Omaha Public Power District

444 South 16th Street Mall
Omaha, NE 68102-2247

LIC-11-0017
March 4, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Reference: Docket No. 50-285

SUBJECT: Fort Calhoun Station (FCS) License Amendment Request (LAR) 10-06, Proposed Change to Establish the Ultimate Heat Sink (UHS) Limiting Condition for Operation (LCO) and Addition of UHS Level and Temperature Surveillance Requirements

Pursuant to 10 CFR 50.90, the Omaha Public Power District (OPPD) hereby requests an amendment to the Renewed Facility Operating License No. DPR-40 for Fort Calhoun Station (FCS), Unit No. 1. The proposed amendment would establish the limiting condition for operation (LCO) requirements for the ultimate heat sink (UHS) in Technical Specification (TS) 2.16, *River Level*, and adds two new surveillance requirements (SRs) for UHS level and temperature to TS 3.2, *Equipment and Sampling Tests*, Table 3-5, *Minimum Frequencies for Equipment Tests*. Specifically, this proposed change: revises the title of LCO 2.16 from "River Level" to "Ultimate Heat Sink (UHS);" provides more explicit applicability for the LCO 2.16; removes the existing LCOs for river level in TS 2.16, Items 1) and (2); and, reformats TS LCO 2.16 to provide required actions for an inoperable UHS. In addition, two new SRs, Items 25 and 26, will be added to TS 3.2, Table 3-5, to test the river level and temperature on a daily frequency; and for consistency, the columns will be reformatted to allow adding the column header to Table 3-5 for Items 17 through 24. These TS revisions will result in the TS LCOs and SRs for the UHS (river level and temperature) being more aligned with NUREG-1432, *Standard Technical Specifications, Combustion Engineering Plants*, Revision 3, for UHS requirements. The Table of Contents is revised to reflect the title change of LCO 2.16.

In addition, the associated Basis for TS 2.16 is being modified to reflect the proposed UHS level and temperature LCO, remove the extraneous verbiage related to flooding levels, and revise the references. The Basis for TS 3.2 is also being revised to reflect the proposed UHS level and temperature SRs for UHS operability. These TS Bases Changes (TSBCs) are included for information and will be processed in accordance with TS 5.20.

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NRR

The proposed TS changes conform to NRC regulation 10 CFR 50.36 for the contents of the Technical Specifications.

OPPD concludes that the proposed LAR presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

The enclosure contains OPPD's evaluation of the proposed changes, including the supporting technical evaluation, and the significant hazards consideration determination. Attachment 1 provides the existing TS and TS Bases pages marked-up to show the proposed changes to TS 2.16 and 3.2. Attachment 2 provides the associated retyped (clean) TS and TS Bases pages.

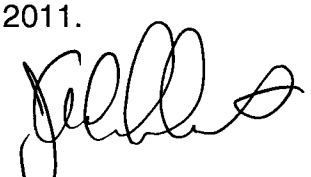
OPPD requests approval of the proposed amendment by March 4, 2012. Once approved, the amendment shall be implemented within 120 days.

There are no regulatory commitments associated with this proposed change.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated State of Nebraska official.

If you should have any questions regarding this submittal or require additional information, please contact Mr. Bill R. Hansher at 402-533-6894.

I declare under penalty of perjury that the foregoing is true and correct. Executed on March 4, 2011.



Jeffrey A. Reinhart
Site Vice President

Enclosure: OPPD's Evaluation of the Proposed Change(s)

c: Manager Radiation Control Program, Nebraska Health & Human Services, R & L Public Health Assurance, State of Nebraska

OPPD's Evaluation of the Proposed Change(s)

Fort Calhoun Station (FCS) License Amendment Request (LAR) 10-06, Proposed Change to Establish the Ultimate Heat Sink (UHS) Limiting Condition for Operation (LCO) and Addition of UHS Level and Temperature Surveillance Requirements

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ATTACHMENTS:

1. Technical Specification and Information Only Bases Pages Markups
2. Retyped ("Clean") Technical Specifications and Information Only Bases Pages

1.0 SUMMARY DESCRIPTION

This license amendment request (LAR) proposes a change to Renewed Facility Operating License No. DPR-40 for Fort Calhoun Station (FCS), Unit No. 1. The Omaha Public Power District (OPPD) proposes to revise the Technical Specification (TS) limiting condition for operation (LCO) 2.16, *River Level*, and TS 3.2, *Equipment and Sampling Tests*, Table 3-5, *Minimum Frequencies for Equipment Tests*. Specifically, this proposed change: revises the title of LCO 2.16 from "River Level" to "Ultimate Heat Sink (UHS);" provides more explicit applicability for the LCO 2.16; removes the existing LCOs for river level in TS 2.16, Items 1) and (2); and, reformats TS LCO 2.16 to provide required actions for an inoperable UHS. In addition, two new SRs, Items 25 and 26, will be added to TS 3.2, Table 3-5, to test the river level and temperature on a daily frequency. This proposed change also reformats columns to allow adding the column header to Table 3-5, Items 17 through 24, for consistency. The Table of Contents is also revised to reflect the title change of LCO 2.16. These TS revisions will result in the TS LCOs and SRs for the UHS (river level and temperature) being more aligned with NUREG-1432, *Standard Technical Specifications, Combustion Engineering Plants*, Revision 3, for UHS requirements.

2.0 DETAILED DESCRIPTION

The proposed TS changes for LAR 10-06 are as follows:

- TS LCO 2.16, *River Level*
  - LCO title is revised from "River Level" to "Ultimate Heat Sink (UHS)"
  - Applicability statement is being revised to add "operational status of the" and "for reactor coolant temperature $T_{cold} \geq 210°F$" for the Missouri River as this is absent from the current TS 2.16.
  - Objective statement is being revised to delineate that the objective of this LCO is to "ensure operability of the UHS" to assure safe reactor operation.
  - Specifications are being revised to:
    - Delete Items "1)" and "(2)" in their entirety as the Specifications are being replaced with a UHS specification more applicable to the UHS operability.
    - Add "UHS shall be OPERABLE."
  - Add "Required Actions" statement:

    "(1) With the UHS inoperable, be in HOT SHUTDOWN within 6 hours and COLD SHUTDOWN within the following 36 hours."

These proposed changes to TS 2.16 will result in the FCS TS LCO 2.16 being more aligned with NUREG 1432, *Standard Technical Specifications, Combustion Engineering Plants* for the UHS.

- TS Surveillance Requirement 3.2, *Equipment and Sampling Tests*
  - Table 3-5, *Minimum Frequencies for Equipment Tests*
    - Item 25, *River Level*, is being added to the table to verify the water level of the UHS is ≥ 976 feet 9 inches mean sea level on a daily (D) frequency.
    - Item 26, *River Temperature*, is being added to the table to verify water temperature of UHS is ≤ 90°F on a daily (D) frequency.
    - Table 3-5 is also being reformatted such that the column entitled "USAR Section Reference" is added for items 17 through 26. As a result, for these same items, under the column entitled "Frequency," the text is being "wrapped" to the next line(s) as appropriate, to ensure the text fits in the allotted column space for proper tabular formatting. These are administrative corrections which make Table 3-5 grammatically consistent throughout.

