Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

WBN-TS-06-09

DEC 29 2006

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

Gentlemen:

In the Matter of) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT UNIT 1 - TECHNICAL SPECIFICATION (TS) CHANGE WBN-TS-06-09 REQUEST FOR ADDITIONAL INFORMATION REGARDING TECHNICAL SPECIFICATION CHANGE REQUEST FOR ULTIMATE HEAT SINK TEMPERATURE (TAC NO. MD 1460)

The purpose of this letter is to provide TVA's response to the request for additional information dated September 12, 2006, concerning the subject amendment request that was submitted to NRC on May 8, 2006. Enclosure 1 provides TVA's partial response to the NRC questions. TVA will provide responses to NRC Questions 1 and 9 as soon as possible, but no later than February 16, 2007. The revised regulatory commitment is provided in Enclosure 2.

There are no new commitments associated with this submittal. If you have any questions concerning this matter, please call me at (423)365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 29th day of December 2006.

Sincerely,

for

J. D. Smith
Manager, Site Licensing
and Industry Affairs (Acting)

Enclosures
cc: See page 2

D030

cc (Enclosures):

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
DOCKET NO. 50-390

PROPOSED LICENSE AMENDMENT REQUEST WBN-TS-06-09
REVISION OF ULTIMATE HEAT SINK (UHS) TEMPERATURE

TVA submitted an application for an amendment to revise the WBN Unit 1 Technical Specification (TS) to increase the UHS temperature limit. The NRC submitted a request for additional information dated September 12, 2006. TVA's partial response to that request is provided below:

NRC QUESTION 1

In Page 5, Tennessee Valley Authority (TVA) states:

"The conclusion of the review is that there is sufficient justification to increase the UHS [ultimate heat sink] upper temperature allowable limit from 85°F to 88°F. Operational procedure guidelines will be enhanced, as required, in order to implement this limit."

Provide/describe the specific operational procedure guidelines, as required, in order to implement this proposed limit of 88°F.

RESPONSE TO QUESTION 1

TVA will provide the response to this question in a separate submittal by February 16, 2007.

NRC QUESTION 2

In Page 13, TVA states that the increased UHS temperature is justified, in part, by margins in the essential raw cooling water (ERCW) flow rates that were established for each of the affected components during the pre-operational testing program. Provide detailed discussion to explain how the existing flow margins have been demonstrated to still be valid; how much of the existing margin will be used in the revised UHS analysis and how much margin will remain; how much of the remaining margin is needed to account for tube plugging, system fouling, pump degradation, measurement uncertainty, etc.; and how technical specification surveillance requirements will ensure that the required flow margins are maintained over time for all of the affected components.

RESPONSE TO QUESTION 2

Please refer to the response to Question 5 for the discussion on how the existing flow margins remain valid, and the accounting for system fouling and pump degradation.

The containment spray heat exchangers 1A-A and 1B-B and the Residual Heat Removal (RHR) heat exchangers 1A-A and 1B-B were evaluated by Westinghouse in the loss-of-coolant-accident containment integrity analysis (LTR-CRA-06-96) and the RHR cool down analysis (WCAP-16286-P, see Section 6.2.3) for the replacement steam generator program. The containment integrity analysis was provided as Enclosure 4 of TVA's June 7, 2006 submittal, "Watts Bar Nuclear Plant (WBN) - Unit 1 - Technical Specification (TS) Change No. TVA-WBN-TS-05-09 - Ice Condenser Ice Weight Increase Due to Replacement Steam Generators - Supplemental Information." The analysis input used the existing design flow rates and tube plugging margins in conjunction with the higher UHS temperature of 88 degrees Fahrenheit (F). The containment analysis for the replacement steam generators resulted in a slight increase in containment pressure, but is within the existing design specifications of the containment. The replacement steam generators were installed during the Unit 1 Cycle 7 (U1C7) refueling outage which was completed on November 30, 2006. The containment analysis for the replacement steam generators which was performed using the UHS temperature of 88 degrees F was approved in Amendment 62, on July 25, 2006.

The diesel generator jacket water heat exchangers were also evaluated for a UHS temperature of 88 degrees F (Reference 1). Due to the increase in temperatures and other design issues, a yearly cleaning frequency was established to ensure acceptable performance of the heat exchangers.

