related Tech Spec.
ADAMSAccessionNumber:	ML15042A470

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2,– REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST TO REVISE TECHNICAL SPECIFICATION ON ULTIMATE HEAT SINK (TAC NOS. MF2852 AND MF2853)

Dear Mr. Shea:

By letter dated October 2, 2013, you submitted an application to revise technical specification 3.7.5, "Ultimate Heat Sink," with temperature limitations supporting alternate Essential Raw Cooling Water loop alignments.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing your submittal and has determined that additional information is required to complete the review. The specific information requested is addressed below. The proposed questions were discussed by telephone with your staff on February 10 2015. Your staff confirmed that these questions did not include proprietary or security-related information and agreed to provide a response by March 20, 2015 to this request for additional information (RAI).

The NRC staff considers that timely responses to RAIs help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. Please note that if you do not respond to this request by the agreed-upon date or provide an acceptable alternate date, we may deny your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108. If circumstances result in the need to revise the agreed upon response date, please contact me at (301) 415-8480 or via e-mail Andrew.Hon@nrc.gov.

Sincerely,

R/A

Andrew Hon, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Accession No. ML15042A470

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST TO

CHANGE TO TECHNICAL SPECIFICATION 3.7.5, "ULTIMATE HEAT SINK"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT (WBN), UNIT 1 AND UNIT 2

DOCKET NOS. 50-327 AND 50-328

RAI -1

BACKGROUND

The Updated Final Safety Analysis Report (UFSAR) has specified normal lineups for both the Essential Raw Cooling Water (ERCW) and Containment Cooling Systems (CCSs). Specifically, UFSAR Section 9.2.2 for the ERCW system states, "The normal cooling water supply to CCS heat exchangers 1A1 and 1A2, 2A1 and 2A2, and 0B1 and 0B2, is from ERCW headers 2A, 2A, and 2B, respectively." UFSAR Section 9.2.1 for the CCS system states, "Under normal power operation, the CCS will require the use of one component cooling water pump (i.e., 1A-A, or 1B-B in unit 1 and 2A-A or 2B-B in unit 2) and the CCS heat exchangers in train A of each unit. One additional CCS pump may be needed in the unit carrying the Spent Fuel Pool heat exchanger. Normally, only CCS pump C-S will be aligned to the train B headers." These statements imply that other lineups other than the normal lineup may be used during plant operations.

According to 10 CFR 50.36, each Limiting Conditions for Operation (LCO) must define the lowest functional capability or performance level of equipment required for safe operation of the facility. Since ERCW and CCS are shared systems, the safe operation of the facility includes the safety operation of both units.

ISSUE

The licensee proposed new ERCW loop OPERABLE criteria for one ERCW pump operation and for strainer outages that are dependent on the "normal ERCW lineup" to the CCS heat exchangers. Neither the proposed Technical Specifications (TS) nor the proposed TS Bases state that the "normal ERCW lineup" to the CCS heat exchangers is required for the added ERCW loop OPERABLE cases. Alternate ERCW lineups would invalidate the calculation results upon which the proposed TS change is based.

In the Design-Basis accident (DBA) analysis either the A loop ERCW or the B loop ERCW can perform the ERCW safety function thereby satisfying single failure criteria. With the A loop not available and the B loop performing the safety function, the licensee stated in response to Request for Additional Information (RAI) -1 in their August 14, 2014 letter that two train B CCS pumps are necessary.

As stated in the Background above, the CCS has normal and alternate lineups. Since the licensee plans to use the "one pump ERCW operation" lineup to clean Shutdown Boards (SDB) one at a time and the SDBs power CCS pumps, certain CCS pumps would not be available when a SDB is INOPERABLE.

REQUEST

1) Please designate in the TS change which ERCW lineups are authorized for the ERCW loop OPERABLE criteria.

2) For each of the eight outage cases defined in Table 4.2-6 for "One Pump per Loop ERCW Operation Case Description," please identify what pre- Loss-Of-Coolant Accident (LOCA)/Main Steamline Break (MSLB) CCS lineup and component OPERABILITY status is necessary such that upon the subsequent loss of offsite power and loss of two EDGs on the same loop, the safety functions of CCS and ERCW can be accomplished, i.e. mitigate the DBA in the accident unit and keep the shutdown unit in Mode 5.

