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

CNL-16-011

March 11, 2016

10 CFR 50.4
10 CFR 50.90

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

Sequoyah Nuclear Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327 and 328

Subject: **Sequoyah Nuclear Plant, Units 1 and 2, Proposed Technical Specification Change to Extend the Allowed Completion Time to Restore Essential Raw Cooling Water System Train to OPERABLE Status from 72 hours to 7 days (TS-SQN-16-01)**

Reference: Letter from TVA to NRC, "Third Status Update of Planned Actions to Facilitate Maintenance of 6.9 Kilovolt and 480 Volt Shutdown Boards at Sequoyah Nuclear Plant, Units 1 and 2," dated September 30, 2013

In accordance with the provisions of 10 CFR 50.90, "Application for Amendment of License, Construction Permit, or Early Site Permit," Tennessee Valley Authority (TVA) is submitting a request for an amendment to Renewed Facility Operating License Nos. DPR-77 and DPR-79 for the Sequoyah Nuclear Plant (SQN), Units 1 and 2.

As discussed in the referenced letter, TVA is proposing changes to SQN, Units 1 and 2, Technical Specification (TS) 3.7.8, “Essential Raw Cooling Water (ERCW) System,” to extend the allowed completion time to restore one ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance.

The enclosure provides a description of the proposed changes, technical evaluation of the proposed changes, regulatory evaluation, and a discussion of environmental considerations. Attachments 1 and 2 to the enclosure provide the existing TS and Bases pages marked-up to show the proposed changes. Attachments 3 and 4 to the enclosure provide the existing TS and Bases pages retyped with the proposed changes incorporated. Attachment 5 to the enclosure provides proposed FSAR mark-up. The Bases and FSAR pages are being provided for information only.

TVA requests approval of this TS change by July 31, 2016.

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

The SQN Plant Operations Review Committee and the TVA Nuclear Safety Review Board have reviewed this proposed change and determined that operation of SQN in accordance with the proposed change will not endanger the health and safety of the public.

Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and the enclosure to the Tennessee Department of Environment and Conservation.

There are no new regulatory commitments contained in this letter. If you have any questions, please contact Ed Schrull at 423-751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 11th day of March 2016.

Respectfully,

J. W. Shea

Digitally signed by J. W. Shea
DN: cn=J. W. Shea, o=Tennessee Valley Authority, ou=Nuclear Licensing, email=jwshea@tva.gov, c=US
Date: 2016.03.11 14:17:48 -05'00'

J. W. Shea
Vice President, Nuclear Licensing

Enclosure: Evaluation of Proposed Change

cc (Enclosures):

- NRC Regional Administrator - Region II
- NRC Senior Resident Inspector - Sequoyah Nuclear Plant
- NRC SQN Project Manager

ENCLOSURE
TS-SQN-16-01

Evaluation of Proposed Change

Subject: **Request to extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days**

ATTACHMENTS

Evaluation of Proposed Change

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Operating License Nos. DPR-77 and DPR-79 for Sequoyah Nuclear Plant (SQN), Units 1 and 2.

TVA is proposing changes to SQN, Units 1 and 2, Technical Specification (TS) 3.7.8, “Essential Raw Cooling Water (ERCW) System,” to extend the allowed Completion Time to restore one ERCW System train to OPERABLE status from 72 hours to 7 days. Theses changes are needed to facilitate cleaning and inspection of the 6.9 kilovolt (kV) shutdown boards and associated 480 Volt (V) shutdown boards without requiring a dual unit shutdown.

2.0 DETAILED DESCRIPTION

2.1 Proposed Changes

Changes to SQN Unit 1 and Unit 2 TS 3.7.8, ERCW are proposed to add a new Condition A to TS 3.7.8, Essential Raw Cooling Water (ERCW) System, to extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of the reactor vessel flange and Ultimate Heat Sink (UHS) temperature is ≤ 79 degrees F.

Unit 1 TS 3.7.8 will be revised to add Condition A, as follows:

CONDITION	REQUIRED ACTION		COMPLETION TIME
--------------NOTES------------- 1. Only applicable when Unit 2 is defueled or in MODE 6 following defueled with Unit 2 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF	A.1	--------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System.	

Evaluation of Proposed Change

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A. One ERCW System train inoperable for planned maintenance.	Restore ERCW System train to OPERABLE status.	7 days
	AND	
	A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF	1 hour AND Once per 8 hours thereafter
B. One ERCW System train inoperable for reasons other than Condition A.	B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------ Restore ERCW System train to OPERABLE status.	72 hours

Original Unit 1 TS 3.7.8, Conditions A and B are renamed Conditions B and C, respectively.

Unit 2 TS LCO 3.7.8 will be revised to add Condition A, as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME

--------------NOTES------------- 1. Only applicable when Unit 1 is defueled or in MODE 6 following defueled with Unit 1 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF ------------------------------------- A. One ERCW System train inoperable for planned maintenance.	A.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status. <u>AND</u> A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF	 7 days 1 hour <u>AND</u> Once per 8 hours thereafter
B. One ERCW System train inoperable for reasons other than Condition A.	B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of	

	LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	 72 hours

Original Unit 2 TS 3.7.8, Conditions A and B are renamed Conditions B and C, respectively.

Mark-ups of the affected TS pages are provided in Attachment 1. Corresponding changes will also be made to the TS Bases. Mark-ups of the proposed corresponding TS Bases changes are provided in Attachment 2 for information only.

2.2 Condition Intended to Resolve

In a letter to NRC dated July 17, 2012 (Reference 4), TVA evaluated actions that would be required to facilitate the scheduling of maintenance activities on the 6.9 kV and 480 V shutdown boards in the electrical distribution system at SQN. As further discussed in the letter dated October 26, 2012 (Reference 5), TVA determined that both design changes and physical modifications to the facility as well as changes to certain SQN TS requirements were needed to facilitate the specific maintenance activities. TVA's objective is to facilitate cleaning and inspection of the 6.9 kV shutdown board and associated 480 V shutdown boards without requiring a dual unit shutdown.

In the October 26, 2012 letter, as further discussed in the letter dated March 28, 2013, and the letter dated September 30, 2013 (References 6 and 7), TVA indicated that, as part of a combination of plant modifications and TS changes to facilitate the shutdown board maintenance activities, changes to TS 3.7.5, "Ultimate Heat Sink," would be developed. However, due to the conversion of the SQN TS to Improved Standard Technical Specification (ITS) format, the required changes needed to facilitate the shutdown board maintenance activities will be contained in TS 3.7.8, ERCW System.

With regard to the ERCW system, each 6.9 kV shutdown board is aligned to power two ERCW pumps. A selector switch determines which of the two associated ERCW pumps the 6.9 kV shutdown board is supporting for operability. Current SQN TSs require two ERCW pumps to be operable per train, with two trains required for each unit. Consequently, this requires all four Emergency Diesel Generator (EDG) supported ERCW pumps to be operable, and thus all four 6.9 kV shutdown boards must be operable to support the ERCW pump TS requirement.

The requested changes are needed because taking one 6.9 kV shutdown board out of service to perform maintenance affects both units. An inoperable 6.9 kV shutdown board renders one of two required ERCW pumps per train inoperable. In this condition the current TS allows 72 hours to return the ERCW pump to an operable status.

However, 72 hours is not adequate to safely clean and inspect a shutdown board and perform corrective maintenance. Therefore, the completion time to restore an ERCW System train to OPERABLE status needs to be extended from 72 hours to 7 days to facilitate safely cleaning and inspecting a shutdown board and performing corrective maintenance.

3.0 TECHNICAL EVALUATION

3.1 System Description

3.1.1 Ultimate Heat Sink

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 the ERCW 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 3.7.9. If the UHS function cannot be satisfied, unit shutdown is required in accordance with the associated action statements and completion times. No changes are made or proposed to the capability or capacity of the UHS.

3.1.2 Essential Raw Cooling Water

The ERCW System is a two-train system with each train having the capability to provide the maximum required cooling water requirement for both units under any credible plant condition. These ERCW System trains are sufficiently independent to guarantee the availability of at least one train at any time. The ERCW system has been analyzed for "worst case" heat loads under combinations of maximum river water temperature, design basis accident conditions, normal cooldown requirements, power train failures, etc. for both units. Based on these analyses, sharing of the ERCW system by the two nuclear units does not introduce factors that prevent the ERCW system from performing its required function for plant design basis conditions. Sufficient pump capacity is included to provide design cooling water flows under all conditions and the ERCW system is arranged in such a way that the loss of a complete header or the isolation of one supply source does not challenge plant safety.

The ERCW system draws water directly from the Tennessee River (Chickamauga Lake). The ERCW pumping station is located within the plant intake skimmer structure, and has direct communication with the main river channel for all reservoir levels including loss of the Chickamauga Dam. The ERCW headers are crosstied downstream of the ERCW pumps and can be crosstied downstream of the ERCW supply strainers, referred to as yard header crossties (refer to Figure 1 of Section 8 of this enclosure).

The ERCW system has eight pumps (four pumps per train), four traveling water screens, four screen wash pumps, and four supply strainers located within the ERCW pumping station; and associated piping and valves as shown in Updated Final Safety Analysis Report (UFSAR) Figures 9.2.2-1 through 9.2.2-5. The minimum combined safety requirements for one "accident" unit and one "non-accident" unit, or two "non-accident" units, are met by only two pumps on one plant train, when the ERCW system is aligned in its normal configuration. The A and B ERCW trains each have a maximum of two pumps that can be considered operable because only one of the two pumps powered from each of the four 6.9 kV shutdown boards can be aligned to be repowered by an EDG on loss of offsite power. Total loss of either train or the loss of an entire plant emergency power train will not prevent safe shutdown of either unit under any credible plant condition. Thus, sharing of the ERCW does not compromise safety.

The ERCW system is designed to supply water to the following essential components:

- Component cooling heat exchangers (HXs)
- Containment spray HXs
- EDGs HXs
- Emergency makeup for steam generators via the Auxiliary Feedwater (AFW) System
- Emergency makeup for Component Cooling System (CCS)
- Control Building Air-Conditioning Systems
- Auxiliary Building space coolers (for engineered safety features (ESF) equipment)
- Containment Ventilation System coolers
- Auxiliary Control Air (ACA) compressors
- Reactor coolant pump (RCP) motor coolers
- Control rod drive (CRD) ventilation coolers
- Spent fuel pool (SFP) HXs*
- Sample HXs*
- RCP thermal barriers*
- Ice machine refrigeration condensers*
- Residual heat removal (RHR) HXs*
- Station air compressors (alternate supply)

  *Provided with ERCW only during flood mode operation.

The availability of water for the most demanding condition on the ERCW system is based on the following events occurring simultaneously:

- Loss of offsite power
- Loss of downstream dam
- Loss of two EDGs serving the same power train
- Design basis earthquake

However, there are two combined modes of operation under the above circumstances that are not within the design capability of the ERCW system.

- Both units are simultaneously being shutdown to cold shutdown. In this case, one unit can be maintained at Hot Standby, if necessary, until heat loads are low enough to continue to cold shutdown.

- One unit being shutdown to cold shutdown and the other in a Loss of Coolant Accident (LOCA). In this case, the non-accident unit can be maintained at Hot Standby, if necessary, until heat loads are low enough to shutdown to cold shutdown, or if already shutdown, maintained in safe shutdown or allowed to return to Hot Standby, depending on the heat load. The design maximum heat load rejected to the ERCW system occurs with one unit in an accident condition and the other in Hot Standby.

ERCW Piping

The ERCW system piping is arranged in four headers (1A, 1B, 2A, and 2B), each serving certain components in each unit as described below (refer to Figure 1):

- Each header supplies ERCW to one of the two Containment Spray System (CSS) HXs associated with each unit.

- The primary cooling source for each of the EDG HXs is from the Unit 1 ERCW headers. Each diesel also has an alternate supply from the Unit 2 ERCW headers of the opposite train.

- The normal cooling water supplies to CCS HXs 1A1 and 1A2, 2A1 and 2A2, and 0B1 and 0B2 are from ERCW headers 2A, 2A, and 2B, respectively.

- Each A and B ERCW supply header in each unit provides a backup source of feedwater for the turbine-driven Auxiliary Feedwater (TDAFW) pumps in the respective unit.

- Each of the A and B ERCW discharge headers provides a backup source of feedwater for the motor-driven Auxiliary Feedwater pumps in each unit.

- ERCW headers 1A and 1B provide cooling water to the control room and Control Building electrical board room air-conditioning systems.

- Each ERCW A and B header in each unit supplies cooling water to the Auxiliary Building ventilation coolers for ESF equipment, the containment ventilation system coolers, the RCP motor coolers, the CRD vent coolers, and the containment instrument room cooler water chillers in the respective unit.

- ERCW headers 1A and 1B provide an alternate source of cooling water for the Station Air Compressors.

- ERCW headers 1A and 2B provide cooling water for the shutdown board room air conditioners and ACA compressors.