These proposed SRs are more aligned with the UHS SRs delineated in NUREG-1432.

- The Table of Contents (TOC), page 2, is also being revised to reflect the title change of LCO 2.16 from *River Level* to *Ultimate Heat Sink (UHS)*. This is an administrative change for TS consistency to ensure the titles in the TOC and the LCO are aligned.

The associated TS Bases Changes (TSBCs) for TS 2.16 and 3.2 proposed by LAR 10-06 are to provide clarification for the UHS operability LCO and SRs specific to the Missouri River level and temperature. The proposed TSBCs are provided for information purposes and will be processed in accordance with TS 5.20 as part of the amendment implementation.

3.0 TECHNICAL EVALUATION

System Description

The UHS provides a heat sink for processing and operating heat from safety related components during a design basis accident (DBA) or transient, as well as during normal operation. At Fort Calhoun Station (FCS), this is accomplished utilizing the raw water (RW) system and the component cooling water (CCW) System.

The UHS for FCS is the Missouri River. The UHS and supporting structures are capable of providing sufficient cooling and are sufficient to support safe shutdown and cooldown of the operating nuclear unit at the FCS site and maintain it in a safe condition. The basic performance requirements for the UHS are that an adequate supply of water be available, and that the design basis temperatures of safety related equipment not be exceeded.

Per Bases Section 3.7.9 of NUREG 1432 (Reference 6.4), the UHS has been defined as that complex of water sources, including necessary retaining structures (e.g., a pond with its dam, or a river with its dam), and the canals or conduits connecting the sources with, but not

including, the cooling water system intake structures, as discussed in the [Updated] Final Safety Analysis Report (USAR) (Reference 6.1, Section 9.8). The two principal functions of the UHS are the dissipation of residual heat after reactor shutdown, and dissipation of residual heat after an accident.

The UHS is the sink for heat removed from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on shutdown cooling (SDC). Normally, the main feedwater and condensate system is used to remove decay heat immediately after power operation if outside electric power is available. If outside power is not available, or if operating conditions require condenser shutdown, the auxiliary feedwater pumps will be used to remove decay heat.

The operating limits are based on conservative heat transfer analyses for the worst case loss of coolant accidents (LOCAs).

The UHS is required to be operable. The operability of the UHS is based on having a minimum Missouri River water level of 976 feet 9 inches mean sea level and a maximum river water temperature of 90°F. The minimum river level is based on the minimum level assumed in the USAR. If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the emergency core cooling system (ECCS) loads may be affected.

The UHS is considered operable if it contains water at or below the maximum temperature that would allow the RW system to operate following the design basis LOCA without the loss of net positive suction head (NPSH), and without exceeding the maximum design temperature of the equipment served by the RW system. To meet this condition, the UHS temperature must not exceed 90°F.

The 90°F river temperature limit is required to ensure the river provides an adequate heat sink. Calculation FC07259, *FCS RW/CCW GOTHIC Model- Additional Cases*, was previously performed using the integrated RW/CCW model developed in the FCS RSG-Gothic Integrated Model calculation, FC06979, *FCS RSG - GOTHIC Integrated Model.*" (Reference 6.6) Calculation FC07259 determined the maximum RW inlet temperature achievable without exceeding a peak CCW temperature of 160°F at the inlet to the containment fan coolers. This maximum RW temperature is provided in calculation FC07259, Section 4.4.3, as 90°F. The river temperature limit exists to ensure that there is sufficient transfer of heat from the CCW system to the RW system during an event which is associated with a valid safety injection actuation signal (SIAS).

For reactor coolant temperature T_{cold} greater than or equal to 210°F, the UHS is a normally operating system that is required to support the operability of the equipment serviced by the UHS and required to be operable for this condition. For reactor coolant temperature T_{cold} less than 210°F, the operability requirements of the UHS are determined by the systems it supports.

River Stage and Flow

Abnormal operating procedure AOP-1, Acts of Nature, requires that a continuous watch be established at river level 980 feet 0 inches. At this level, hourly cell level measurements will be taken to ensure satisfactory RW pump submergence. The elevation of RW pump suction bells is 973 feet 9 inches mean sea level and the required submergence above the bottom of the suction bell is 3 foot 0 inches, or an elevation of 976 feet 9 inches mean sea level. For the circulating water (CW) pumps to operate properly, the required submergence above the center line of discharge must be 4 foot 0 inches or an elevation of 983 feet 0 inches mean sea level. (Reference 6.10, Section 2.7.1.2)

With respect to low river flow at the site, the release from Gavins Point is 12,000 cubic feet per second (cfs) as a normal minimum depending largely on availability of water. Flows during the non-navigation season will range from 12,000 cfs to 18,000 cfs. In years when an extended period of drought has depleted storage reserves, release flows may periodically run as low as 6,000 cfs, this according to the Army Corps of Engineers' published annual operating plan. An ice jam formation can temporarily reduce low flows to even lower values but such partial stream blockages rarely occur and several methods have been developed to quickly nullify their effects. (Reference 6.10, Section 2.7.1.2)

At low river levels, debris and/or ice on the traveling screens and/or trash racks can cause significant head loss potentially reducing intake cell levels below the RW pump mean sea level of 976 feet 9 inches.

Intake cell levels are also adversely affected by the flows associated with the non-safety related CW pumps since the large flow rates associated with the CW pumps create significant head losses even with relatively clean intake cell conditions. However, the CW pumps have a much higher mean sea level requirement (983 feet 0 inches) and would become unstable and trip or be manually shutdown well before intake cell levels decrease to the RW pump mean sea level. The head loss associated with CW pump flow would then be recovered and intake cell levels would rise. (Reference 6.10, Section 2.7.1.2)

Based on the above, adequate cooling water will be available to meet plant requirements.

USAR Section 2.7.1.3, River Temperature

USAR Table 2.7-2 provides the average monthly and yearly Missouri River water temperatures taken at the Metropolitan Utilities District of Omaha intake over a 27-year period. The intake is 19.6 river miles downstream of the plant site. The average river water temperature in this table does not exceed 90°F.