RAI-2

BACKGROUND

The ERCW system is a shared system that simultaneously provides cooling water flow to numerous safety related and non-safety components in both units. The system had preoperational flow testing (ERCW-Flow Balance) as described in FSAR Chapter 14 to verify sufficient flow to safety related components and thus verify the adequacy of system design. Sufficient flow was used to define system operability and LCO. As required by 10 CFR 50.36, minimum system operability and LCOs were established in TSs to define the lowest functional capability or performance level of equipment required for safe operation of the facility. Preoperational flow testing verified the ERCW flow design and was important to defining operability and the LCO. In the License Amendment Request (LAR), the licensee is proposing additional definitions for ERCW operability and additional LCOs to the ERCW supply water Ultimate Heat Sink (UHS) based on ERCW system computer modeling (Multiflow) to determine flows throughout the system. Multiflow accuracy is dependent on accurate design input. Design input to computer modeling of hydraulic systems include piping layout geometry, flow resistances of pipes, fittings, valves, and other components and pump performance levels among other design inputs.

ISSUE

TVA is using flow modeling as a substitute for system flow testing for verifying new conditions of operability and additional LCOs. The flow modeling changes include isolation of numerous components of a shutdown unit to achieve added flow to operating plant components and represent significant system flow changes. Although computer modeling of the ERCW system can be a valuable tool in determining system performance, the NRC staff considers that margins in design inputs and unknown system problems can cause the Multiflow results that were provided in the LAR and used to establish new LCOs to not be sufficiently accurate for the stated purpose. Due to fouling by river water UHS and uncertainties in component flow resistances and unknown system flow problems, the design input may not have sufficient accuracy for the flows that were calculated and were used to establish the new LCOs. The output tables in the LAR show flow requirements and flow availability have little margin for some components. Such little margins are available that the licensee found it necessary to isolate ERCW flow to a Control Rod Drive Vent Cooler for an operating unit to help gain required flow to other components. Furthermore, Quality Assurance requirements and guidance of NQA-1 and NRC Standard Review Plan state that changes to design inputs shall be justified and subject to design control measures commensurate with those applied to the original design, which as stated above was flow testing.

REQUEST

1) Please provide and explain ERCW flow test results which show that the results of the Multiflow model for all the new configurations proposed for the new LCO conditions for both the Strainer Outage cases and the One Pump Operation cases are accurate and thus meet the lowest functional capability or performance level of equipment required for safe operation.

2) Please propose new Surveillance Requirements to test and verify that critical ERCW flows are achieved prior to "one pump per loop operation", i.e. Outages 1a&b and 2a&b and in Strainer Outage Cases 1 through 8.

3) From the Multiflow model of "One Pump per Loop Operation" for either unit at power, please provide the following information: The itemized ERCW flowrate through both safety and non-safety related components for one ERCW pump operation before any components that are designated in Table B 3/4.7-1 are isolated. Provide this information for both the A and B ERCW loops.

4) Please clarify how valve leakage is (will be) accounted for such that your Multiflow analysis, which is the basis for your TS revision, is sufficiently accurate.

5) Please clarify how the ERCW pump impeller wear and loss of pump efficiency over time are accounting for.

6) Please clarify how the computed ERCW flow rates are accounting for allowed variation in line voltage and frequency for both offsite power and the diesel generators.

RAI-3

BACKGROUND

On August 14, 2014, TVA submitted the responses to RAIs regarding Sequoyah Nuclear Plant, Units 1 and 2, Ultimate Heat Sink LAR. The response to RAI-1 proposed a revised TS 3.7.5 and Technical Specification Bases (TSB) 3.7.4 and 3.7.5, which superseded those found in the October 2, 2013, submittal. TVA proposed additional restrictions in the proposed TSB Table B 3/4.7-1, Minimum Requirements for ERCW – Prerequisite Actions to One Pump per Loop Operation.

10 CFR 50.36(a) (1) specifies that the Bases are considered a summary statement of the bases for the specifications or reasons for such specifications, and are not part of the TSs. 10 CFR 50.36(c)(2) states that LCO are the lowest functional capability or performance levels of equipment required for safe operation for the facility.

Ordinarily, the LCOs specify that certain systems/trains or components are to be OPERABLE to assure safe operation of the facility. The TSB would then further explain system or train operability by specifying what components must be OPERABLE for a system or train to be considered OPERABLE. The TSB also contains summary statements of the reasons for the TS. Supporting information such as analysis assumptions is provided in the Updated Final Safety Analysis Report (UFSAR).

ISSUE

1) The proposed Table B 3/4.7-1 contains performance levels of equipment and statements that direct the operation of plant equipment – e.g., "isolate flow to the following components". The NRC staff is concerned that the Bases revision, as proposed, could be viewed as containing information defining the LCO of the ultimate heat sink and as directing plant operation.
2) As stated in the October 2, 2013 submittal, TVAs objective of this amendment request is to facilitate cleaning and inspection of the 6.9 kV shutdown board and associated 480v SDB without requiring a dual unit shutdown.