- ERCW headers 2A and 2B provide cooling water for the Emergency Gas Treatment System room coolers and boric acid transfer and Unit 2 AFW pump space coolers.

- ERCW headers 1A and 1B provide cooling water for the CCS pumps and Unit 1 AFW pump space coolers.

- Under flood conditions, the ERCW System provides cooling water to the SFP HXs, RCP thermal barriers, ice machine refrigeration condensers, Sampling System sample HXs, and the RHR HXs as needed.

ERCW Strainers

The ERCW system has four supply strainers designated as A1A-A, A2A-A, B1B-B, and B2B-B. Each ERCW supply header (1A, 2A, etc.) is provided with two system supply strainers (manual continuous backwash type) capable of removing particles and organic matter larger than 1/32-inch diameter, which are required to operate during and/or after an accident. These strainers are located in the ERCW pumping station downstream of the ERCW pumps. Each ERCW header can be supplied by the two train specific ERCW supply strainers, one with a Unit 1 designation and the other with a Unit 2 designation. For example (refer to Figure 1), ERCW header 1A can receive ERCW flow through ERCW supply strainers A1A-A and/or A2A-A. This condition is possible, because of the ERCW supply crossties. Each ERCW train has two supply crossties that are normally in service; one just downstream of the ERCW pumps and the other downstream of the ERCW supply strainers. The ERCW supply crosstie downstream of the ERCW pumps does not have any isolation valves and is continuously in service. The crosstie downstream of the ERCW supply strainers (the yard header) has isolation valves that are normally open. Therefore, during operation with both ERCW supply crossties open, ERCW flow from any of the four train specific ERCW pumps can be provided through both of the train specific (e.g., Train A, Unit 1 or Unit 2) supply strainers. Even with the crosstie downstream of the supply strainers closed, ERCW flow from any of the four train specific ERCW pumps can be provided to either supply header through the associated train specific supply strainer.

ERCW Train Operability

The SQN TSs require at least two independent ERCW trains to be operable in MODES 1, 2, 3, and 4. Two ERCW trains are required to be operable to provide the required redundancy to ensure that the system function to remove post-accident heat loads is met, assuming that the worst case single active failure occurs coincident with the loss of offsite power. An ERCW train is considered operable when the required number of pumps are operable, and the associated piping, valves, instrumentation, and controls required to perform the safety related function are operable.

The ERCW system is shared between the SQN units. The two trains are independent of each other. Within each train, there are various crossties between supply headers. While these crossties may be configured as open or closed, the crossties are all within their respective train.

The ERCW system also contains physical crossties between the trains at two locations. The valves on these crossties are configured closed for all normal plant operational modes, and all design basis accidents. These crossties would only be opened when both units are in Mode 5, 6, or defueled, in Flood Mode operation, or in accidents or events that are outside the plant design basis. If the crossties between the trains were to be opened in Modes 1 through 4, then one or both of the ERCW System trains would be inoperable. The valves on these crossties are motor operated valves configured with their power supply breakers open.

Operability of an ERCW System train is determined by its independent capability of taking suction from the UHS and removing post accident heat loads upon an ESF actuation signal coincident with the loss of offsite power. During normal operation with UHS temperature (ERCW average supply header water temperature) up to and including 87°F, an ERCW train is considered operable if two of the four same train ERCW pumps are operable, with each pump aligned to a separate 6.9 kV shutdown board. ERCW train operability also includes the associated valves, piping, instruments, and controls to ensure a flow path capable of taking suction from the UHS and removing post accident heat loads upon an ESF actuation signal.

The following Table shows the relationship between 6.9 kV shutdown boards, associated EDGs, and supported ERCW system pumps.

<table>
<tr><th>6.9 kV Shutdown Board</th><th>EDG</th><th>Supported ERCW Pump</th></tr>
<tr><td rowspan="2">1A-A</td><td rowspan="2">1A-A</td><td>J-A</td></tr>
<tr><td>Q-A</td></tr>
<tr><td rowspan="2">1B-B</td><td rowspan="2">1B-B</td><td>L-B</td></tr>
<tr><td>N-B</td></tr>
<tr><td rowspan="2">2A-A</td><td rowspan="2">2A-A</td><td>K-A</td></tr>
<tr><td>R-A</td></tr>
<tr><td rowspan="2">2B-B</td><td rowspan="2">2B-B</td><td>M-B</td></tr>
<tr><td>P-B</td></tr>
</table>

The ERCW system transfers heat to the UHS and is powered by either the offsite power sources or the onsite emergency power sources. The EDGs are used to supply power for the pumps and motor operated valves during a loss of offsite power. Two ERCW pumps are supplied power from each 6.9 kV shutdown board and are interlocked such that only one ERCW pump automatically starts on restoration of power to the shutdown board by the EDG. On a loss of offsite power, one EDG supplies power to each 6.9 kV shutdown board.

10 CFR 50, Appendix A, Criterion 44 continues to be met with an ERCW supply header aligned to support one pump per train operation, one 6.9 kV shutdown board out of service; the ERCW yard, Auxiliary Building, and ESF headers are crosstied, and the ERCW supply temperature within the proposed TS limits. The train that is aligned for one pump per train operation is fully capable of providing all necessary heat sink requirements. Therefore, if any single failure renders another train inoperable, the remaining train is capable of providing all necessary UHS requirements.

3.2 Technical Analysis

3.2.1 Overview

TVA is requesting approval to extend the allowed completion time to restore one ERCW System train to OPERABLE status from 72 hours to 7 days in order to allow performance of maintenance on the 6.9 kV shutdown boards. 6.9 kV shutdown board maintenance requires the removal of two ERCW pumps from service (powered from the same shutdown board). This involves reducing flow to certain ERCW components. Removing two ERCW pumps from service to support shutdown board maintenance leaves only one EDG backed ERCW pump remaining for that train.

As described in UFSAR Section 3.1.1, SQN is a Hot Standby plant. The ERCW system design basis requires operation under the worst case initial condition of operation as described in UFSAR Section 9.2.2. This condition is postulated to be the low probability combination of a design basis earthquake coincident with a LOCA in one unit, abrupt loss of the downstream dam, loss of the emergency power train, shutdown of the other unit to Hot Standby, and loss of all offsite power.

For the SQN ERCW system, TVA has determined the ERCW heat removal requirements for the safety related components to confirm that adequate ERCW flow rates exist to the components for design basis conditions. In addition, for off-normal ERCW system alignments, this analysis determined the ERCW maximum supply temperatures for components that do not receive their normal design flow rate of 87°F water such that they would perform their required function(s).

The minimum design flow rates for each ERCW heat load were developed in various calculations. The design required flow rate for each safety related ERCW heat load is listed in Table 3.2-5 (Section 7.0 of this enclosure), based on an 87°F average UHS temperature (i.e., average ERCW supply header water temperature). These various calculations were also used to determine the required maximum average UHS temperature for flow rates less than the design required flow rate for these components. For flow rates less than the design required flow rate, a curve fit equation was developed for each of the safety related components. The curve fit equation provided the maximum ERCW temperature that would remove the required heat load with a flow rate of less than the design required ERCW flow rate. The lowest ERCW supply temperature for the ERCW pump outages was used as the maximum UHS TS temperature limit.

3.2.2 Limiting Temperature Determination

To determine the limiting (maximum) UHS temperature, TVA applied the methodology previously used to support SQN License Amendment 317/307 (Reference 1), justifying a maximum UHS temperature limitation of 87°F. The 87°F limitation was based on establishing minimum required ERCW flow rates to ERCW supplied ESF components. These minimum required ERCW flow rates are listed in Table 3.2-5. For the determination of the limiting UHS temperatures, when aligned for single ERCW pump per train operation, the reconfigured flow rates were compared to the design required flow rates. For a component where the reconfigured flow rate was less than the design required flow rate, a curve fit equation was developed to determine the ERCW supply temperature at which the reconfigured flow rate would remove the required heat load from the affected component.

The minimum design flow rates for the CCS HXs are the calculated minimum values required to remove the assumed heat load from the CCS following a LOCA. The majority of the heat load on the CCS comes from the Residual Heat Removal (RHR) HX after sump recirculation begins, which is calculated to be 43 Million British Thermal Unit (MBTU)/hr. The other heat inputs comprising an additional 0.8 MBTU/hr following a LOCA are: Containment Spray Pump (CSP) bearing cooling, Centrifugal Charging Pump (CCP) seal cooler, Safety Injection Pump (SIP) seal cooler, RHR Pump seal cooler, Seal Water HX, and various sample coolers that might be used post-accident. Therefore, the total heat load on the A-train LOCA unit is 43.8 MBTU/hr, which can be accommodated by the 3,605 gpm CCS flow.

The heat load assumed for the non-LOCA unit is from the Reactor Coolant Pump (RCP) Motors, the RCP Thermal Barriers, the CCP seal coolers, the Letdown Heat Exchanger, the Seal Water HX, and various sample coolers, and the SFP. The heat load for an on-line unit is ~8-12 MBTU/hr, plus the SFP heat load, which is typically less than 10 MBTU/hr when a refueling outage is not in progress. The assumed heat load is about 26 MBTU/hr, which can be accommodated by the 1,348 gpm CCS flow.

For the B-train CCS (CCS HX 0B1/0B2), there is the calculated 43 MBTU/hr assumed heat load from the accident unit's RHR HX, plus the minor heat loads from the seal/bearing coolers on both units CCPs, SIP, RHR Pump, and CSP, for a total heat load of about 43.3 MBTU/hr, which can be accommodated by a 3,365 gpm CCS flow.

Because the majority of the heat load on the CCS HXs occurs when the RHR HXs are placed in service at sump recirculation initiation, the CCS and ERCW alignments are only required to be completed at sump recirculation. The normal ERCW alignment always has flow to the CCS HXs. The CCS pumps are normally running as some heat loads/flow loads on the CCS are present during operation.

On accident initiation on one unit, no operator action is required with regard to ERCW or CCS until sump recirculation is initiated, other than to validate that the proper pumps started upon SI signal receipt or upon blackout restoration. At sump swapover, the ERCW throttling motor operated valve (MOV) at both of the A-train CCS HXs is placed in its required position (a total of two ERCW to CCS valves to be manipulated by the Operators). The B train similar MOV is automatically positioned by the SI signal. The ERCW valves to the accident unit Containment Spray HXs are opened (a total of four ERCW-CSS valves to be manipulated by the Operator). The CCS valves for the accident unit's RHR HXs are opened (a total of two valves). On the B-train CCS, the flow to the non-accident unit's RHR HX may need to be adjusted (one valve). The CCS flow to the SFP HXs is removed from the accident unit, if it is supplied by the accident unit (two valves). The SFP cooling load is placed on the non-accident unit, by the non-accident unit's Operators. Therefore, a total of 11 ERCW and CCS valves are manipulated by the control room operators upon sump swapover. All of these valves are located on the same panel in the Main Control Room (MCR). The ERCW system and

CCS system flow balance is set up so that the above listed manipulations, together with the set of SI-signal driven automatic actuations, would place the systems in the required configuration to support accident mitigation.

Therefore, the flow rates in Table 3.2-5 are sufficient to remove the required heat load.

To determine the temperature at which the reconfigured flow rate would remove the required heat load, one of three methods was used to develop a "curve fit equation." The curve fit equation provides the relationship between the component's flow rate and the ERCW supply header water temperature (UHS temperature) at which the required heat load was removed.

The first method used energy balance equations (e.g., q(dot) = m(dot)($C_p\Delta T$) to develop a correlation factor that was then applied to the various component flows in order to calculate the available flow margins where:

q(dot) = heat transfer rate, is the transfer of thermal energy across the HX

M(dot) = mass flow rate, is the mass of a substance which flows past a given location per unit of time

C_p = specific heat capacity is the amount of heat energy required to raise the temperature of a body per unit of mass

ΔT = temperature difference between the HX inlet fluid and outlet fluid.

The correlation factor method was used for the electrical board room coolers, main control room (MCR) chiller, ACA compressors, and the Safety Injection System (SIS) pump oil cooler. Using a previously determined minimum flow rate for 84.5°F for these components, the required minimum flow rates for 87°F and 81°F for the specific structures, systems, or components (SSCs) were determined. The minimum flow rate values at 87°F, 84.5°F, and 81°F were tabulated in Microsoft® Excel (Excel) and an Excel trendgraph was then produced, with a trendline. A second order polynomial curve that fit the trendline was selected. From the polynomial curve, a curve fit equation was developed and used to determine the required maximum supply temperature if the hydraulic analysis shows the HX receives less than the design required flowrate. The results were further reduced in order to ensure that all temperatures computed from the equations are conservative.