Component Cooling Water (CCW) System:

The CCW system was designed to cool components carrying radioactive or potentially radioactive fluids. It also serves as a cooling medium for the containment air coolers, steam generator blowdown sampling coolers, and the control room economizer coils. The system

provides a monitored intermediate barrier between these fluids and the RW system which transfers the heat to the river. Thus, the probability of leakage of contaminated fluids into the river is greatly reduced. In the unlikely event of a design basis accident (DBA) the system provides sufficient cooling water to the engineered safeguards systems. System components are rated for the maximum duty requirements that may occur during normal, shutdown or accident modes of operation. (References 6.1 and 6.3)

The water in the system is demineralized and deaerated and an inhibitor is added for protection against corrosion. Makeup is supplied to the surge tank through a level control valve from the demineralized water system. Level indicating instrumentation is provided at the tank and in the control room where high and low water level alarms are also annunciated. Heat is transferred from the system to the RW system in the CCW heat exchangers. The CCW flows through the shell side and the RW through the tube side. The rejected heat is then discharged by the RW to the Missouri River. Equipment to be cooled following a DBA is provided with a redundant cooling water supply directly from the RW system. (Reference 6.3, Section 9.7.2)

During normal operation, one of three CCW pumps is in continuous service, while the other two are kept at ready standby. The two standby pumps start automatically in the event the in-service pump trips. The operator then selects one pump to stay on-line, shuts off the other pump, and resets the controls for future automatic start of standby pumps. Pump discharge pressure, flow, and temperature are monitored in the control room. The CCW system is normally operated to minimize perturbations of CCW flow and temperature. (Reference 6.3, Section 9.7.4.1)

The number of CCW heat exchangers and RW pumps in service during normal plant operation is a function of river temperature and the amount of cooling capability needed to normally maintain CCW temperature between 55°F and 110°F (these temperatures represent the normal operating temperature range of the CCW system, not design limits).

The Basis for TS 2.4 notes that analyses show that after a high load accident, such as a large break (LB) LOCA or main steam line break (MSLB) inside containment, three in-service CCW heat exchangers will maintain CCW return temperature in an analyzed range. This assumes all of the containment air cooling units are operating which would create the maximum heat load on the CCW system. In order to ensure that three heat exchangers would be in service after a DBA in conjunction with an assumed single failure, four are required to be operable. It is also noted that in the unlikely event of a loss of CCW supply, the RW system may be utilized for direct cooling of certain engineered safeguard components.

The CCW system consists of a number of parallel closed loops which remove heat from the various auxiliary systems, some of which contain reactor coolant (Reference 6.9, Section 1.2.8.3). The system provides cooling at the shutdown heat exchangers, the containment air cooling system, the spent fuel pool heat exchanger, the letdown heat exchanger, the sampling heat exchanger, ventilation equipment and various pumps. Heat removed by the CCW system is transferred to the RW by the CCW heat exchangers. The RW system is a once through system operating with screened river water. Redundancy has been provided in

the CCW and RW systems to provide for both normal and emergency operation with pumping and heat exchange equipment out of service. Further, the system arrangement permits the RW to be circulated through portions of the CCW system piping to provide direct cooling of vital engineered safeguards components in the unlikely event of all of the CCW pumps and heat exchangers being unavailable to fulfill their design function.

The CCW system has sufficient capacity for all normal and shutdown operating modes. In addition, the system is capable of satisfying the design criteria under post-DBA condition with the single failure of an active component and a loss of instrument air. Analyses demonstrate that CCW flow rates to essential equipment would be adequate for removing post accident design basis heat loads. A contribution from the containment air coolers (cooled by CCW) is credited in the mitigation of containment peak pressure for a MSLB. For a LOCA, the containment air coolers are credited for both mitigation of peak containment pressure and long term containment cooling. After a RAS is generated, the CCW flow to the containment air coolers would be adequate to remove the containment heat loads. The CCW system return temperature would be maintained at or below 160°F under post accident conditions at river temperatures of 90°F or less (Reference 6.3, Section 9.7.8.1). The river temperature limit of 90°F satisfies both station design criteria (Reference 6.3, Section 9.7.8.1) and state-imposed environmental criteria (Reference 6.3, Section 9.7.8.3).

Raw Water System:

USAR Section 9.8.1, *Design Bases*, states, in part, that the RW system was designed to provide a cooling medium for the CCW system. The system is rated for the maximum duty requirements that may occur during shutdown or accident modes of operation. The heat transferred to the RW is discharged to the Missouri River. The water temperature can vary between 32°F in winter to a maximum of 90°F in summer (Reference 6.1). For protection against a complete failure of the CCW system, RW can be diverted to cool certain engineered safeguards equipment.

Four RW pumps are installed in the intake structure pump house to provide screened river water to the CCW heat exchangers. The pump discharge piping is arranged as two headers which are interconnected and valved at the pumps and in the auxiliary building. Each header was designed to accommodate sufficient flow to the CCW heat exchangers to support normal modes of plant operation. System pressures, flows and valve positions are displayed in the control room. Water level instrumentation in the intake structure will alarm in the control room if water from any source should endanger the RW pumps. A majority of the system operational and control functions can be performed from the control room. (Reference 6.1, Section 9.8.2)

The RW pumps are designed for a pump flow of 5325 gpm with a total dynamic head of 118 feet. However, the RW pumps are capable of providing 8500 gpm with a dynamic head of 25 feet and a minimum submergence of 3 feet. The RW pumps provide different flows for various plant conditions.

In the unlikely event of a complete failure of the CCW system, RW direct cooling capability exists for the following equipment: (Reference 6.1, Section 9.8.2)

- RW direct cooling of the shutdown cooling heat exchangers would be needed for long-term decay heat removal after a large LOCA.
- RW direct cooling may be used for the control room A/C waterside economizers, if desired.
- RW may be utilized for direct cooling of the safety injection and containment spray pumps, if locally accessible. They may be inaccessible post-RAS, however the pumps can perform their post-accident function without cooling water.
- RW direct cooling to the containment air coolers is not required for containment peak pressure suppression. RW backup of the CCW being supplied to the containment cooling coils should be carefully implemented. It is not a postulated occurrence with any other event in progress.

The RW system was designed to provide sufficient flow and head capability to maintain the CCW at a maximum return temperature of 110°F during normal operation. In addition, the system is capable of satisfying the design criteria under post-DBA conditions with the single failure of an active component and a loss of instrument air. Analyses demonstrate that RW flow to the CCW heat exchangers would be adequate for removing post accident design basis heat loads while maintaining a maximum CCW return temperature of ≤ 160°F. (Reference 6.1, Section 9.8.5)

Missouri River level/temperature limits are observed for some off-normal RW system operating alignments. The river condition limits are based on calculations which use the low-limit hydraulic performance for the RW pumps. The river condition limits, in conjunction with the minimum required RW pump performance, ensure that if a DBA occurs while in an off-normal alignment, CCW return temperature will be at or below 160°F (Reference 6.3).

The RW pump minimum hydraulic performance limit is chosen by OPPD. The river condition limits are a function of the chosen RW pump performance limit, because the cooling performance of the RW system is a function of river conditions as well as pump hydraulic performance.

The RW system is capable of providing direct cooling of the required DBA controlling equipment if the CCW system is not available. Analyses demonstrate that adequate flow would be provided to the required equipment and that the temperature of the RW returning to the river would be less than 210°F with the river at its peak temperature of 90°F.