REQUEST

1) Please clarify how the proposed LCO for TS 3.7.5 sufficiently specifies the conditions in which UHS is operable with only one ERCW pump operable on one ERCW train. These conditions would include restrictions on UHS temperature, the condition of the other unit (time elapsed since last criticality and MODE), requirements for the opposite train ERCW loop, and a reference to the appropriate system lineup. A summary of the analysis and a description of the system alignment necessary to protect the analysis assumptions should be placed in the UFSAR. Please also address how the TSB should be modified to explain system or train operability and reflect a summary of the requirements for single ERCW loop operation.

2) Please address how the LCO should be revised such that one pump loop operation is only allowed for facilitating cleaning and inspection of the 6.9 kV shutdown board and associated 480v shutdown boards.

RAI-4

BACKGROUND

Table 4.2-1 lists the following "Component Minimum Design required ERCW Flow Rates" when ERCW inlet temperature is 87°F.

CCS HX Train A, LOCA unit	3605 GPM
CCS HX Train A, non-LOCA unit	1348 GPM
CCS HX 0B1/0B2	3365 GPM

ISSUE

The quantity of ERCW flow to these heat exchangers is vital to mitigating the LOCA and satisfying the safety requirements for the non-accident unit. Therefore, the NRC staff wants the licensee to explain the purpose of the stated flow quantities.

REQUEST

Please explain why these values represent minimum flow rates by discussing what these flow rates do, including when they are needed after a DBA and any operator action that is needed to make these flow rates perform their intended safety functions.

RAI-5

BACKGROUND

Outages 2a&b and 4a&b of Table 4.2-6 of the August 14, 2014 letter specify isolating the accident units containment spray system (CSS) heat exchangers and reducing flow to the A train CCS heat exchanger for MSLB in units 1 and 2 within 1 to 4 hours after the MSLB in order to provide adequate ERCW flow to the Lower Containment Coolers.

ISSUE

Isolating ERCW flow to the CSS heat exchangers makes them inoperable and thus unavailable; reducing flow to the CCS heat exchanger provide less heat sink for plant cooldown.

REQUEST

Please provide justification for making the CSS heat exchangers inoperable in Outages 2a&b and 4a&b thereby reducing the ability for plant cooldown.

RAI-6

BACKGROUND

Table B 3/4.7-1 of the proposed TS Bases for Unit 1 lists isolating Unit One Control Rod Drive Vent Cooler (CRDVC) 1B when Unit 1 is in Mode 1.

ISSUE

The license's response to RAI-12 in your letter dated August 14, 2014 stated that, "If there are less than two CRDVCs operating and aligned to the Reactor head shroud for CRD cooling, then the CRDMs may overheat, causing inaccurate Control Rod Position Indicators, and possibly leading to a dropped rod when Unit 1 is in Mode 1."

REQUEST

Please provide reasons for not discussing loss of CRDVC 1B in your significant hazards consideration which was submitted as section 5.3 in your LAR dated October 2, 2013 or revise the significant hazards determination accordingly.

RAI-7

BACKGROUND

Table B 3/4.7-1 and the "Component Alignment" column of Table 4.2-6 both list components that must be isolated when in the one pump per loop operation.

ISSUE

The information provided in the "Component Alignment" column of Table 4.2-6 does not match the alignment required in Table B 3/4.7-1.

REQUEST

Please verify the information in these two tables and correct where necessary.

RAI-8

BACKGROUND

Section 3/4.7.4 of the proposed TS Bases defines OPERABILITY for an ERCW loop.

ISSUE

Items a through c in this section specify criteria "per loop," which implies that the criteria applies to both ERCW loops, where it should only apply to an ERCW loop. Also, Item c should specify that this criteria is applicable to one ERCW loop only at a time and only during cleaning and inspection of a 6.9 kV shutdown board and associated 480v shutdown boards.

REQUEST

Please correct the above issues.

RAI-9

BACKGROUND

TVA is relying on the Multiflow model to determine flow rates through safety related components. The Multiflow calculated flow rates are compared to the required flow rates from Table 4.2-1, which are for an ERCW temperature of 87°F. As shown in Table 4.2-12 for Multiflow calculated flow rates less than required, a revised ERCW temperature is calculated to ensure that the required heat energy is transferred. The most limiting revised temperatures are for the CCS and CSS heat exchangers. The minimum revised temperature is used to establish limits for the new proposed TS limit.

The response to RAI-11 of the August 14, 2013 letter also listed calculated Multiflow ERCW flow rates for LOCA and MSLB as that for Table 4.2-12.

ISSUE

The ERCW flow rates for the CCS and CSS heat exchangers in the response to RAI -11 are less than those of Table 4.2-12 where they should be identical.

REQUEST

Please explain why these critical calculated flow rates are different.