The second method used was the manipulation of the PROTO-HX computer code to model the component. In PROTO-HX, changes to the calculation settings were made to provide resulting data for required ERCW flow over various ERCW supply temperatures. The values determined were again tabulated in Excel, and an Excel trendgraph was produced, with a trendline. A second or third order polynomial curve that fit the trendline was selected. From the polynomial curve, a curve fit equation was developed and used to determine the required maximum supply temperature if the hydraulic analysis shows the HX receives less than the design required flowrate. The results were reduced further in order to ensure that all temperatures computed from the equations are conservative.

The third method was the use of values directly from other design inputs that had determined the required flowrate for those components at various temperatures, such as a chiller analysis for ERCW temperature change. The values were tabulated in Excel, and an Excel trendgraph was produced, with a trendline. A second order polynomial curve that fit the trendline was selected. From the polynomial curve, a curve fit equation was developed and used to determine the required maximum supply temperature if the hydraulic analysis shows the HX receives less than the required design flowrate. The results were reduced further in order to ensure that all temperatures computed from the equations are conservative.

3.2.3 Determination of Acceptability of Available ERCW Flowrates

The analysis compared the available flow under specific plant conditions, referred to as cases (e.g., one ERCW pump per train operation) to the required flow. If the available flow rate is less than the required flow rate for 87°F, the curve fit equations are applied to determine the applicable limitations on the ERCW supply header water temperature.

To determine the available flow for the specific plant condition of concern, the ERCW Flow Balanced Hydraulic Model (Multiflow Model) was configured for several different cases. To determine the available ERCW flow when only one ERCW pump per train is in operation, the Multiflow Model was configured in the various cases listed in Table 3.2-1, which describes alignments that may occur during single unit shutdowns, and would support an extended Completion Time for one ERCW System train to support cleaning shutdown boards. Specifically, this would occur because of the removal of the two ERCW pumps associated with an out of service 6.9 kV shutdown board, with one unit shutdown, and various components with their ERCW supply isolated. The results from the Multiflow Model for each ERCW pump outage case are listed in Tables 3.2-2 through 3.2-4.

The ERCW flow values determined in the Multiflow hydraulic analysis had a five percent uncertainty subtracted from each calculated flow value to account for the measurement and analysis uncertainties. The five percent uncertainty was accepted by the NRC in a previously approved license amendment (References 2 and 3). The five percent subtraction bounds the measurement and analysis uncertainties.

In addition to the margin described above, valve leakage of up to 100 gpm was determined to not affect the results of the Multiflow analysis. The various groupings of valves that are boundary valves to each train of ERCW are described and evaluated below.

- Although, each ERCW train is independent, there are two locations where the trains touch. These locations have a single isolation valve separating the trains. SQN enters TS 3.0.3 (both trains inoperable) if one of these valves is opened with either unit in Modes 1-4. During recent maintenance activities, wherein the piping system physically close to these valves was opened, these valves were visually verified to be not leaking. Operating experience indicates that this type of valve,(i.e., Pratt rubber seated butterfly, the seat is vulcanized to the body, entire inside of the valve body is covered), is very dependable with respect to leakage.

- Each ERCW train has four pumps. Leakage from the non-running pump's discharge check valves would be lost system inventory. The ASME Section XI tests for the ERCW pumps are set up in such a way that leakage through the non-running pump's discharge check valves is determined as a part of the ASME Section XI quarterly pump tests. Check valve leakage would appear as a loss of the tested ERCW pump capacity.

- The Multiflow model credits zero flow at the various containment penetrations, under conditions where a containment isolation would occur. Because each containment penetration is actually a closed loop inside containment, there are four isolation valves in series on each loop that would stop ERCW flow (inboard and outboard Containment Isolation Valves (CIVs) for the supply line and inboard and outboard CIVs for the return line). All of these valves are in the TVA 10 CFR 50 Appendix J program, with acceptance criteria for allowable leakage and have excellent histories on non-leakage. Any leakage that meets 10 CFR 50 Appendix J acceptance criteria through any one valve is negligible with respect to the hydraulic models.

- The non-accident unit's Containment Spray Heat Exchangers (CSHX) are assumed in the analysis to have zero leakage. The actual condition of these valves is validated during routine maintenance draining of the heat exchangers. These valves have not been noted to leak during such activities. Also, these HXs are maintained in wet layup, with the water quality verified quarterly. Leakage of 1 gpm would be readily apparent. Additionally, each CSHX has an inlet and outlet valve that is normally closed. To affect the analysis, both valves would have to have significant leakage.

- ERCW to Station Air Compressors (SAC). The SACs are not safety related. The normal cooling water supply to the SACs is from the non-safety related Raw Cooling Water system. The ERCW system is capable of providing a backup cooling water source. Each train of ERCW has a supply line to the SAC, with a single 4" isolation valve that is normally closed. These valves are examined for leakage during routine maintenance on the check valves located downstream of the valves. No significant leakage has been noted. Operating Experience indicates that these valves are very dependable with respect to leakage. Due to the small size of these valves, leakage is not a concern with respect to the overall ERCW system flow model.

- ERCW to AFW tell-tale drains. The ERCW system is the backup source of water to the suction of the AFW pumps. At each location, there are two isolation valves in series, with a normally-open 1" tell-tale drain in between. The ERCW supplies to the Turbine Driven AFW pump are from the ERCW supply headers. The hydraulic analysis assumes that ERCW is being supplied to the Turbine Driven AFW pump. The 1" tell tale drains for these pumps have a 1/4" tube attached to them, routed to a floor drain. The small size of this tube makes this flow path small enough to be negligible. The motor-driven AFW pumps are supplied from the ERCW discharge headers. It is conservative to the analysis to assume that ERCW is not supplied to the motor driven AFW pumps or leaking through the tell-tale drains. For these reasons, the possible leakage from ERCW at the AFW pumps would not adversely affect the ERCW System hydraulic analysis.

- ERCW to EDG Alternate supply. Each of the EDGs are cooled by the ERCW System. The normal, credited, cooling water source for each EDG is supplied by the corresponding train of ERCW. As a backup, each EDG has a cooling water supply line from the opposite train of ERCW. The EDG cannot be declared operable with the opposite train supplying the cooling water. There is no automatic actuation that will open the alternate ERCW 6" supply valves. Due to the relatively small amount of leakage that could leak through a valve of this size, and the hydraulic location of these valves in the system, any leakage would have a negligible effect on the ERCW analysis.

In summary, potential valve leakage does not present a challenge to the analytical accuracy of the ERCW system hydraulic model.

The degraded pump curves that are used in the hydraulic analysis are also the basis for the ERCW pump ASME Section XI acceptance criteria. The ASME Section XI pump test procedures use the hydraulic calculation as the source of the pump test acceptance criteria. The pump test procedure acceptance criteria is the model pump curve, at the appropriate developed head, except where the Section XI allowable ranges are more restrictive.

The cases in Table 3.2-1 are labeled Outage 1 through Outage 4 for the analysis determining the restriction necessary when only one ERCW pump per train is operating. If the five percent reduced flow rate is less than the component's design required flow rate, a temperature limit is listed. If no temperature limit is listed, the five percent reduced flow rate is greater than the component's design required flow rate and the current average ERCW supply header water temperature TS limit of 87°F provides adequate heat removal capability.

The analysis for determining the acceptability of available ERCW flow rates was done by comparing the reconfigured available flow rate to the design required flow rate. If the reconfigured available flow rate is less than the design required flow rate, the curve fit equations are applied to determine the applicable limitation on the ERCW supply temperature.

Tables 3.2-2 (A Train) and 3.2-3 (B Train) present the results of the Multiflow analysis associated with Outage Cases 1 and 3 described in Table 3.2-1. Outage Cases 2 and 4 provide the results of the MSLB Multiflow Model runs described in Section 3.2.4.

Tables 3.2-2 through 3.2-4 are organized by component, listing the associated design required flow rates, Multiflow analysis results, and any required temperature limitations less than 87°F. The first column identifies the component that relies on the ERCW system as a heat sink. The second column is labeled "Required Flow," and lists the ERCW system design required flow rate, in gpm, at the TS limit of 87°F. The next three columns are duplicated in each ERCW system case. These duplicate columns are grouped by outage designation. The first of the three columns is labeled "Multiflow Results," the second of the three columns is labeled "minus 5%," and the third of the three columns is labeled "Temp Limit." Column 1 of 3 lists the reconfigured available flow rate, in gpm, determined by the Multiflow Model when aligned as identified in Table 3.2-1, and a postulated LOCA is occurring on the designated unit. Column 2 of 3 ("minus 5%") is the value listed in Column 1 of 3 minus five percent. Column 3 of 3 ("Temp Limit") lists the reduced ERCW system supply temperature limit required because the Column 2 of 3 flow rate (reconfigured available flow rate minus five percent) is less than the component's design required flow rate listed in the "Required Flow" column. This temperature limitation was determined using the reconfigured available flow rate minus five percent, and the curve fit equation for the specific component that was previously developed. The last row in Tables 3.2-2 through 3.2-4 lists the maximum temperature limit determined for each ERCW system pump outage case.

In determining the limiting conditions for examining the ERCW system capabilities when only one ERCW pump is in operation, two design basis accidents were reviewed: a LOCA and a Main Steam Line Break (MSLB) inside containment. These accident scenarios were examined to support removing one 6.9 kV shutdown board from service, along with its associated EDG, to perform maintenance on the 6.9 kV shutdown board and its associated 480 V boards.

With both Unit 1 and Unit 2 in Mode 1, 2, 3, or 4, TS 3.7.8 requires two ERCW trains to be operable. The SQN TS Bases state that the OPERABILITY of the ERCW 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. The assumption used is that two ERCW pumps will operate in one train during the hypothetical combined accident and loss of normal power, assuming one of the other train's EDGs fail.

Once the initial conditions of one unit in Mode 5, 6, or defueled was modeled in the Multiflow Model, additional conditions were established that isolated various ERCW loads on the unit that was shutdown. Because one unit is in a shutdown condition, several of the shutdown unit's ESF loads are not required and can be isolated. Isolation of these unnecessary loads with the header crossties open increases the available ERCW supply to the required ERCW loads of the operating unit. Table 3.2-1 provides details of the initial conditions established for the Multiflow Model runs. The results of the calculations for only one ERCW pump in service are contained in Tables 3.2-2 through 3.2-4. For each outage case, the ERCW Multiflow Model is configured as described in Table 3.2-1.

Four outage alignment cases were run. Two of the alignment cases, Outages 1 and 3, were run based on postulating that the operating unit has a LOCA. The other two alignment cases, Outages 2 and 4, were run based on postulating the operating unit has an MSLB inside containment. Outages 1 and 3 were used to determine whether all ESF components would receive sufficient ERCW flow rate to remove the component heat loads. Outages 2 and 4 were used to determine if the lower containment vent coolers (LCCs) received sufficient flow rate to remove the heat load assumed for equipment qualification of certain equipment located in the lower containment compartment. Table 3.2-4 shows the results of the MSLB run for the LCCs, which is discussed in Section 3.2.4, "Equipment Environmental Qualification Issue."

3.2.4 Equipment Environmental Qualification Issue

As described in Section 3.2.3, Multiflow Model runs were prepared assuming an MSLB inside containment . Outage Cases 2 and 4 of Table 3.2-1 provide the initial conditions for the MSLB Multiflow Model runs. Outage Cases 2 and 4 of Table 3.2-4 provide the corresponding ERCW flow results. Outages 2 and 4 in Table 3.2-4 were prepared to ensure the lower containment vent coolers (LCCs) received the required 200 gpm flow rate with one pump operating on the affected train.

Based on the Multiflow Model results (Table 3.2-4), no additional ERCW supply temperature limitations are required. In the event that LCCs are required on the inoperable train, if necessary, operators will reduce ERCW flow in the accident unit's Containment Spray Heat Exchangers and A-train Component Cooling System (CCS) Heat Exchanger to ensure the required flow is available to the Lower Compartment Coolers. Reducing flow to these components is acceptable since this is a long-term action which applies after containment spray flow is no longer needed (due to break flow terminating as the affected steam generator blows dry) and since the CCS heat load following a steam line break is significantly lower than the post-LOCA heat load. These actions ensure the environmental qualification temperature limitation on instrumentation in lower containment is not exceeded.

3.2.5 Summary of Results

One ERCW Pump per Train Operation

Unit 1 in Operation, Unit 2 Shutdown

- The ERCW system design function for Train A can be met with only one running ERCW pump per train, during a Unit 2 cold shutdown outage, subject to a maximum ERCW supply temperature of 81°F. The analysis assumptions include that the 2A EDG, 2A CS HX, U2 TDAFW pump, 2A and 2C LCC groups, 2A and 2C UCCs, 2A IIRC all have no ERCW flow. The analysis assumed that the yard header, the 16-inch Auxiliary Building header, and the 6-inch ESF header crossties are in service on Train A ERCW.