The Corps of Engineers adjusts winter releases from Gavins Point as necessary to accommodate the needs of all Missouri River water users. Normally, the water level is maintained higher than 983.0 feet. Although agreement between OPPD and the Corps of Engineers to maintain minimum river water levels has not been formalized, the Corps of Engineers does cooperate with OPPD in these matters and would provide additional flow from upstream dams if such conditions would be impending. The time required for severe ice blockage of the river to occur extends into many hours and the weather conditions which

would cause blockage would be evident over a period of a few days. Even lower river water levels would not be detrimental to plant safety since the minimum submergence level (MSL) on the RW pumps is 976 feet 9 inches or more than six feet below the controlled minimum river water level.

Should the RW system become inoperable, the reactor can be stabilized by removing decay heat through the steam generators.

Circulating Water (CW) System:

The circulating water for the condenser is taken from the Missouri River, pumped through the condenser tubes, and discharged to the Missouri River. Three CW pumps are provided in the intake structure. During normal operations, two or three CW pumps provide CW to the main condensers. The number of pumps required is dependent on system load and river temperature. Provision is made to control surface and frazil ice by recirculating the discharge water and the surface sluice piping. Motor driven traveling screens are installed ahead of the pump suction. The debris and refuse picked up by the screens are removed by water supplied from motor driven spray pumps integral to each screen. (Reference 6.2, Section 10.2.3).

10 CFR Part 50.36 Criteria:

10 CFR 50.36(c)(2)(ii) states that "A technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of the following criteria:

(A) Criterion 1 - Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

(B) Criterion 2 - A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

(C) Criterion 3 - A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

(D) Criterion 4 - A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety."

Reference 6.5, *Final Commission Statement on Technical Specifications for Nuclear Power Reactors*, dated July 22, 1993, concluded that those existing TS requirements, which do not satisfy the screening criteria specified in regulation 10 CFR 50.36 above, may be deleted from the TS, and the requirements established in licensee-controlled documents, subject to the controls of 10 CFR 50.59. Type A instruments provide the primary information required to permit the control room operator to take specific manually controlled actions, for which no automatic control is provided, and that are required for safety systems to accomplish their safety functions for design basis accident (DBA) events. Category 1 instruments are designed for full qualification redundancy, continuous real-time display, and onsite (standby) power.

NRC-approved NUREG-1432, *Standard Technical Specifications, Combustion Engineering Plants*, Revision 3 (Reference 6.4), identifies an improved TS that was developed based on the screening criteria in the Commission's Final Policy Statement (Reference 6.5) and subsequently codified in 10 CFR 50.36. The UHS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (described above) and its operability will be required by the proposed changes to FCS TS 2.16, *River Level*.

However, the instrumentation for detecting high river level is not necessary for indicating a significant abnormal degradation of the RCS pressure boundary considered by Criterion 1. This is consistent with the Commission's Final Policy Statement (Reference 6.5) which indicated that the first criterion was intended to assure that the TS controlled those instruments specifically installed to detect reactor coolant leakage but not to include instrumentation to identify the source of actual leakage (e.g., valve position indication). As such, TS LCO 2.16, Items 1) for high river level does not meet the requirements of 10 CFR 50.36(c)(2)(ii) and is being deleted. Administrative controls for high river level (e.g., flood protection) are covered by TS 5.8.1a., as procedures recommended in RG 1.33, Revision 2, Appendix A, 1978. In addition, this river level information is contained in USAR Sections 2.7 and 9.8 and is administratively controlled by AOP-1, Acts of Nature, and the FCS Emergency Plan for flood protection.

River Temperature and Level Instrumentation:

River Temperature:

The proposed TS surveillance requirement for river temperature is 90°F. If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the ECCS loads may be affected.

River temperature is monitored by instrument loop T-6251. The loop is a 4-20 mA loop consisting of a 100-ohm resistance temperature detector (RTD), temperature transmitter, recorder, input to the distributed control system (DCS), and power supply.

Specifically, Missouri River temperature is detected by non-safety related temperature element TE-6251 and discharge tunnel temperature is detected by non-safety related TE-6250. Associated temperature transmitters TT-6251 and TT-6250, respectively, transmit temperature signals to the DCS and subsequently alarm at the Emergency Response Facility Computer System (ERFCS).

Missouri River temperature history, as recorded by the plant data server for loop T-6251, was reviewed over the time period from year 2005 to present. The highest temperature observed during the reviewed time frame was 85.76°F occurring on July 16, 2005.

The surveillance test that implements the proposed SR for the UHS temperature will encompass the T-6251 loop uncertainty.

Alternate methods of river temperature measurement will be used via CW condenser inlet temperature indications or manual methods in the event the primary instrumentation is unavailable or more accurate temperature measurement is required.

River Level:

Missouri River level is currently monitored by non-safety related loop L-1900. The measurement technology is based on a bubbler system where air pressure is directly proportional to the depth of the bubbler outlet. The accuracy of this loop is very poor with an As Found/As Left loop tolerance of +/- 2 feet as documented in calibration procedure IC-CP-01-1900. This loop is in the process of being replaced with loop L-2000 via engineering change EC 35741. This instrumentation is expected to be placed in service during 2011.

The surveillance test that implements the proposed SR for the UHS level will encompass river level loop L-2000 uncertainty, which is based on radar technology with improved accuracy over the current air bubbler design. Both designs (loops L-1900 and L-2000) transmit level measurement information to the DCS and the ERFCS.

The proposed TS SR for river level is 976 feet 9 inches, which is based on the minimum level assumed in the USAR. The minimum river level of 976 feet 9 inches provides adequate suction to the RW pumps for cooling plant components. The minimum elevation of the RW pump suction is 973 feet 9 inches. An intake cell level of 976 feet 9 inches is required for RW pump minimum submergence level. The partial loss of this supply is considered highly unlikely. However, provisions for low water levels during winter and spring ice conditions are considered necessary. When river level is low, head loss from debris and/or ice on the traveling screens and/or trash racks could reduce intake cell level such that the required RW pump minimum submergence level is not achieved. This could lead to pump degradation from the formation of vortices at the free water surface. Thus, when the continuous watch requirement is in effect, in addition to the river level, the level of the intake cells is monitored.

Intake cell levels are also adversely affected by the flows associated with the non-safety related CW pumps since the large flow rates associated with the CW pumps create significant head losses even with relatively clean intake cell conditions. However, the CW pumps have much higher minimum submergence level requirement (983 feet 0 inches) and would become unstable and trip or be manually shutdown well before intake cell levels decrease to the RW pump minimum submergence level. The head loss associated with CW pump flow would then be recovered and intake cell levels would rise.

FCS Technical Specifications

The current FCS Technical Specifications do not explicitly state when the TS 2.16 LCO is applicable. The Specification requires that the reactor be placed in a COLD SHUTDOWN condition using normal operating procedures to exit the condition (e.g., low river level). Therefore, by doing so, OPPD is explicitly stating when this TS LCO is applicable, consistent with NUREG 1432.