The evaluations of the other equipment served by the ERCW System and the effects of the change in the UHS temperature on the piping stress analysis and building environment were qualitative. The evaluations did not determine the specific flow requirement for the equipment at 88 degrees F, nor did the evaluations determine how much of the existing margin was used by the increase in the UHS temperature. The evaluations compared the preoperational flow test results against the analytical design basis flow requirements. The evaluations (References 2, 3, 4 and 8) demonstrated there was sufficient flow margin to envelop an 88 degrees F river water temperature. A specific flow value was not determined to account for tube plugging. TVA would need to perform additional evaluations for any future tube plugging.

The qualitative evaluations used the nominal flow data obtained during the performance of the preoperational test flow balance. The nominal flow data did not account for instrument inaccuracies. The margin used in the equipment evaluations was the margin between the nominal preoperational test flow data and the design requirement for the component.

Surveillance Requirement 3.7.8.1 of the WBN TS requires that each manual valve in a flow path that services safety-related equipment is verified to be in the correct position on a 31-day frequency. The procedures and instructions described in the answer to Question 5 ensure the flow path is monitored and inspected for flow blockages in the flow path. Any blockages or flow restrictions are eliminated.

NRC QUESTION 3

General Design Criteria (GDC) 44, "Cooling Water," requires that 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.

Also Standard Review Plan (SRP) 9.1.3, "Spent Fuel Pool Cooling and Cleanup System," specifies that continuous fuel cooling be provided during normal, abnormal, and accident conditions.

With regard to TVA's evaluation of the effects on the spent fuel pool (SFP) cooling system resulting from the proposed increase in the UHS temperature, provide detailed/complete discussions of:

- The SFP cooling licensing basis (e.g., maximum heat load, temperature, time to boil, etc.) along with how the existing licensing basis will continue to be satisfied at the increased UHS temperature limit; and
- How the above cited GDC requirement and SRP criteria will continue to be satisfied at the increased UHS temperature limit. Of particular interest is the proposed action to terminate SFP cooling for up to 5 hours, and to what extent is this consistent with the plant licensing basis.

RESPONSE TO QUESTION 3

Section 9.1.3.1.1, "Spent Fuel Pool Cooling," of the WBN Updated Final Safety Analysis Report (UFSAR) states that ". . . up to 47.4E+06 Btu/hr can be placed in the spent fuel pool within specific limitations on spent fuel pool cooling heat exchanger fouling and component cooling system supply temperatures less than the design temperature of 95°F". Furthermore, this section of the UFSAR ends with the following statement: "A decay heat calculation is routinely performed at the end of each operating cycle to produce heat decay vs. time curves for the core and spent fuel pool. This calculation can be used to determine the time to begin core off load and the rate at which the core can be off loaded." WBN UFSAR Table 9.1-1, "Spent Fuel Pool Cooling and Cleanup System Design Parameters," provides values for SFP performance based on various scenarios, including the limiting licensing basis decay heat load. The licensing basis values for SFP heat up rate is 15.54 degrees F/hour (hr), and the boil-off time to 10-feet above rack with no makeup is 30 hours. While a value for time to boil is not explicitly stated in the table, such a value can be inferred from the licensing basis values for maximum SFP temperature (159.2 degrees F) and the heat up rate (15.54 degrees F/hr), which would yield a value of approximately 3.4 hours for time to boil after all cooling is lost starting from the maximum allowable SFP temperature.

Operation of the component cooling system (CCS) heat exchangers at an increased UHS temperature of 88 degrees F was analytically shown to have no adverse affect on meeting the refueling design basis CCS temperature value of 95 degrees F. Since the SFP cooling licensing basis assumptions used for CCS temperature (95 degrees F) have not been altered, the ability of the SFP heat exchangers to remove the allowable decay heat has similarly not been diminished. Procedures (Reference 9) are in place to ensure that the allowable licensing basis maximum decay heat load, up to 47.4E+06 Btu/hr, is consistent with input parameters including ERCW temperature, fouling values for the SFP cooling heat exchangers, and CCS temperatures. If a desired SFP decay heat load is determined to be inconsistent with the input parameters, a delay in time to begin core off load or a decrease in fuel assembly rate of off load is procedurally enacted to assure that the SFP licensing basis values are not exceeded.

The allowable SFP decay heat load and the method for determining decay heat have not been altered. Also, the ability to remove the design basis heat load has not been diminished; therefore, it follows that the licensing basis maximum temperature of 159.2 degrees F will not be exceeded. Similarly, since the heat up rate, time to boil, and boil-off time values are functions of maximum decay heat load and heat removal capability, the licensing basis values as shown in or inferred from UFSAR Table 9.1-1 are not affected by the proposed change to the UHS temperature.