- The ERCW system design function for Train B can be met with only one running ERCW pump per train, during a Unit 2 cold shutdown outage, subject to a maximum ERCW supply temperature of 82°F. The analysis assumptions include that the 2B EDG, 2B CS HX, U2 TDAFW pump, 2B and 2D LCC groups, 2B and 2D UCCs, and 2B IIRC all have no ERCW flow. The analysis assumed that the yard header, the 16-inch Auxiliary Building header, and the 6-inch ESF header crossties are in service on Train B ERCW. Also, the ERCW flow to the 1B Control Rod Drive cooler must be isolated.

Unit 2 in Operation, Unit 1 Shutdown

- The ERCW system design function for Train A can be met with only one running ERCW pump per train, during a Unit 1 cold shutdown outage, subject to a maximum ERCW supply temperature of 79°F. The analysis assumptions include that the 1A EDG, 1A CS HX, U1 TDAFW pump, 1A and 1C LCC groups, and 1A IIRC all have no ERCW flow. The analysis assumed that the yard header, the 16-inch Auxiliary Building header, and the 6-inch ESF header crossties are in service on Train A ERCW.

- The ERCW system design function for Train B can be met with only one running ERCW pump per train, during a Unit 1 cold shutdown outage, subject to a maximum ERCW supply temperature of 82°F. The analysis assumptions include that the 1B EDG, 1B CS HX, U1 TDAFW pump, 1B and 1D LCC groups, and 1B IIRC all have no ERCW flow. The analysis assumed that the yard header, the 16-inch Auxiliary Building header, and the 6-inch ESF header crossties are in service on Train B ERCW.

The proposed average ERCW supply header water temperature limit for Unit 1 and Unit 2 listed in the ERCW TS is ≤ 79°F based on the Unit 2 Train A results.

3.2.6 Generic Letter 89-13 Program

In Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment," the NRC requested that licensees perform the action listed in the GL or equally effective actions to ensure that their service water systems are in compliance and will be maintained in compliance with 10 CFR Part 50, Appendix A, General Design Criteria 44, 45, and 46 and Appendix B, Section XI. By the definition of "service water" found in the generic letter, "the system or systems that transfer heat from safety related structures, systems, or components to the UHS," this system at SQN is the ERCW system. In accordance with GL 89-13, a continuing program is maintained to perform periodic inspections of the ERCW intake structure for biological fouling mechanisms, sediment and corrosion. In addition, a continuing test/inspection program is maintained to verify the heat transfer capability of all safety related HXs included in the GL 89-13 program.

Additional details associated with SQN's ERCW HXs and GL 89-13 program were provided to the NRC as a part of TVA's License Amendment Request to raise the UHS temperature limit and water level limit (Reference 2). This request was approved by the NRC under License Amendment 317/307 [Unit 1/Unit 2] (Reference 3).

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

The NRC's regulatory requirements related to the content of the TSs are contained in 10 CFR 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.
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 TSs is required. Furthermore, the requirements of 10 CFR 50.59 necessitate that the NRC approve the TS changes before they are implemented. TVA's submittal meets the requirements of 10 CFR 50.59(c)(1)(i) and 10 CFR 50.90.

General Design Criteria

SQN was designed to meet the intent of the Proposed General Design Criteria for Nuclear Power Plant Construction Permits published in July 1967. The SQN construction permit was issued in May 1970. The UFSAR, however, addresses the NRC GDCs published as Appendix A to 10 CFR 50 in July 1971. Conformance with the GDCs is described in Section 3.1.2 of the UFSAR.

Each criterion listed below is followed by a discussion of the design features and procedures that meet the intent of the criteria. Any exception to the 1971 GDCs resulting from the earlier commitments is identified in the discussion of the corresponding criterion.

Criterion 2, "Design Bases for Protection Against Natural Phenomena"

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 function. The design bases for these structures, systems, and components shall reflect:

1. Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated,

2. Appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and

3. The importance of the safety functions to be performed.

SQN Criterion 2 Compliance

The 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. Appropriate combinations of normal, accident, and natural phenomena structural loadings are considered in the plant design.

This proposed LAR has no effect on SQN's compliance with Criterion 2 as described above.

Criterion 5, "Sharing of Structures, Systems, and Components"

Structures, systems, and components important to safety shall not be shared between nuclear power units unless it is 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.

SQN Criterion 5 Compliance

The two SQN units share several structures and systems, many of which have no safety function. 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 include the ERCW, component cooling, fire protection, fuel handling/storage and cooling, fuel oil storage, preferred and emergency electric power, chemical and volume control, condensate, radioactive waste, gas treatment, and Control and Auxiliary Building ventilation systems. The Vital Direct-Current (DC) Power System is shared to the extent that a few loads (e.g., the vital inverters) in one nuclear unit are energized by the DC power channels assigned primarily to power loads of the other unit. 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 the 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.

This proposed LAR has no effect on SQN's compliance with Criterion 5 as described above.

Criterion 18, "Inspection and Testing of Electric Power Systems"

Electric Power Systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components. The systems shall be designed with a capability to test periodically (1) the operability and functional performance of the components of the systems, such as onsite power sources, relays, switches, and buses, and (2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system and the onsite power system.

SQN Criterion 18 Compliance

In addition to continuous surveillance by visual and audible alarms for any abnormal condition, the onsite power system is designed to permit inspection and checking of wiring, insulation, connections, and switchboards to the extent that personnel safety is not jeopardized, equipment not damaged, and the plant not exposed to accidental tripping.

Approval of this LAR is one part of the activities needed to permit maintenance on the 6.9 kV shutdown boards while maintaining personnel safety, preventing equipment damage, and minimizing exposure of the plant to accidental tripping. The proposed changes in this LAR will ensure SQN's continued compliance with Criterion 18.

Criterion 44, "Cooling Water"

A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions.

Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure.

SQN Criterion 44 Compliance

A Seismic Category I CCS is provided to transfer heat from the RCS, and selected reactor support equipment to a Seismic Category I ERCW system. The CSS HXs are cooled directly by ERCW.

The CCS consists of two independent ESF subsystems, each of which is capable of serving all necessary loads under normal or accident conditions, powered by either offsite sources or onsite emergency power sources.

In addition to serving as the heat sink for the CCS, the ERCW system is also used as the heat sink for the containment spray and ESF equipment through use of compartment and space coolers and selected seal jackets on ESF pumps. The ERCW system consists of two independent trains, each of which is capable of providing all necessary heat sink requirements. The ERCW system transfers heat to the UHS and is powered by either the offsite sources or the onsite emergency power sources.

This proposed LAR has no effect on SQN's compliance with Criterion 44 as described above.

Criterion 45, "Inspection of Cooling Water System"

The Cooling Water System shall be designed to permit appropriate periodic inspection of important components, such as HXs and piping, to assure the integrity and capability of the system.

SQN Criterion 45 Compliance

The CCS 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.

This proposed LAR has no effect on SQN's compliance with Criterion 45 as described above.

Criterion 46, "Testing of Cooling System"

The Cooling Water System shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leak-tight integrity of its components, (2) the operability and the performance of the active components of the system, and (3) the operability of the system as a whole and under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation for reactor shutdown and for LOCA, including operation of applicable portions of the protection system and the transfer between normal and emergency power sources.

SQN Criterion 46 Compliance

The CCS and the ERCW system are normally pressurized during plant operations. The systems/components are subject to tests per the ASME Section XI Inservice Inspection / Inservice Testing programs. The emergency functions of the systems are periodically tested out to the final actuated device.

This proposed LAR has no effect on SQN's compliance with Criterion 46 as described above.

4.2 Precedent

In Reference 3, the NRC approved the current UHS minimum water level at or above elevation 674 feet mean sea level United States Geological Survey (USGS) datum and an average ERCW supply header water temperature of less than or equal to 87°F for SQN, Units 1 and 2.

In Reference 1, the NRC approved a request for SQN Unit 1 to limit UHS temperature based on a temporary configuration of the ERCW system needed to support the Unit 2 steam generator replacement project. TVA used the same methodology in determining adequate heat removal capability of the ERCW system.

4.3 Significant Hazards Consideration

The proposed change adds new Condition A to Technical Specification (TS) 3.7.8, Essential Raw Cooling Water (ERCW) System for Sequoyah Nuclear Plant (SQN) Units 1 and 2. The proposed change will extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of reactor vessel flange and UHS Temperature is ≤ 79 degrees F. This change is needed to support required maintenance on the safety-related 6.9 kilovolt (kV) shutdown boards.

Tennessee Valley Authority (TVA) has concluded that the proposed change to TS 3.7.8, ERCW System, for SQN Units 1 and 2 does not involve a significant hazards consideration. TVA's conclusion is based on its evaluation in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.91(a)(1) of the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

1. *Does the proposed amendment involve a significant increase in the probability or consequence of an accident previously evaluated?*

   Response: No.

   The proposed change adds new Condition A to Technical Specification (TS) 3.7.8, Essential Raw Cooling Water (ERCW) System for Sequoyah Nuclear Plant (SQN) Units 1 and 2. The proposed change will extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of reactor vessel flange and UHS Temperature is ≤ 79 degrees F. This change does not result in any physical changes to plant safety-related structures, systems, or components (SSCs). The UHS and associated ERCW system function is to remove plant system heat loads during normal and accident conditions. As such, the UHS and ERCW system are not design basis accident initiators, but instead perform accident mitigation functions by serving as the heat sink for safety-related equipment to ensure the conditions and assumptions credited in the accident analyses are preserved. During operation under the proposed change with one ERCW train inoperable, the other ERCW train will continue to perform the design function of the ERCW system. Therefore, the proposed change does not involve a significant increase in the probability of an accident previously evaluated.

   Accordingly, as demonstrated by TVA design heat transfer and flow modeling calculations, operation with one ERCW System inoperable for 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of reactor vessel flange, the fuel cladding, Reactor Coolant System (RCS) pressure boundary, and containment integrity limits are not challenged during worst-case post-accident conditions. Accordingly, the conclusions of the accident analyses will remain as previously evaluated such that there will be no significant increase in the post-accident dose consequences.

Therefore, the proposed change does not involve a significant increase in the probability or consequence of an accident previously evaluated.

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

   Response: No.

   The proposed change does not involve any physical changes to plant safety related SSCs or alter the modes of plant operation in a manner that is outside the bounds of the current UHS and ERCW system design heat transfer and flow modeling analyses. The proposed change to add new Condition A to TS 3.7.8, ERCW System, which would extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. Thus, although the specified ERCW system alignments result in reduced heat transfer flow capability, the plant's overall ability to reject heat to the UHS during normal operation, normal shutdown, and hypothetical worst-case accident conditions will not be significantly affected by this proposed change. Because the safety and design requirements continue to be met and the integrity of the RCS pressure boundary is not challenged, no new credible failure mechanisms, malfunctions, or accident initiators are created, and there will be no effect on the accident mitigating systems in a manner that would significantly degrade the plant's response to an accident.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No.

   The proposed change to add new Condition A to TS 3.7.8, ERCW System, which would extend the allowed completion time to restore ERCW System train to OPERABLE status from 72 hours to 7 days for planned maintenance when the opposite unit is defueled or in mode 6 following defueled with refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. As demonstrated by TVA design basis heat transfer and flow modeling calculations, the design limits for fuel cladding, RCS pressure boundary, and containment integrity are not exceeded under both normal and post-accident conditions. As required, these calculations include evaluation of the worst-case combination of meteorology and operational parameters, and establish adequate margins to account for measurement and instrument uncertainties. While operating margins have been reduced by the proposed change in order to support necessary maintenance activities, the current limiting design basis accidents remain applicable and the analyses conclusions remain bounding such that the accident safety margins are maintained. Accordingly, the proposed change will not significantly degrade the margin of safety of any SSCs that rely on the UHS and ERCW system for heat removal to perform their safety related functions.

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 does not involve a 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.

Conclusions

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.