The TS 2.16 LCO does not explicitly state the time allowed to enter COLD SHUTDOWN conditions. This LAR proposes 6 hours to HOT SHUTDOWN and 36 hours to COLD SHUTDOWN for a total of 42 hours to COLD SHUTDOWN for an inoperable UHS. This allowed outage time is consistent with the existing FCS TS allowed outage times, including TS 2.0.1, *General Requirements*.

In addition to the proposed changes to TS LCO 2.16 applicability and required action, TS 2.16 will be re-titled from "River Level" to "Ultimate Heat Sink (UHS)," to more accurately reflect the LCO for Missouri River operability (level and temperature) which is more aligned with NUREG 1432. This TS 2.16 LCO title change will be reflected in the TOC.

Precedent for revising TS 2.16 river level LCO requirement and adding the TS SRs for UHS water level and temperature is consistent with NUREG 1432 (Reference 6.4).

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

4.1.1 Regulations

Code of Federal Regulations Part 50:

10 CFR 50.36, *Technical Specifications*: 10 CFR 50.36(c)(2) states, "When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met." The revised actions continue to meet the requirements of this regulation.

10 CFR 50.36(c)(3) criteria states that "surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met." Reliability centered inspections and maintenance overhauls, while important, do not meet the requirements set forth in 10 CFR 50.36 for incorporation into the TS, and are not activities that are generally used to demonstrate component operability. Although this is true of the high river level LCO criteria which is being deleted, addition of the river water level and temperature surveillance requirements are acceptable because these new SRs will ensure the operability of the UHS.

10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*: The overall objective of this performance-based rule is to ensure that nuclear power plant structures, systems, and components (SSCs) will be maintained so that they will perform their intended function when required. The revised actions continue to meet the requirements of this regulation.

Fort Calhoun Station (FCS), Unit No. 1 was licensed for construction prior to May 21, 1971, and is committed to the draft General Design Criteria (GDC) published for comment in the Federal Register on July 11, 1967 (32 FR 10213) in lieu of 10 CFR 50, Appendix A. Appendix G of the FCS Updated Safety Analysis Report (USAR) shows that draft GDC 2 and 12 are most applicable to the proposed amendment. It should be noted that draft GDC 12 precedes the requirements of NUREG-0578 and NUREG-0737.

CRITERION 2 - *PERFORMANCE STANDARDS*

Those systems and components of reactor facilities which are essential to the prevention of accidents which could affect public health and safety or to mitigation of their consequences shall be designed, fabricated, and erected to performance standards that will enable the facility to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice and other local site effects. The design bases so established shall reflect: (a) Appropriate consideration for the most severe of these natural phenomena that have been recorded for the site and the surrounding area and (b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a basis for design.

This criterion is met. The systems and components of the Fort Calhoun Station, Unit No. 1 reactor facility that are essential to the prevention or mitigation of accidents that could affect public health and safety are designed, fabricated, and erected to withstand without loss of capability to protect the public, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, floods, winds, ice and other local site effects.

The containment will be designed for simultaneous stresses produced by the dead load, by 60 psig internal pressure at the associated design temperature, and by the application of forces resulting from an earthquake whose ground motion is 0.08g horizontally and 0.053g vertically. Further, the containment structure will be designed to withstand a sustained wind velocity of 90 mph in combination with the dead load and design internal pressure and temperature conditions. The wind load is based on the highest velocity wind at the site location for 100-year period or recurrence: 90 mph base wind at 30 feet above ground level. Other Class I structures will be designed similarly except that no

internal pressure loading is applicable. Class I systems will be designed for their normal operating loads acting concurrently with the earthquake described above.

The containment structure is predicted to withstand without loss of function the simultaneous stresses produced by the dead load, by 75 psig internal pressure and temperature associated with this pressure and by an earthquake whose ground motion is 0.10 horizontally and 0.07 vertically.

The containment structure is predicted to withstand without loss of function 125% of the force corresponding to a 90 mph wind impinging on the building concurrently with the stresses associated with the dead load and 75 psig internal pressure.

With no earthquake or wind acting, the structure is predicted to withstand 90 psig internal pressure without loss of function.

Under each of these conditions, stresses in the structural members will not exceed 0.95 yield.

The facility is designed so that the plant can be safely shutdown and maintained in a safe shutdown condition during a tornado. Design considerations associated with tornadoes are further explained in Section 5.4.7 of the USAR.

Flooding of Fort Calhoun Station, Unit No. 1 is considered highly unlikely. All plant openings into functional areas are at 1007 feet Mean Sea Level (MSL) or higher whereas the 0.1% flood peak stage is 1004.2 feet [mean sea level] *MSL. Further information is available in USAR Section 2.7.1.2.*

The proposed license amendment request provides for addition of the UHS operability LCO and the UHS level and temperature surveillance requirements to ensure operability of the UHS. No physical changes are being made to the plant or the RW, CW or CCW systems as a result of this LAR. This criterion will continue to be met.

CRITERION 12 - *INSTRUMENTATION AND CONTROL SYSTEMS*

Instrumentation and controls shall be provided as required to monitor and maintain variables within prescribed operating ranges.

This criterion is met. Instrumentation is provided for continuous measurement of all significant process variables. Controls are provided for the purpose of maintaining these variables within the limits prescribed for safe operation. The instrumentation conforms to applicable Institute of Electrical and Electronics Engineers (IEEE) standards.

The principal process variables monitored include neutron level (reactor power); reactor coolant temperature, flow, and pressure; pressurizer liquid level; and steam generator level. In addition, instrumentation is provided for continuous automatic monitoring of radiation level.
The instrumentation and control systems are described in detail in USAR Section 7.

The proposed license amendment request provides for addition of the UHS operability LCO and the UHS level and temperature surveillance requirements to ensure operability of the UHS. No physical changes are being made to the plant. This criterion will continue to be met.

4.1.2 Design Basis

The design basis requirement for the UHS was discussed in the Technical Evaluation Section 3.0 as it relates to the RW, CW, and CCW systems and their associated USAR sections.

4.1.3 Approved Methodologies

There are no new specific approved methodologies associated with this proposed TS change.

4.1.4 Analysis

No new analyses were needed in support of this proposed LAR. However, the following analysis was completed as part of License Renewal for FCS, which in part, encompassed an evaluation of the effects of continued plant operation on river temperature. The results of the analysis were documented as follows:

Reference 6.7, the NRC letter, *Issuance of Renewed Facility Operating License No. DPR-40 for Fort Calhoun Station, Unit 1,* dated November 11, 2003, (NRC-03-209) identified NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 12, Regarding Fort Calhoun Unit 1," (Reference 6.8), as containing the results of the environmental reviews related to the issuance of the renewed license. This recognition validated the conclusions of the environmental impact statement as being acceptable to the NRC.