5.0 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. 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 effluents 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 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. Letter from Brendan T. Moroney (NRC) to William R. Campbell (TVA), "Sequoyah Nuclear Plant, Units 1 and 2 - Issuance of Amendments Regarding Increased Temperature and Level Limits of Ultimate Heat Sink (TAC NOS. MD2621 AND MD2622)," dated September 28, 2007. (ADAMS Accession No. ML072420043)

2. Letter from Glenn W. Morris (TVA to Document Control Desk (NRC), "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 – Technical Specifications (TS) Change 06-03, 'Ultimate Heat Sink (UHS) Temperature Increase and Elevation Changes Supplemental Information,' (TAC NOS. MD2621 & MD2622)," dated December 7, 2006. (ADAMS Accession No. ML063470029)

3. Letter from Brendan T. Moroney (NRC) to William R. Campbell (TVA), "Sequoyah Nuclear Plant, Units 1 and 2 - Issuance of Amendments Regarding Increased Temperature and Level Limits of Ultimate Heat Sink (TAC NOS. MD2621 AND MD2622)," dated September 28, 2007. (ADAMS Accession No. ML072420043)

4. Letter from TVA to NRC, "Planned Actions to Facilitate Maintenance of 6.9 Kilovolt and 480 Volt Shutdown Boards at Sequoyah Nuclear Plant, Units 1 and 2," dated July 17, 2012. (ADAMS Accession No. ML12202A011)

5. Letter from TVA to NRC, "Status Update of Planned Actions to Facilitate Maintenance of 6.9 Kilovolt and 480 Volt Shutdown Boards at Sequoyah Nuclear Plant, Units 1 and 2," dated October 26, 2012. (ADAMS Accession No. ML12307A111)

6. Letter from TVA to NRC, "Second Status Update of Planned Actions to Facilitate Maintenance of 6.9 Kilovolt and 480 Volt Shutdown Boards at Sequoyah Nuclear Plant, Units 1 and 2," dated March 28, 2013. (ADAMS Accession No. ML13092A103)

7. Letter from TVA to NRC, "Third Status Update of Planned Actions to Facilitate Maintenance of 6.9 Kilovolt and 480 Volt Shutdown Boards at Sequoyah Nuclear Plant, Units 1 and 2," dated September 30, 2013. (ADAMS Accession No. ML13276A049)

7.0 TABLES

Table 3.2-1
One Pump per Loop ERCW Operation Case Description

Case Number [a]	Crosstie Operation	Plant Condition	Prerequisite ERCW Component Alignment	Post-Event Alignment	CCS Pre-condition	Failure / Results
Outage 1a	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U1 LOCA, Unit 2 outage	The ERCW is isolated to the 2A EDG, 2A CS HX, U2 TDAFWP, 2A IIRC, and the U2 A-train LCC groups and UCCs.	No change to current procedures	2A CCS is not operable due to the 2A SDB being inoperable. Other loops must be operable.	Stipulate that the 1A SDB is lost. The B CCS, with any one of its three pumps, powered by either the 1B or 2B SDB, fulfills the CCS safety function
Outage 1b	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U1 LOCA, Unit 2 outage	The ERCW is isolated to the 2B EDG, 2B CS HX, U2 TDAFWP, 2B IIRC, and the U2 B-train LCC groups and UCCs; 1B CRD cooler[d]	No change to current procedures	2B CCS is not operable due to the 2B SDB being inoperable. Other loops must be operable.	Stipulate that the 1B SDB is lost. The 1A and 2A CCS loops, with the pumps powered by the 1A and 2A SDB respectively, fulfills the CCS safety function
Outage 2a	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U1 MSLB, Unit 2 outage	The ERCW is isolated to the 2A EDG, 2A CS HX, U2 TDAFWP, 2A IIRC, and the U2 A-train LCC groups and UCCs.	Isolate the 1A CSS HX, and place 1-FCV-67-146 in the 35% position [b, c].	2A CCS is not operable due to the 2A SDB being inoperable. Other loops must be operable.	Stipulate that the 1A SDB is lost. The B CCS, with any one of its three pumps, powered by either the 1B or 2B SDB, fulfills the CCS safety function
Outage 2b	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U1 MSLB, Unit 2 outage	The ERCW is isolated to the 2B EDG, 2B CS HX, U2 TDAFWP, 2B IIRC, and the U2 B-train LCC groups and UCCs; also the 1B CRD cooler[d]	Isolate the 1B CSS HXs[b, c]	2B CCS is not operable due to the 2B SDB being inoperable. Other loops must be operable.	Stipulate that the 1B SDB is lost. The 1A and 2A CCS loops, with the pumps powered by the 1A and 2A SDB respectively, fulfills the CCS safety function

(a) Case Number refers to a specific plant condition (e.g., Outage 1) as described in the "Crosstie Operation," "Plant Condition," and "Component Alignment" columns.
(b) Isolating the operating unit's CSS HX and placing valve FCV-67-146 in the 35% position are actions that may be necessary in the post-recirculation phase as discussed in LAR Section 3.2.4, Equipment Environmental Qualification Issue. Isolating these components is only necessary on the train that is aligned for one-pump operation.
(c) This analysis is the same as Outage 1a and 1b respectively, except what is being examined is the ability of the LCCs to receive 200 gpm in order to satisfy TRV 8.6.4.3.These manipulations are only necessary in order to satisfy that TRV.
(d) To ensure 1B CRD cooler is isolated, it is included in the prerequisite line up for one-pump operation if the B-train ERCW is aligned for one-pump operation.

Table 3.2-1
One Pump per Loop ERCW Operation Case Description

Case Number [a]	Crosstie Operation	Plant Condition	Prerequisite ERCW Component Alignment	Post-Event Alignment	CCS Pre-condition	Failure / Results
Outage 3a	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U2 LOCA, Unit 1 outage	The ERCW is isolated to the 1A EDG, 1A CS HX, U1 TDAFWP, 1A IIRC, and the U1 A-train LCC groups.	No change to current procedures	1A CCS is not operable due to the 1A SDB being inoperable. Other loops must be operable.	Stipulate that the 2A SDB is lost. The B CCS, with any one of its three pumps, powered by either the 1B or 2B SDB, fulfills the CCS safety function
Outage 3b	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U2 LOCA, Unit 1 outage	The ERCW is isolated to the 1B EDG, 1B CS HX, U1 TDAFWP, 1B IIRC, and the U1 B-train LCC groups.	No change to current procedures	1B CCS is not operable due to the 1B SDB being inoperable. Other loops must be operable.	Stipulate that the 2B SDB is lost. The 1A and 2A A CCS loops, with the pumps powered by the 1A and 2A SDB respectively, fulfills the CCS safety function
Outage 4a	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U2 MSLB, Unit 1 outage	The ERCW is isolated to the 1A EDG, 1A CS HX, U1 TDAFWP, 1A IIRC, and the U1 A-train LCC groups.	Isolate the 2A CSS HX, and place 2-FCV-67-146 in the 35% position[b, c]	1A CCS is not operable due to the 1A SDB being inoperable. Other loops must be operable.	Stipulate that the 2A SDB is lost. The B CCS, with any one of its three pumps, powered by either the 1B or 2B SDB, fulfills the CCS safety function
Outage 4b	Yard Header Crossties, 6" ESF Header Crossties and 16" Aux Bldg Header Crossties are all open.	U2 MSLB, Unit 1 outage	The ERCW is isolated to the 1B EDG, 1B CS HX, U1 TDAFWP, 1B IIRC, and the U1 B-train LCC groups.	Isolate the 2B CSS HX [b]	1B CCS is not operable due to the 1B SDB being inoperable. Other loops must be operable.	Stipulate that the 2B SDB is lost. The 1A and 2A CCS loops, with the pumps powered by the 1A and 2A SDB respectively, fulfills the CCS safety function

(a) Case Number refers to a specific plant condition (e.g., Outage 1) as described in the "Crosstie Operation," "Plant Condition," and "Component Alignment" columns.
(b) Isolating the operating unit's CSS HX and placing valve FCV-67-146 in the 35% position are actions that may be necessary in the post-recirculation phase as discussed in LAR Section 3.2.4, Equipment Qualification Issue. Isolating these components is only necessary on the train that has the one-pump operable alignment.
(c) This analysis is the same as Outage 3a and 3b respectively, except what is being examined is the ability of the LCCs to receive 200 gpm in order to satisfy TRV 8.6.4.3.These manipulations are only necessary in order to satisfy that TRV.

Table 3.2-2
Train A One Pump Outages 1 and 3

A-Train ERCW components	Required Flow (gpm)	Outage 1a			Outage 3a		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)
EDG 1A1	522.0	481.1	457.0	82.8	0.0	0.0	---
EDG 1A2	522.0	473.8	450.1	82.3	0.0	0.0	---
EDG 2A1	522.0	0.0	0.0	---	460.7	437.7	81.4
EDG 2A2	522.0	0.0	0.0	---	435.6	413.8	79.5
ELECT BD RM CHR A	163.9	153.3	145.6	85.1	145.9	138.6	84.4
MCR CHILLER A	95.4	108.8	103.4	---	103.5	98.3	---
SHUTDOWN BD RM CHR A	380.0	361.9	343.8	84.9	347.2	329.8	84.1
CCP PMP OIL CLR 1A	23.0	24.7	23.5	---	23.5	22.3	86.1
CCP Gear OIL CLR 1A	12.0	14.0	13.3	---	13.3	12.6	---
CCP RM CLR 1A	34.0	35.1	33.3	86.6	33.5	31.8	86.1
CCP PMP OIL CLR 2A	23.0	27.1	25.7	---	25.2	23.9	---
CCP Gear OIL CLR 2A	12.0	15.0	14.3	---	13.9	13.2	---
CCP RM CLR 2A	34.0	39.5	37.5	---	36.7	34.9	---
SIS PMP RM CLR 1A	18.0	26.7	25.4	---	25.2	23.9	---
SIS OIL CLR 1A	4.1	7.9	7.5	---	7.5	7.1	---
SIS PMP RM CLR 2A	18.0	25.6	24.3	---	23.9	22.7	---
SIS OIL CLR 2A	4.1	9.7	9.2	---	9.1	8.6	---
EGTS 2A	9.0	11.1	10.5	---	10.2	9.7	---
AUX CONT AIR A	5.1	4.7	4.5	84.9	4.5	4.3	84.2
SFP & TBBP CLR 1A	28.0	29.2	27.7	86.8	27.9	26.5	86.3
CCS & AFW CLR 1A	55.0	84.0	79.8	---	79.9	75.9	---
BAT & AFW CLR 2A	62.0	57.4	54.5	85.7	53.1	50.4	85.2
714 PEN RM CLR 1A	19.0	23.9	22.7	---	22.6	21.5	---
714 PEN RM CLR 2A	19.0	23.9	22.7	---	22.4	21.3	---
690 PEN RM CLR 1A	12.0	23.7	22.5	---	22.4	21.3	---
690 PEN RM CLR 2A	12.0	22.7	21.6	---	21.3	20.2	---
669 PEN RM CLR 1A	17.0	39.5	37.5	---	37.3	35.4	---
669 PEN RM CLR 2A	17.0	46.0	43.7	---	43.0	40.9	---
PIPE CHASE CLR 1A	29.0	47.4	45.0	---	44.8	42.6	---
PIPE CHASE CLR 2A	29.0	37.8	35.9	---	35.4	33.6	---
CNT SPRAY PMP RM CLR 1A	10.0	19.8	18.8	---	18.7	17.8	---
CNT SPRAY PMP RM CLR 2A	10.0	27.7	26.3	---	25.9	24.6	---
RHR PMP RM CLR 1A	15.0	13.6	12.9	85.6	12.8	12.2	85.2

Table 3.2-2
Train A One Pump Outages 1 and 3

A-Train ERCW components	**Required Flow (gpm)**	Outage 1a			Outage 3a		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)
RHR PMP RM CLR 2A	15.0	17.5	16.6	---	16.3	15.5	---
CCS HX 1A1/1A2	3605.0	3243.1	3080.9	81.7	1504.4	1429.2	---
CCS HX 2A1/2A2	1348.0	1269.7	1206.2	82.0	3366.2	3197.9	82.5
CSS HX 1A	3400.0	3205.8	3045.5	82.6	0.0	0.0	---
CSS HX 2A	3400.0	0.0	0.0	---	3202.2	3042.1	---
MINIMUM TEMPERATURE:				81.7			79.5

Table 3.2-3
Train B One Pump Outages 1 and 3

B-Train ERCW components	Required Flow (gpm)	Outage 1b			Outage 3b		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)
EDG 1B1	522.0	539.1	512.1	86.0	0.0	0.0	---
EDG 1B2	522.0	503.5	478.3	84.2	0.0	0.0	---
EDG 2B1	522.0	0.0	0.0	---	501.7	476.6	84.1
EDG 2B2	522.0	0.0	0.0	---	515.1	489.3	84.8
ELECT BD RM CHR B	163.9	162.7	154.6	85.8	167.0	158.7	86.0
MCR CHILLER B	95.4	119.7	113.7	---	122.8	116.7	---
SHUTDOWN BD RM CHR B	380.0	349.8	332.3	84.2	349.0	331.6	84.2
CCP PMP OIL CLR 1B	23.0	19.5	18.5	84.7	20.0	19.0	84.9
CCP Gear OIL CLR 1B	12.0	10.7	10.2	84.5	11.0	10.5	84.7
CCP RM CLR 1B	34.0	29.2	27.7	85.3	30.0	28.5	85.4
CCP PMP OIL CLR 2B	23.0	27.0	25.7	---	27.0	25.7	---
CCP Gear OIL CLR 2B	12.0	14.3	13.6	---	14.4	13.7	---
CCP RM CLR 2B	34.0	37.3	35.4	---	37.4	35.5	---
SIS PMP RM CLR 1B	18.0	23.1	21.9	---	23.5	22.3	---
SIS OIL CLR 1B	4.1	9.0	8.6	---	9.2	8.7	---
SIS PMP RM CLR 2B	18.0	28.3	26.9	---	28.5	27.1	---
SIS OIL CLR 2B	4.1	9.7	9.2	---	9.7	9.2	---
EGTS 2B	9.0	11.6	11.0	---	11.6	11.0	---
AUX CONT AIR B	5.1	5.3	5.0	86.0	5.3	5.0	86.0
SFP & TBBP CLR 1B	28.0	27.4	26.0	86.2	28.2	26.8	86.4
CCS & AFW CLR 1B	55.0	77.5	73.6	---	79.6	75.6	---
BAT & AFW CLR 2B	62.0	57.0	54.2	85.6	57.2	54.3	85.7
714 PEN RM CLR 1B	19.0	24.7	23.5	---	25.2	23.9	---
714 PEN RM CLR 2B	19.0	25.9	24.6	---	26.1	24.8	---
690 PEN RM CLR 1B	12.0	23.9	22.7	---	24.4	23.2	---
690 PEN RM CLR 2B	12.0	24.4	23.2	---	24.5	23.3	---
669 PEN RM CLR 1B	17.0	29.3	27.8	---	29.8	28.3	---
669 PEN RM CLR 2B	17.0	46.8	44.5	---	47.1	44.7	---
PIPE CHASE CLR 1B	29.0	36.5	34.7	---	37.2	35.3	---
PIPE CHASE CLR 2B	29.0	38.4	36.5	---	38.7	36.8	---
CNT SPRAY PMP RM CLR 1B	10.0	21.4	20.3	---	21.8	20.7	---
CNT SPRAY PMP RM CLR 2B	10.0	29.7	28.2	---	29.9	28.4	---
RHR PMP RM CLR 1B	15.0	12.9	12.3	85.3	13.1	12.4	85.4
RHR PMP RM CLR 2B	15.0	15.5	14.7	86.7	15.6	14.8	86.8
CCS HX 0B1/0B2	3365.0	4338.3	4121.4	---	4395.7	4175.9	---

Table 3.2-3
Train B One Pump Outages 1 and 3

B-Train ERCW components	Required Flow (gpm)	Outage 1b			Outage 3b		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)
CSS HX 1B	3400.0	3210.7	3050.2	82.6	0.0	0.0	---
CSS HX 2B	3400.0	0.0	0.0	---	3182.4	3023.3	82.3
MINIMUM TEMPERATURE:				82.6			82.3

Table 3.2-4
LCC Available Flow Outages

Lower Containment Vent Coolers	Required Flow (gpm)	Outage 2a			Outage 4c		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit (°F)
1AA LCC	170.0	318.2	302.3	---	---	---	---
1CA LCC	170.0	288.2	273.8	---	---	---	---
2AA LCC	170.0	---	---	---	288.0	273.6	---
2CA LCC	170.0	---	---	---	247.8	235.4	---
MINIMUM TEMPERATURE:				---			---

Lower Containment Vent Coolers	Required Flow (gpm)	Outage 2b			Outage 4d		
		Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)	Multiflow Results (gpm)	minus 5% (gpm)	Temp Limit(*) (°F)
1BB LCC	170.0	225.0	213.8	---	---	---	---
1DB LCC	170.0	264.2	251.0	---	---	---	---
2BB LCC	170.0	---	---	---	242.1	230.0	---
2DB LCC	170.0	---	---	---	287.7	273.3	---
MINIMUM TEMPERATURE:				---			---

(*) Only temperatures less than the TS UHS maximum temperature limit of 87°F are indicated.

Table 3.2-5
Component Minimum Design Required ERCW Flow Rate

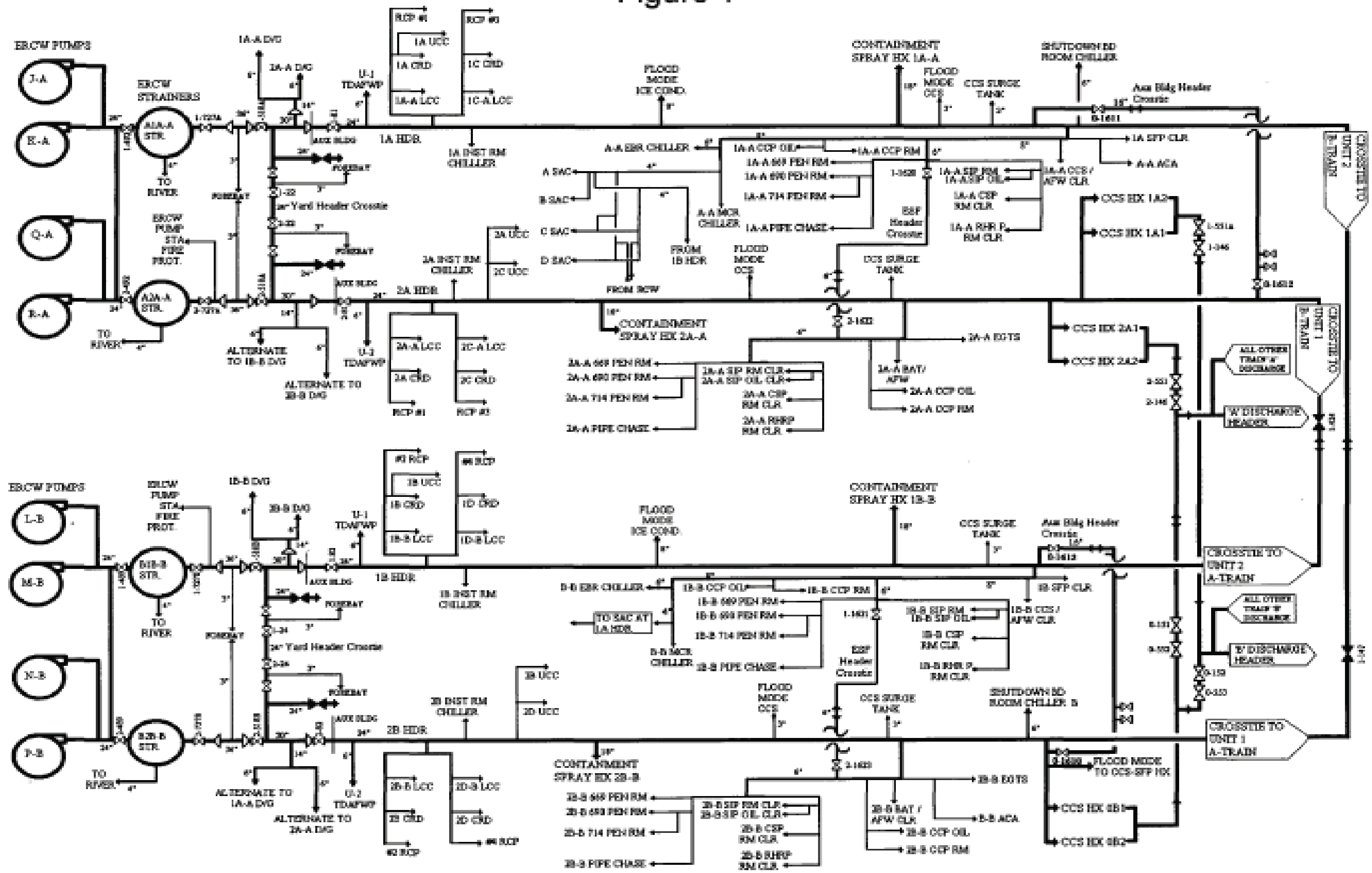
Component	Required Flow Rate[1] (gpm)
EDG HX	522
CCS HX Train A, LOCA unit	3605
CCS HX Train A, non-LOCA unit	1348
CCS HX 0B1/0B2	3365
CSS HX	3400
ELECTRIC (ELECT) BOARD (BD) ROOM (RM) CHILLER (CHR) A	163.9
MCR CHR A	95.4
SHUTDOWN BD RM CHR A	380
CENTRIFUGAL CHARGING PUMP (CCP) OIL COOLER (CLR)	23
CCP Gear OIL CLR	12
CCP RM CLR 1A	34
SIS PUMP (PMP) RM CLR	18
SIS OIL CLR	4.1
EMERGENCY GAS TREATMENT SYSTEM (EGTS)	9
AUXILIARY (AUX) CONTROL (CONT) AIR	5.1
SFP & THERMAL BARRIER BOOSTER PUMP (TBBP) CLR	28
CCS & AFW CLR	55
BORIC ACID TANK (BAT) & AFW CLR	62
714 PENETRATION (PEN) RM CLR	19
690 PEN RM CLR	12
669 PEN RM CLR	17
PIPE CHASE CLR	29
CONTAINMENT (CNT) SPRAY PMP RM CLR	10
RHR PMP RM CLR	15
LCC[2]	170

(1) Required flow rate supporting 87°F average ERCW supply temperature.

(2) The LCCs only have a safety function to help mitigate a non-LOCA high energy line break (HELB) inside containment, such as an MSLB. The design flow was determined to be 170 gpm in order to achieve the required thermal performance. However, TRV 8.6.4.3. requires that 200 gpm be available to each LCC.

8.0 FIGURE 1 - SIMPLIFIED ERCW FLOW DIAGRAM

Figure 1



Attachment 1

Proposed Technical Specifications Markups

3.7 PLANT SYSTEMS

3.7.8 Essential Raw Cooling Water (ERCW) System

LCO 3.7.8 Two ERCW System trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
-----------NOTES----------- 1. Only applicable when Unit 2 is defueled or in MODE 6 following defueled with Unit 2 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF ------------------------------- A. One ERCW System train inoperable for planned maintenance..	A.1 ------------NOTES--------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	7 days
	AND	
	A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF.	1 hour AND Once every 8 hours thereafter

~~A~~B. One ERCW System train inoperable for reasons other than Condition A.	~~A~~B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	72 hours
~~B~~C. Required Action and associated Completion Time of Condition A or B not met.	~~B~~C.1 Be in MODE 3. AND ~~B~~C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.8.1	-------------------------------NOTE------------------------------ Isolation of ERCW System flow to individual components does not render the ERCW System inoperable. --- Verify each ERCW System manual, power operated, and automatic valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.2	Verify each ERCW System automatic valve in the flow path servicing safety related equipment that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.3	Verify each ERCW System pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program

3.7 PLANT SYSTEMS

3.7.8 Essential Raw Cooling Water (ERCW) System

LCO 3.7.8 Two ERCW System trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
--------------NOTES------------- 1. Only applicable when Unit 1 is defueled or in MODE 6 following defueled with Unit 1 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF ------------------------------------- A. One ERCW System train inoperable for planned maintenance. .	A.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	 7 days
	<u>AND</u>	
	A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF	1 hour <u>AND</u> Once per 8 hours thereafter

~~A~~B. One ERCW System train inoperable for reasons other than Condition A.	~~A~~B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	72 hours
~~B~~C. Required Action and associated Completion Time of Condition A or B not met.	~~B~~C.1 Be in MODE 3. AND ~~B~~C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.8.1	-------------------------------NOTE------------------------------ Isolation of ERCW System flow to individual components does not render the ERCW System inoperable. --- Verify each ERCW System manual, power operated, and automatic valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.2	Verify each ERCW System automatic valve in the flow path servicing safety related equipment that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.3	Verify each ERCW System pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program

Attachment 2
Proposed TS Bases Page Markups (for information only)

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Raw Cooling Water (ERCW) System

BASES

BACKGROUND

The ERCW system provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the ERCW system also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The ERCW system consists of two separate and independent, 100% capacity, safety related, cooling water trains. The water supply and distribution system is essentially common to both units. Two common trains feed both units. Each train consists of two main supply headers, two strainers, four pumps, two traveling water screens, and associated piping, valving, and instrumentation. To meet the design requirements, with the Ultimate Heat Sink (UHS) temperature at its limit, the system requires two main supply headers, two strainers, and two pumps sharing one traveling screen. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops and selected by the selector switch are automatically started upon receipt of a safety injection signal, and the essential valves are aligned to their post accident positions. Additionally, each emergency diesel generator has two assigned ERCW pumps. The two assigned ERCW pumps are interlocked so that only the selected pump will start if offsite power is lost.

Additional information about the design and operation of the ERCW system, along with a list of the components served, is presented in the UFSAR, Section 9.2.2 (Ref. 1). The principal safety related function of the ERCW system is the removal of decay heat from the reactor via the CCS.

APPLICABLE SAFETY ANALYSES

The design basis of the ERCW system is for one ERCW system train, in conjunction with the CCS and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the UFSAR, Section 6.2 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The ERCW system is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The ERCW system, in conjunction with the CCS, also cools the unit from residual heat removal (RHR), as discussed in the UFSAR, Section 5.5.7,

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Ref. 3) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of component cooling water and RHR System trains that are operating. One ERCW system train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum ERCW system temperature of 87°F occurring simultaneously with maximum heat loads on the system.

The ERCW system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two ERCW system trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An ERCW system train is considered OPERABLE during MODES 1, 2, 3, and 4 when the required ERCW pumps are operable and the associated piping, valves, heat exchanger, and instrumentation and controls require to perform the safety related function as described in UFSAR Section 9.2.2.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ERCW system is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the ERCW system and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ERCW system are determined by the systems it supports.