Reference 6.8, Section 4.1.3, states, in part, that in reviewing the scientific literature on thermal regimes in the Missouri River, a recent study performed by scientists from the University of Iowa was identified (Wright et al., 1999). The study utilized available temperature data and a dynamic river flow and mixing model (CHARIMA) to examine the thermal regime in the Missouri from Gavins Point Dam down to Rulo, Nebraska (near the Kansas border). There are at least five power plants along this reach which discharge into the river, two of which lie between FCS, Unit 1 and the confluence of the Platte and Missouri

Rivers. This investigation established that, relative to other discharges to the Missouri, the total impact of FCS, Unit No. 1 discharge on the thermal regime of the Missouri is minor (Wright et al., 1999). This study examined a number of different scenarios beyond those that could result from proposals in the Missouri River Main Stem Reservoir System Master Manual, projecting the thermal regime 40 years into the future. The most extreme simulation assumed all the power plants on the reach were operating at maximum capacity, a summer low-flow regime, and an increase in ambient temperature due to global warming. Even under these most extreme conditions, while a cumulative warming effect was demonstrated, water temperatures did not exceed the 90°F maximum limit of Title 117 of the Nebraska Surface Water Quality Standards (Title 117 Chapter 4.003.01B). Also, under those extreme conditions, average river temperatures for the month of August (an indicative summer month) were less than 79°F. It was the conclusion of NRC staff that based on these conservative analyses, that the cumulative impacts of the operation of FCS, Unit 1, through 2033 on the thermal regime of the Missouri River will be small. (Reference 6.8, Section 4.1.3)

According to Reference 6.8, the NRC staff reviewed the available information and, on the basis of the conditions of the NPDES permit, the recent thermal studies, and the operating history of the FCS discharge, concluded that the direct and potential cumulative impacts of discharging heated water from the cooling-water-intake system are small. Therefore, new mitigation measures were not warranted.

4.2 Precedent

As noted in Section 3.0 above, precedent for adding the TS LCOs and SRs for UHS water level and temperature is consistent with NUREG 1432. However, no plant-specific precedence is cited in this LAR.

4.3 Significant Hazards Consideration

The proposed change would modify Technical Specification (TS) 2.16, Items 1 and 2; and add surveillance requirements (SRs) 3.2, Table 3-5, Items 25 and 26, to allow the provision for the ultimate heat sink (UHS) water level and temperature operability. These proposed changes are aligned with NUREG 1432, *Standard Technical Specifications, Combustion Engineering Plants*, Revision 3. In addition, administrative changes are being made to SR Table 3-5, Items 17 through 24, in that they are being reformatted for tabular column consistency to allow appropriate space for the text and column header.

The Omaha Public Power District (OPPD) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on 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 consequences of an accident previously evaluated?**

   Response: No.

   The river level and temperature surveillance requirements (SRs) provide the basis for the operability of the ultimate heat sink (UHS). As such, the proposed change does not increase the probability of an accident. The proposed changes do not alter the physical design of the UHS, intake structure or any other plant structure, system or component (SSC) at Fort Calhoun Station (FCS). The changes would add the UHS operability limiting condition for operability (LCO) and SRs to the FCS Technical Specifications (TS).

   The proposed changes conform to the Nuclear Regulatory Commission's (NRC's) regulatory guidance regarding the content of plant TS as identified in 10 CFR 50.36 and NRC publication NUREG-1432.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences 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 TS changes do not alter the physical design, safety limits, or safety analysis assumptions associated with the operation of the plant. Hence, the proposed changes do not introduce any new accident initiators, nor do they reduce or adversely affect the capabilities of any plant structure or system in the performance of their safety function.

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

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

   Response: No.

   The TS operability requirements for the UHS ensure there is adequate river level and temperature present to assure safe reactor operation and are necessary to ensure safety systems accomplish their safety function for design basis accident events. Adding additional surveillance requirements to the FCS TS for river level and temperature ensure UHS operability and will not adversely impact any margin of safety. These proposed TS changes for the UHS are aligned with the surveillance requirements provided in NUREG-1432.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

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

4.4 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, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

6.1 Updated Safety Analysis Report, (USAR) Section 9.8, Raw Water System, Revision 27, dated December 29, 2010

6.2 USAR, Section 10.2, Steam and Power Conversion Systems, System Design and Operation, Revision 9, dated August 19, 2010

6.3 USAR, Section 9.7, Auxiliary Systems, Component Cooling Water System, Revision 15, dated July 31, 2008

6.4 NUREG 1432, Revision 3, Standard Technical Specifications, Combustion Engineering Plants, dated June 2004

6.5 NRC "Final Policy Statement on Technical Specifications Improvement for Nuclear Power Reactors" (58 FR 39132, dated July 22, 1993)

6.6 USAR Reference 9.7.8.1, Calculation FC07259, FCS RW/CCW Gothic Model – Additional Cases [river temp], Revision 2, dated May 8, 2008

6.0 REFERENCES (continued)

6.7 Letter from the NRC (R. K. Anand) to OPPD (R. T. Ridenoure), *Issuance of Renewed Facility Operating License No. DPR-40 for Fort Calhoun Station, Unit 1,* dated November 4, 2003 (NRC-03-209)

6.8 NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 12, Regarding Fort Calhoun Station, Unit 1, Final Report, Section 4.1.3, Heat Shock, dated August 15, 2003 (TAC NO. MB3402)

6.9 USAR Section 1.2, Summary and Plant Description, Component Cooling and Raw Water Systems, Revision 35, dated September 30, 2010

6.10 USAR Section 2.7, Site and Environs, Hydrology, Revision 10, dated February 3, 2011

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2.0 LIMITING CONDITIONS FOR OPERATION

2.16 ~~River Level~~ Ultimate Heat Sink (UHS)

Applicability

Applied to operational status of the Missouri River ~~level as measured~~ at the intake structure at the Fort Calhoun Station for reactor coolant temperature $T_{cold} \geq 210°F$.

Objective

To ~~specify maximum and minimum Missouri River levels which must be present to~~ ensure operability of the UHS to assure safe reactor operation.

Specifications

The Ultimate Heat Sink shall be operable.

~~1) If the Missouri River level exceeds 1009[1] feet the reactor will be placed in a cold shutdown condition using normal operating procedures. When the river level reaches elevation 1004.2 feet and rising, the emergency plan to protect the plant will be instituted.~~

~~(2) If the Missouri River level is less than 976 feet 9 inches the reactor will be placed in a cold shutdown condition using normal operating procedures. At river levels less than 980 feet a continuous watch will be maintained to assure no sudden loss of water supply occurs.~~

Required Actions

(1) With the UHS inoperable, be in HOT SHUTDOWN within 6 hours and COLD SHUTDOWN within the following 36 hours.

Basis

~~At the Fort Calhoun Station (FCS) site, the probable maximum flood that might occur as a result of runoff from a probable maximum rainstorm over the area below the Gavins Point dam coupled with an assumed outflow of 50,000 cubic feet per second from Gavins Point reservoir is 1009.3 feet. In the unlikely event that the Oahe or Fort Randall dams fail at that time, the Corps of Engineers has estimated that the flood level could be as high as 1014 feet[1].~~

~~The intake structure can be protected from these Missouri River floods using removable flood gates on doorways and the screen wash discharge trough. The water level inside the intake cells can be controlled by positioning the exterior sluice gates to restrict the flow into the cells. The auxiliary building can be protected to 1009.5 feet using its installed flood gates. Protection of the auxiliary building to 1014 feet requires the installation of removable flood barriers and sandbagging at the 1013 foot elevation of the equipment hatch room (Room 66).~~

The OPERABILITY of the UHS is based on having a minimum Missouri River water level of 976 feet 9 inches mean sea level and a maximum river water temperature of 90°F. The minimum river level is based on the minimum level assumed in the USAR. If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the emergency core cooling system (ECCS) loads may be affected.[2]

With the reactor coolant temperature $T_{cold} \geq 210°F$, the UHS must be OPERABLE to support the OPERABILITY of the equipment serviced by the UHS and required to be OPERABLE in this condition. With the reactor coolant $T_{cold} < 210°F$, the OPERABILITY requirements of the UHS are determined by the systems it supports.

If the Missouri River level is less than 976 feet 9 inches or river temperature is greater than 90°F, then the reactor will be placed in HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within the following 36 hours using normal operating procedures. At river levels less than 980 feet, a continuous watch will be maintained to assure no sudden loss of water supply occurs.

Amendment No.
TSBC-07-002-0
~~TSBC-10-001-0~~
~~TSBC-10-003-0~~

2.16 ~~River Level~~ Ultimate Heat Sink (UHS) (Continued)

Basis (Continued)

The minimum river level of 976 feet 9 inches provides adequate suction to the raw water (RW) pumps for cooling plant components. The minimum elevation of the RW pump suction is 973 feet 9 inches. An intake cell level of 976 feet 9 inches is required for RW pump minimum submergence level (MSL)[(2)]. The partial loss of this supply is considered highly unlikely. However, provisions for low water levels during winter and spring ice conditions are considered necessary. When river level is low, head loss from debris and/or ice on the traveling screens and/or trash racks could reduce intake cell levels such that the required RW pump MSL is not achieved. This could lead to pump degradation from the formation of vortices at the free water surface. Thus, when the continuous watch requirement is in effect, in addition to river level, the level of the intake cells is monitored.

Intake cell levels are also adversely affected by the flows associated with the non safety related circulating water (CW) pumps since the large flow rates associated with the CW pumps create significant head losses even with relatively clean intake cell conditions. However, the CW pumps have a much higher MSL requirement (983 feet 0 inches) and would become unstable and trip or be manually shutdown well before intake cell levels decrease to the RW pump MSL. The head loss associated with CW pump flow would then be recovered and intake cell levels would rise.

References

(1) ~~USAR, Section 2.7.1.2~~Deleted
(2) USAR, Section 9.8

3.0 SURVEILLANCE REQUIREMENTS

3.2 Equipment and Sampling Tests (continued)

Table 3-5, Item 8b verifies that primary to secondary LEAKAGE is less or equal to 150 gallons per day through any one SG. Satisfying the primary to secondary LEAKAGE limit ensures that the operational LEAKAGE performance criterion in the Steam Generator Program is met. If this surveillance requirement is not met, compliance with LCO 3.17, "Steam Generator Tube Integrity," should be evaluated. The 150 gallons per day limit is measured at room temperature as described in Reference 5. The operational LEAKAGE rate limit applies to LEAKAGE through any one SG. If it is not practical to assign the LEAKAGE to an individual SG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one SG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of daily is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the EPRI guidelines (Ref. 5).

Surveillance requirement (SR) Table 3-5, Item 25 verifies adequate long term cooling can be maintained for the ultimate heat sink (UHS). The river level specified also ensures sufficient net positive suction head is available for operating the RW pumps. The surveillance Frequency of "Daily" is a reasonable interval and is based on operating experience related to the trending of the parameter variations during the applicable reactor coolant temperatures T_{cold}. This SR verifies that the UHS water level is ≥ 976 feet 9 inches mean seal level.

If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the emergency core cooling system (ECCS) loads may be affected. Surveillance requirement Table 3-5, Item 26 verifies that the RW system is available to cool the CCW system to at least its maximum design temperature within the maximum accident or normal design heat loads following a DBA. This SR verifies that the UHS water temperature is ≤ 90°F.

References

1) USAR, Section 9.10
2) ASTM D4057, ASTM D975, ASTM D4176, ASTM D2622, ASTM D287, ASTM 6217, ASTM D2709
3) ASTM D975, Table 1
4) Regulatory Guide 1.137
5) EPRI, "Pressurized Water Reactor Primary-to-Secondary Leak Guidelines."

TABLE 3-5
MINIMUM FREQUENCIES FOR EQUIPMENT TESTS

		Test	Frequency	USAR Section Reference
17.	DELETED			
18.	Shutdown Cooling	1. Verify required shutdown cooling loops are OPERABLE and one shutdown cooling loop is IN OPERATION.	S (when shutdown cooling is required by TS 2.8).	
		2. Verify correct breaker alignment and indicated power is available to the required shutdown cooling pump that is not IN OPERATION.	W (when shutdown cooling is required by TS 2.8).	

TABLE 3-5
MINIMUM FREQUENCIES FOR EQUIPMENT TESTS

		Test	Frequency	USAR Section Reference
19.	Refueling Water Level	Verify refueling water level is ≥ 23 ft. above the top of the reactor vessel flange.	Prior to commencing, and daily during CORE ALTERATIONS and/or REFUELING OPERATIONS inside containment.	
20.	Spent Fuel Pool Level	Verify spent fuel pool water level is ≥ 23 ft. above the top of irradiated fuel assemblies seated in the storage racks.	Prior to commencing, and weekly during REFUELING OPERATIONS in the spent fuel pool.	
21.	Containment Penetrations	Verify each required containment penetration is in the required status.	Prior to commencing, and weekly during CORE ALTERATIONS and/or REFUELING OPERATIONS in containment.	
22.	Spent Fuel Assembly Storage	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-10.	Prior to storing the fuel assembly in Region 2 (including peripheral cells).	
23.	P-T Limit Curve	Verify RCS Pressure, RCS temperature, and RCS heatup and cooldown rates are within the limits specified by the P-T limit Figure(s) shown in the PTLR.	This test is only required during RCS heatup and cooldown operations and RCS inservice leak and hydrostatic testing. While these operations are occurring, this test shall be performed every 30 minutes.	
24.	Spent Fuel Cask Loading	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-11.	Prior to placing the fuel assembly in a spent fuel cask in the spent fuel pool.	
25.	UHS–Missouri River Level	Verify water level of UHS is ≥ 976 feet 9 inches above mean sea level.	D	9.8
26.	UHS–Missouri River Temperature	Verify water temperature of the UHS is ≤ 90°F.	D	9.7

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2.0 LIMITING CONDITIONS FOR OPERATION

2.16 Ultimate Heat Sink (UHS)

Applied to operational status of the Missouri River at the intake structure at the Fort Calhoun Station for reactor coolant temperature $T_{cold} \geq 210°F$.