ACTIONS

A.1

Condition A is modified by two notes that limit the conditions and parameters that allow entry into Condition A. The first note limits the applicability of Condition A to the time period when the opposite unit is either defueled or in MODE 6 following defueled with refueling water cavity level > 23 ft. above the top of the reactor vessel flange. The second note requires a temperature limitation on UHS Temperature. In order to credit the temperature limit, the effected ERCW train must been aligned in accordance with FSAR 9.2.2.2. This will allow the plant

configuration to be aligned (i.e., cross-ties exist and isolation of loads to facilitate maintenance and modification activities) to minimize the heat load on the ERCW system to ensure ERCW continues to meet its design function.

The 7 day completion time is acceptable based on the following:

- Low probability of a DBA occurring during that time
- Heat load on the ERCW System is substantially lower than assumed for the DBA with the opposite unit defueled or subsequent to defueled.
- Redundant capabilities afforded by the OPERABLE train

If one ERCW system train is inoperable for planned maintenance, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function.

Required Action A.1 is modified by two Notes. The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

Required Action A.2 ensures the credited temperature limit for Ultimate Heat Sink is maintained.

~~A.~~B.1

If one ERCW system train is inoperable for reasons other than Condition A, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function. Required Action ~~A~~B.1 is modified by two Notes.

BASES

ACTIONS (continued)

The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

~~B~~C.1 and ~~B~~C.2

If the ERCW system train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the ERCW system components or systems may render those components inoperable, but does not affect the OPERABILITY of the ERCW system.

Verifying the correct alignment for manual, power operated, and automatic valves in the ERCW system flow path provides assurance that the proper flow paths exist for ERCW system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies proper automatic operation of the ERCW system valves on an actual or simulated actuation signal. The Safety Injection signal is the automatic actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.8.3

This SR verifies proper automatic operation of the ERCW system pumps on an actual or simulated (i.e., Safety Injection) actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing during normal operation.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.2.
3. UFSAR, Section 5.5.7.

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Raw Cooling Water (ERCW) System

BASES

BACKGROUND

The ERCW system provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the ERCW system also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The ERCW system consists of two separate and independent, 100% capacity, safety related, cooling water trains. The water supply and distribution system is essentially common to both units. Two common trains feed both units. Each train consists of two main supply headers, two strainers, four pumps, two traveling water screens, and associated piping, valving, and instrumentation. To meet the design requirements, with the Ultimate Heat Sink (UHS) temperature at its limit, the system requires two main supply headers, two strainers, and two pumps sharing one traveling screen. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops and selected by the selector switch are automatically started upon receipt of a safety injection signal, and the essential valves are aligned to their post accident positions. Additionally, each emergency diesel generator has two assigned ERCW pumps. The two assigned ERCW pumps are interlocked so that only the selected pump will start if offsite power is lost.

Additional information about the design and operation of the ERCW system, along with a list of the components served, is presented in the UFSAR, Section 9.2.2 (Ref. 1). The principal safety related function of the ERCW system is the removal of decay heat from the reactor via the CCS.

APPLICABLE SAFETY ANALYSES

The design basis of the ERCW system is for one ERCW system train, in conjunction with the CCS and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the UFSAR, Section 6.2 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The ERCW system is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The ERCW system, in conjunction with the CCS, also cools the unit from residual heat removal (RHR), as discussed in the UFSAR, Section 5.5.7,

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Ref. 3) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of component cooling water and RHR System trains that are operating. One ERCW system train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum ERCW system temperature of 87°F occurring simultaneously with maximum heat loads on the system.

The ERCW system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two ERCW system trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An ERCW system train is considered OPERABLE during MODES 1, 2, 3, and 4 when the required ERCW pumps are operable and the associated piping, valves, heat exchanger, and instrumentation and controls required to perform the safety related function as described in UFSAR Section 9.2.2.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ERCW system is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the ERCW system and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ERCW system are determined by the systems it supports.

ACTIONS

A.1

Condition A is modified by two notes that limit the conditions and parameters that allow entry into Condition A. The first note limits the applicability of Condition A to the time period when the opposite unit is either defueled or in MODE 6 following defueled with refueling water cavity level > 23 ft. above the top of the reactor vessel flange. The second note requires a temperature limitation on UHS Temperature. In order to credit the temperature limit, the effected ERCW train must been aligned in accordance with FSAR 9.2.2.2. This will allow the plant

configuration to be aligned (i.e., cross-ties exist and isolation of loads to facilitate maintenance and modification activities) to minimize the heat load on the ERCW system to ensure ERCW continues to meet its design function.

The 7 day completion time is acceptable based on the following:

- Low probability of a DBA occurring during that time
- Heat load on the ERCW System is substantially lower than assumed for the DBA with the opposite unit defueled or subsequent to defueled.
- Redundant capabilities afforded by the OPERABLE train

If one ERCW system train is inoperable for planned maintenance, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function.

Required Action A.1 is modified by two Notes. The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

Required Action A.2 ensures the credited temperature limit for Ultimate Heat Sink is maintained.

~~A~~B.1

If one ERCW system train is inoperable for reasons other than Condition A, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function. Required Action ~~A~~B.1 is modified by two Notes.

BASES

ACTIONS (continued)

The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

~~B~~C.1 and ~~B~~C.2

If the ERCW system train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the ERCW system components or systems may render those components inoperable, but does not affect the OPERABILITY of the ERCW system.

Verifying the correct alignment for manual, power operated, and automatic valves in the ERCW system flow path provides assurance that the proper flow paths exist for ERCW system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies proper automatic operation of the ERCW system valves on an actual or simulated actuation signal. The Safety Injection signal is the automatic actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.8.3

This SR verifies proper automatic operation of the ERCW system pumps on an actual or simulated (i.e., Safety Injection) actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing during normal operation.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.2.
3. UFSAR, Section 5.5.7.

Attachment 3
Proposed Retyped Technical Specifications Pages

3.7 PLANT SYSTEMS

3.7.8 Essential Raw Cooling Water (ERCW) System

LCO 3.7.8 Two ERCW System trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
-----------NOTES----------- 1. Only applicable when Unit 2 is defueled or in MODE 6 following defueled with Unit 2 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF -------------------------------- A. One ERCW System train inoperable for planned maintenance..	A.1 ------------NOTES--------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. -------------------------------------- Restore ERCW System train to OPERABLE status.	 7 days
	<u>AND</u> A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF.	 1 hour <u>AND</u> Once every 8 hours thereafter

B. One ERCW System train inoperable for reasons other than Condition A.	B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	72 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.8.1	------------------------------NOTE------------------------------ Isolation of ERCW System flow to individual components does not render the ERCW System inoperable. -- Verify each ERCW System manual, power operated, and automatic valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.2	Verify each ERCW System automatic valve in the flow path servicing safety related equipment that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.3	Verify each ERCW System pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program

3.7 PLANT SYSTEMS

3.7.8 Essential Raw Cooling Water (ERCW) System

LCO 3.7.8 Two ERCW System trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
--------------NOTES------------- 1. Only applicable when Unit 1 is defueled or in MODE 6 following defueled with Unit 1 refueling water cavity level ≥ 23 ft. above top of reactor vessel flange. 2. Only applicable when Ultimate Heat Sink temperature is ≤ 79ºF ------------------------------------- A. One ERCW System train inoperable for planned maintenance. .	A.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status. AND A.2 Verify Ultimate Heat Sink temperature is ≤ 79ºF	7 days 1 hour AND Once per 8 hours thereafter

B. One ERCW System train inoperable for reasons other than Condition A.	B.1 --------------NOTES------------- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for emergency diesel generator made inoperable by ERCW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," for residual heat removal loops made inoperable by ERCW System. ------------------------------------- Restore ERCW System train to OPERABLE status.	 72 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. AND C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.8.1	------------------------------NOTE------------------------------ Isolation of ERCW System flow to individual components does not render the ERCW System inoperable. -- Verify each ERCW System manual, power operated, and automatic valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.2	Verify each ERCW System automatic valve in the flow path servicing safety related equipment that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.3	Verify each ERCW System pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program

Attachment 4
Proposed Retyped TS Bases Pages (for information only)

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Raw Cooling Water (ERCW) System

BASES

BACKGROUND	The ERCW system provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the ERCW system also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO. The ERCW system consists of two separate and independent, 100% capacity, safety related, cooling water trains. The water supply and distribution system is essentially common to both units. Two common trains feed both units. Each train consists of two main supply headers, two strainers, four pumps, two traveling water screens, and associated piping, valving, and instrumentation. To meet the design requirements, with the Ultimate Heat Sink (UHS) temperature at its limit, the system requires two main supply headers, two strainers, and two pumps sharing one traveling screen. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops and selected by the selector switch are automatically started upon receipt of a safety injection signal, and the essential valves are aligned to their post accident positions. Additionally, each emergency diesel generator has two assigned ERCW pumps. The two assigned ERCW pumps are interlocked so that only the selected pump will start if offsite power is lost. Additional information about the design and operation of the ERCW system, along with a list of the components served, is presented in the UFSAR, Section 9.2.2 (Ref. 1). The principal safety related function of the ERCW system is the removal of decay heat from the reactor via the CCS.
APPLICABLE SAFETY ANALYSES	The design basis of the ERCW system is for one ERCW system train, in conjunction with the CCS and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the UFSAR, Section 6.2 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The ERCW system is designed to perform its function with a single failure of any active component, assuming the loss of offsite power. The ERCW system, in conjunction with the CCS, also cools the unit from residual heat removal (RHR), as discussed in the UFSAR, Section 5.5.7,

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Ref. 3) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of component cooling water and RHR System trains that are operating. One ERCW system train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum ERCW system temperature of 87°F occurring simultaneously with maximum heat loads on the system.

The ERCW system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two ERCW system trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An ERCW system train is considered OPERABLE during MODES 1, 2, 3, and 4 when the required ERCW pumps are operable and the associated piping, valves, heat exchanger, and instrumentation and controls require to perform the safety related function as described in UFSAR Section 9.2.2.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ERCW system is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the ERCW system and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ERCW system are determined by the systems it supports.

ACTIONS

A.1

Condition A is modified by two notes that limit the conditions and parameters that allow entry into Condition A. The first note limits the applicability of Condition A to the time period when the opposite unit is either defueled or in MODE 6 following defueled with refueling water cavity level > 23 ft. above the top of the reactor vessel flange. The second note requires a temperature limitation on UHS Temperature. In order to credit the temperature limit, the effected ERCW train must been aligned in accordance with FSAR 9.2.2.2. This will allow the plant

configuration to be aligned (i.e., cross-ties exist and isolation of loads to facilitate maintenance and modification activities) to minimize the heat load on the ERCW system to ensure ERCW continues to meet its design function.

The 7 day completion time is acceptable based on the following:

- Low probability of a DBA occurring during that time
- Heat load on the ERCW System is substantially lower than assumed for the DBA with the opposite unit defueled or subsequent to defueled.
- Redundant capabilities afforded by the OPERABLE train

If one ERCW system train is inoperable for planned maintenance, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function.

Required Action A.1 is modified by two Notes. The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

Required Action A.2 ensures the credited temperature limit for Ultimate Heat Sink is maintained.

B.1

If one ERCW system train is inoperable for reasons other than Condition A, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function. Required Action B.1 is modified by two Notes.

BASES

ACTIONS (continued)

The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

C.1 and C.2

If the ERCW system train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the ERCW system components or systems may render those components inoperable, but does not affect the OPERABILITY of the ERCW system.

Verifying the correct alignment for manual, power operated, and automatic valves in the ERCW system flow path provides assurance that the proper flow paths exist for ERCW system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies proper automatic operation of the ERCW system valves on an actual or simulated actuation signal. The Safety Injection signal is the automatic actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.8.3

This SR verifies proper automatic operation of the ERCW system pumps on an actual or simulated (i.e., Safety Injection) actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing during normal operation.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.2.
3. UFSAR, Section 5.5.7.

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Raw Cooling Water (ERCW) System

BASES

BACKGROUND

The ERCW system provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the ERCW system also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The ERCW system consists of two separate and independent, 100% capacity, safety related, cooling water trains. The water supply and distribution system is essentially common to both units. Two common trains feed both units. Each train consists of two main supply headers, two strainers, four pumps, two traveling water screens, and associated piping, valving, and instrumentation. To meet the design requirements, with the Ultimate Heat Sink (UHS) temperature at its limit, the system requires two main supply headers, two strainers, and two pumps sharing one traveling screen. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops and selected by the selector switch are automatically started upon receipt of a safety injection signal, and the essential valves are aligned to their post accident positions. Additionally, each emergency diesel generator has two assigned ERCW pumps. The two assigned ERCW pumps are interlocked so that only the selected pump will start if offsite power is lost.