Objective

To ensure operability of the UHS to assure safe reactor operation.

Specification

The Ultimate Heat Sink shall be operable.

Required Action

(1) With the UHS inoperable, be in HOT SHUTDOWN within 6 hours and COLD SHUTDOWN within the following 36 hours.

Basis

The OPERABILITY of the UHS is based on having a minimum Missouri River water level of 976 feet 9 inches mean sea level and a maximum river water temperature of 90°F. The minimum river level is based on the minimum level assumed in the USAR. If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the emergency core cooling system (ECCS) loads may be affected.[2]

With the reactor coolant temperature $T_{cold} \geq 210°F$, the UHS must be OPERABLE to support the OPERABILITY of the equipment serviced by the UHS and required to be OPERABLE in this condition. With the reactor coolant $T_{cold} < 210°F$, the OPERABILITY requirements of the UHS are determined by the systems it supports.

If the Missouri River level is less than 976 feet 9 inches or river temperature is greater than 90°F, then the reactor will be placed in HOT SHUTDOWN within 6 hours and in COLD SHUTDOWN within the following 36 hours using normal operating procedures. At river levels less than 980 feet, a continuous watch will be maintained to assure no sudden loss of water supply occurs.

The minimum river level of 976 feet 9 inches provides adequate suction to the raw water (RW) pumps for cooling plant components. The minimum elevation of the RW pump suction is 973 feet 9 inches. An intake cell level of 976 feet 9 inches is required for RW pump minimum submergence level (MSL)[2]. The partial loss of this supply is considered highly unlikely. However, provisions for low water levels during winter and spring ice conditions are considered necessary. When river level is low, head loss from debris and/or ice on the traveling screens and/or trash racks could reduce intake cell levels such that the required RW pump MSL is not achieved. This could lead to pump degradation from the formation of vortices at the free water surface. Thus, when the continuous watch requirement is in effect, in addition to river level, the level of the intake cells is monitored.

2.16 Ultimate Heat Sink (UHS) (Continued)

Basis (Continued)

Intake cell levels are also adversely affected by the flows associated with the non safety related circulating water (CW) pumps since the large flow rates associated with the CW pumps create significant head losses even with relatively clean intake cell conditions. However, the CW pumps have a much higher MSL requirement (983 feet 0 inches) and would become unstable and trip or be manually shutdown well before intake cell levels decrease to the RW pump MSL. The head loss associated with CW pump flow would then be recovered and intake cell levels would rise.

References

(1) Deleted
(2) USAR, Section 9.8

3.0 SURVEILLANCE REQUIREMENTS

3.2 Equipment and Sampling Tests (continued)

Table 3-5, Item 8b verifies that primary to secondary LEAKAGE is less or equal to 150 gallons per day through any one SG. Satisfying the primary to secondary LEAKAGE limit ensures that the operational LEAKAGE performance criterion in the Steam Generator Program is met. If this surveillance requirement is not met, compliance with LCO 3.17, "Steam Generator Tube Integrity," should be evaluated. The 150 gallons per day limit is measured at room temperature as described in Reference 5. The operational LEAKAGE rate limit applies to LEAKAGE through any one SG. If it is not practical to assign the LEAKAGE to an individual SG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one SG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of daily is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the EPRI guidelines (Ref. 5).

Surveillance requirement (SR) Table 3-5, Item 25 verifies adequate long term cooling can be maintained for the ultimate heat sink (UHS). The river level specified also ensures sufficient net positive suction head is available for operating the RW pumps. The surveillance Frequency of daily is a reasonable interval and is based on operating experience related to the trending of the parameter variations during the applicable reactor coolant temperatures T_{cold}. This SR verifies that the UHS water level is ≥ 976 feet 9 inches mean seal level.

If the water temperature of the Missouri River exceeds 90°F, long term core cooling capability of the emergency core cooling system (ECCS) loads may be affected. Surveillance requirement Table 3-5, Item 26 verifies that the RW system is available to cool the CCW system to at least its maximum design temperature within the maximum accident or normal design heat loads following a DBA. This SR verifies that the UHS water temperature is ≤ 90°F.

References

1) USAR, Section 9.10
2) ASTM D4057, ASTM D975, ASTM D4176, ASTM D2622, ASTM D287, ASTM 6217, ASTM D2709
3) ASTM D975, Table 1
4) Regulatory Guide 1.137
5) EPRI, "Pressurized Water Reactor Primary-to-Secondary Leak Guidelines."

TABLE 3-5
MINIMUM FREQUENCIES FOR EQUIPMENT TESTS

	Test		Frequency	USAR Section Reference
17.	DELETED			
18.	Shutdown Cooling	1. Verify required shutdown cooling loops are OPERABLE and one shutdown cooling loop is IN OPERATION.	S (when shutdown cooling is required by TS 2.8).	
		2. Verify correct breaker alignment and indicated power is available to the required shutdown cooling pump that is not IN OPERATION.	W (when shutdown cooling is required by TS 2.8).	

TABLE 3-5
MINIMUM FREQUENCIES FOR EQUIPMENT TESTS

		Test	Frequency	USAR Section Reference
19.	Refueling Water Level	Verify refueling water level is ≥ 23 ft. above the top of the reactor vessel flange.	Prior to commencing, and daily during CORE ALTERATIONS and/or REFUELING OPERATIONS inside containment.	
20.	Spent Fuel Pool Level	Verify spent fuel pool water level is ≥ 23 ft. above the top of irradiated fuel assemblies seated in the storage racks.	Prior to commencing, and weekly during REFUELING OPERATIONS in the spent fuel pool.	
21.	Containment Penetrations	Verify each required containment penetration is in the required status.	Prior to commencing, and weekly during CORE ALTERATIONS and/or REFUELING OPERATIONS in containment.	
22.	Spent Fuel Assembly Storage	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-10.	Prior to storing the fuel assembly in Region 2 (including peripheral cells).	
23.	P-T Limit Curve	Verify RCS Pressure, RCS temperature, and RCS heatup and cooldown rates are within the limits specified by the P-T limit Figure(s) shown in the PTLR.	This test is only required during RCS heatup and cooldown operations and RCS inservice leak and hydrostatic testing. While these operations are occurring, this test shall be performed every 30 minutes.	
24.	Spent Fuel Cask Loading	Verify by administrative means that initial enrichment and burnup of the fuel assembly is in accordance with Figure 2-11.	Prior to placing the fuel assembly in a spent fuel cask in the spent fuel pool.	
25.	UHS – Missouri River Level	Verify water level of UHS is ≥ 976 feet 9 inches above mean sea level.	D	9.8
26.	UHS – Missouri River Temperature	Verify water temperature of UHS is ≤ 90°F	D	9.7