Additional information about the design and operation of the ERCW system, along with a list of the components served, is presented in the UFSAR, Section 9.2.2 (Ref. 1). The principal safety related function of the ERCW system is the removal of decay heat from the reactor via the CCS.

APPLICABLE SAFETY ANALYSES

The design basis of the ERCW system is for one ERCW system train, in conjunction with the CCS and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the UFSAR, Section 6.2 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The ERCW system is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The ERCW system, in conjunction with the CCS, also cools the unit from residual heat removal (RHR), as discussed in the UFSAR, Section 5.5.7,

BASES

APPLICABLE SAFETY ANALYSES (continued)

(Ref. 3) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of component cooling water and RHR System trains that are operating. One ERCW system train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum ERCW system temperature of 87°F occurring simultaneously with maximum heat loads on the system.

The ERCW system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two ERCW system trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An ERCW system train is considered OPERABLE during MODES 1, 2, 3, and 4 when the required ERCW pumps are operable and the associated piping, valves, heat exchanger, and instrumentation and controls required to perform the safety related function as described in UFSAR Section 9.2.2.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ERCW system is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the ERCW system and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ERCW system are determined by the systems it supports.

ACTIONS

A.1

Condition A is modified by two notes that limit the conditions and parameters that allow entry into Condition A. The first note limits the applicability of Condition A to the time period when the opposite unit is either defueled or in MODE 6 following defueled with refueling water cavity level > 23 ft. above the top of the reactor vessel flange. The second note requires a temperature limitation on UHS Temperature. In order to credit the temperature limit, the effected ERCW train must been aligned in accordance with FSAR 9.2.2.2. This will allow the plant

configuration to be aligned (i.e., cross-ties exist and isolation of loads to facilitate maintenance and modification activities) to minimize the heat load on the ERCW system to ensure ERCW continues to meet its design function.

The 7 day completion time is acceptable based on the following:

- Low probability of a DBA occurring during that time
- Heat load on the ERCW System is substantially lower than assumed for the DBA with the opposite unit defueled or subsequent to defueled.
- Redundant capabilities afforded by the OPERABLE train

If one ERCW system train is inoperable for planned maintenance, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function.

Required Action A.1 is modified by two Notes. The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

Required Action A.2 ensures the credited temperature limit for Ultimate Heat Sink is maintained.

B.1

If one ERCW system train is inoperable for reasons other than Condition A, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE ERCW system train is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ERCW system train could result in loss of ERCW system function. Required Action B.1 is modified by two Notes.

BASES

ACTIONS (continued)

The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," should be entered if an inoperable ERCW system train results in an inoperable emergency diesel generator. The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops - MODE 4," should be entered if an inoperable ERCW system train results in an inoperable residual heat removal loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period.

C.1 and C.2

If the ERCW system train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the ERCW system components or systems may render those components inoperable, but does not affect the OPERABILITY of the ERCW system.

Verifying the correct alignment for manual, power operated, and automatic valves in the ERCW system flow path provides assurance that the proper flow paths exist for ERCW system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies proper automatic operation of the ERCW system valves on an actual or simulated actuation signal. The Safety Injection signal is the automatic actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.8.3

This SR verifies proper automatic operation of the ERCW system pumps on an actual or simulated (i.e., Safety Injection) actuation signal. The ERCW system is a normally operating system that cannot be fully actuated as part of normal testing during normal operation.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.2.
3. UFSAR, Section 5.5.7.

Attachment 5

Proposed FSAR Changes (for information only)

The ERCW pumping station is located within the plant intake skimmer structure, and has direct communication with the main river channel for all reservoir levels including loss of downstream dam. The ERCW station and all equipment therein remain operable during the probable maximum flood. The system has the ability to remain operational during flood and loss of downstream dam. The normal minimum reservoir elevation is 675'. The ERCW system shall operate and deliver its rated flow when the reservoir is at the minimum design elevation of 639'. Section 2.4.11 discusses low water considerations. Section 2.4.A discusses the flood protection plan. Section 2.4.11.5.1 discusses two-unit operation.

The ERCW supply temperature maximum is 87^{o}F.

Supply water for the ERCW pumps enters the pumping station through each of four traveling water screens directly into a corresponding ERCW pump pit from which two ERCW pumps take suction.

Water is supplied to the auxiliary building from the ERCW pumping station through four independent sectionalized supply headers designated as 1A, 2A, 1B, and 2B. Four ERCW pumps are assigned to train A, and four to train B. The two headers associated with the same train (i.e., 1A/2A or 1B/2B) are cross-tied upstream of the Auxiliary Building to provide greater flexibility. This allows one supply header to be out of service (e.g., strainer maintenance), subject to ultimate heat sink limitation. The two 6" ERCW ESF headers and also the two 24" main supply headers associated with the same train (i.e., 1A/2A or 1B/2B) are cross-tied in the Auxiliary Building. All of the crossties may be in or out of service with no restrictions. These crossties exist to facilitate maintenance and modification activities and improve system hydraulic performance. Isolation of segments of the ERCW system may be performed in unit outages or with both units online subject to ~~various restrictions~~ on the ultimate heat sink temperature.

Insert 1

During all conditions of operation, the discharge from the various heat exchangers served by the ERCW System will go to a seismically-qualified open basin with overflow capability and then flow by gravity to the return channel of the natural draft Cooling Towers of the CCW System.

The ERCW System piping is arranged in four headers (1A, 1B, 2A, and 2B) each serving certain components in each unit as follows: Note that use of the crossties described above may modify some of these descriptions.

1. Each header supplies ERCW to one of the two containment spray heat exchangers associated with each unit.

2. The primary cooling source for each of the diesel generator heat exchangers is from the Unit 1 headers. Each diesel also has an alternate supply from the unit 2 headers of the opposite train.

3. 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.

4. Each A and B supply header in each unit header provides a backup source of feedwater for the turbine-driven auxiliary feed pumps in the respective unit.

5. Each of the two discharge headers provides a backup source of feedwater for the motor-driven auxiliary feedwater pumps in each unit.

6. Headers 1A and 1B provide ERCW cooling water to the Control Room and Control Building Electrical Board Room Air-condition Systems.

FSAR Insert 1 Page 9.2-10

The following list identifies the component configuration required to meet the Design Function of a single ERCW Loop with one operating ERCW pump:

For Unit 1 Train A One Pump Operation:

ERCW flow is isolated to the following components:

- 2A-A Diesel Generator Heat Exchangers;
- Unit 2 Containment Spray Heat Exchanger 2A;
- Unit 2 TDAFW Pump from the "2A" ERCW Main Supply Header;
- Lower Containment Vent Cooler 2A, Control Rod Drive Vent Cooler 2A, and Reactor Coolant Pump 2-1 Motor Cooler;
- Lower Containment Vent Cooler 2C, Control Rod Drive Vent Cooler 2C, and Reactor Coolant Pump 2-3 Motor Cooler;
- Upper Containment Vent Cooler 2A;
- Upper Containment Vent Cooler 2C; and
- Incore Instrumentation Room Water Coolers 2A.

The following components are in service:

- Train A ERCW yard header crosstie;
- Train A ERCW 16-inch Auxiliary Building header crosstie; and
- Train A ERCW 6-inch Engineered Safety Features (ESF) header crosstie

For Unit 1, Train B One Pump Operation

ERCW flow is isolated to the following components:

- 2B-B Diesel Generator Heat Exchangers
- Unit 2 Containment Spray Heat Exchanger 2B
- Unit 2 TDAFW Pump from the "2B" ERCW Main Supply Header
- Lower Containment Ventilation Cooler 2B, Control Rod Drive Vent Cooler 2B, and Reactor Coolant Pump 2-2 Motor Cooler
- Lower Containment Ventilation Coolers 2D, Control Rod Drive Vent Cooler 2D, and Reactor Coolant Pump 2-4 Motor Cooler
- Upper Containment Ventilation Coolers 2B
- Upper Containment Ventilation Coolers 2D
- Incore Instrumentation Room Water Coolers 2B
- ERCW flow to the 1B Control Rod Drive Vent Cooler

The following components are in service:

- Train B ERCW yard header crosstie
- Train B ERCW 16-inch Auxiliary Building header crosstie
- Train B ERCW 6-inch Engineered Safety Features (ESF) header crossties.

For Unit 2 Train A One Pump Operation:

ERCW flow is isolated to the following components:

- 1A-A Diesel Generator Heat Exchangers
- Unit 1 Containment Spray Heat Exchanger 1A
- Unit 1 TDAFW Pump from the "1A" ERCW Main Supply Header
- Lower Containment Vent Cooler 1A, Control Rod Drive Vent Cooler 1A, and Reactor Coolant Pump 1-1 Motor Cooler
- Lower Containment Vent Cooler 1C, Control Rod Drive Vent Cooler 1C, and Reactor Coolant Pump 1-3 Motor Cooler
- Incore Instrumentation Room Water Coolers 1A

The following components are in service:

- Train A ERCW yard header crosstie;
- Train A ERCW 16-inch Auxiliary Building header crosstie; and
- Train A ERCW 6-inch Engineered Safety Features (ESF) header crosstie

For Unit 2, Train B One Pump Operation

ERCW flow is isolated to the following components:

- 1B-B Diesel Generator Heat Exchangers
- Unit 1 Containment Spray Heat Exchanger 1B
- Unit 1 TDAFW Pump from the "1B" ERCW Main Supply Header
- Lower Containment Ventilation Cooler 1B, Control Rod Drive Vent Cooler 1B, and Reactor Coolant Pump 1-2 Motor Cooler
- Lower Containment Ventilation Coolers 1D, Control Rod Drive Vent Cooler 1D, and Reactor Coolant Pump 1-4 Motor Cooler
- Incore Instrumentation Room Water Coolers 1B

The following components are in service:

- Train B ERCW yard header crosstie
- Train B ERCW 16-inch Auxiliary Building header crosstie
- Train B ERCW 6-inch Engineered Safety Features (ESF) header crossties.

2. Earthquake with or without failure of main river dams above and below the site. Safe shutdown is assured by designing the ERCW pumping station, ERCW pumps, ERCW station traveling screens and screen wash pumps, and associated piping and structures to Class I seismic requirements. The ERCW pumping station is designed and located so as to maintain direct communication with the main river channel at minimum possible water level resulting from loss of the dams.

   A pipe rupture in the non-seismically qualified ERCW piping located in the turbine building is of no consequence because the ERCW piping is normally isolated.

3. Probable Maximum Flood with the coincident or subsequent loss of the upstream and/or downstream dams. To meet this condition the ERCW pumps, traveling screens, and screen wash pumps are protected from the probable maximum flood by the ERCW pumping station. The 27-hour flood warning period provides a more than adequate time period for cooling water system alignment, even assuming an initial difficulty in opening one of the non-redundant, manually-operated, butterfly valves. The construction of these valves is such that a failure which could preclude manual operation is extremely unlikely. However, if this did happen, the valve installation is such that rapid replacement (within a few hours) or repair can be accomplished with a minimum of manpower and equipment. Once cooling flow is established and adjusted, operation of any non-redundant valve is not required. During flood mode operation, all active components of the ERCW supply are redundant, and can therefore tolerate a single failure in the short or long term. A passive failure, consistent with the 50 gal/min loss rate specified in FSAR subsection 3.1.1, can be tolerated for an indefinite period without interrupting the required flow. The ERCW System would not furnish feedwater to the steam generators during the probable maximum flood. This would be provided by the Fire Protection System (subsection 9.5.1), by the method described in subsection 2.4A.2.2. During flood mode operations a single line, conforming to the single failure criteria outlined in FSAR Section 3.1.1, supplies cooling water to the spent fuel pit heat exchangers.

The availability of water for the most demanding condition on the ERCW System is based on the following events occurring simultaneously:

1. Loss of offsite power
2. Loss of downstream dam
3. Loss of two diesel generator units serving the same power train.
4. Design basis earthquake

Diesel generators are used to supply power for the pumps and valves in case of loss of offsite power. The loss of two diesel generators means that cooling water must be supplied with two ERCW pumps operating through two headers on the same plant train. Under all plant conditions, the yard header cross-tie in the CCW Pumping Station may remain open. Within limitations based on the ultimate heat sink temperature, an ERCW train may remain operable with a strainer isolated for maintenance by use of this cross-tie. The two 6” ERCW ESF headers and also the two 24” main supply headers associated with the same train (i.e., 1A/2A) are also cross-tied in the Auxiliary Building. These crossties may be in or out of service with no restrictions. These cross-ties exist to facilitate maintenance and modification activities. ~~Isolation of segments of the ERCW system may be performed in unit outages or with both units online subject to various restrictions on the ultimate heat sink temperature.~~

Certain combined modes of operation under the above circumstances are not within the design capability of the ERCW System. The modes that cannot be adequately supplied are simultaneously shutdown/cooldown of both units or one unit in shutdown/cooldown and the