To clarify the information contained in TVA's May 8, 2006, TS Change Request, the isolation of SFP cooling discussed in

Section 3.16 of Attachment 1, pertains to the ability to achieve a TS plant cool down (non-accident) with only one train of RHR cooling. Although termination of SFP cooling in order to achieve single-train RHR cool down is not specifically contained in the WBN UFSAR, the previous design basis value was 9 hours. The revised analysis (with the old steam generators) that was performed in support of 88 degrees F UHS decreased this design basis value to 5 hours. Since the May 8, 2006 submittal, WBN removed the old steam generators and installed the replacement steam generators during the U1C7 refueling outage which ended on November 30, 2006. As part of the replacement steam generator program, the assumptions used in the analysis for a single-train RHR cool down were re-examined. It was determined that the single-train RHR design cool down case could be accommodated without isolation of spent fuel pool cooling and the reactor coolant pumps in service provided that the unit is held at 350 degrees F until 26 hours after reactor shutdown with cooling provided by the steam generators prior to transitioning to RHR cooling.

Based upon the installation of the replacement steam generators during U1C7 and the single-train of RHR cool down analysis associated with the replacement steam generators, TVA is revising Commitment 2, contained in Enclosure 4, of the May 8, 2006 TS Change Request as follows:

> "The UFSAR will be revised to address single-train RHR cool down restrictions for ERCW temperatures above 85 degrees F which consists of holding the unit at 350 degrees F until 26 hours after reactor shutdown with cooling provided by the steam generators prior to transitioning to RHR cooling."

NRC QUESTION 4

TVA determined that the emergency diesel generator (EDG) jacket water heater exchangers were marginal at the higher UHS temperature and in order to resolve this problem, the heat exchanger cleaning frequency and timing will be changed to annually (instead of during each refueling outage) during the spring (prior to experiencing the hotter summer temperatures). Provide a detailed discussion to explain how the adequacy of this approach will be validated to assure acceptable EDG performance during those periods when the UHS temperature may be as high as 88F and heat exchanger fouling is at maximum.

RESPONSE TO QUESTION 4

During TVA's evaluation of the diesel generator jacket water heat exchangers for tube plugging margins, the heat exchangers were determined to have not been designed with a tube plugging allowance. This condition was documented in TVA's Corrective Actions Program (Reference 10).

The Seventh Edition of the STANDARDS OF THE TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION indicates the minimum fouling resistance for raw water with a velocity greater than 3 feet (ft)/second (sec) is 0.001 hr-ft^2-°F/BTU, and the average value is 0.002 hr-ft^2-°F/BTU for water with a temperature up to 240 degrees F. In addition, the same reference indicates the engine jacket water fouling resistance should be 0.001 hr-ft^2-°F/BTU. The heat exchanger specification sheets for WBN had a value of 0.001 hr-ft^2-°F/BTU for the river water side of the heat exchanger and a value of 0.000 hr-ft^2-°F/BTU for the jacket water side of the heat exchanger (Reference 1). This resulted in a smaller heat exchanger.

Subsequently, evaluations were performed to determine the conditions which would permit some tubes to be plugged if the tubes were damaged. Rather than increase the flow rate to the heat exchangers, TVA decided to maintain the existing flow rate and determine the operating conditions for which this flow rate would be acceptable. The evaluations involved the use of current design information from the vendor, data collected during performance tests on the heat exchanger, and the use of the existing ERCW system design flow rate (650 gallons per minute (gpm)) to the heat exchanger (Reference 1). The surveillance test data was used to verify the information from the vendor. The test data was also used to determine the rate of increase in the fouling rate for the heat exchangers. The evaluations also included an evaluation for an UHS temperature of 88 degrees F.

First, the overall fouling resistance was determined for an ERCW flow rate of 650 gpm and temperatures of 85 degrees F and 88 degrees F. Then the test data was evaluated to determine the rate of increase in the fouling resistance and the period of time after cleaning at which the limiting overall fouling resistance would be reached. This resulted in requiring the jacket water heat exchangers to be cleaned in the spring time of each year in order to be capable of performing their design basis functions during the higher temperatures experienced in the summer.

The new jacket water heat exchanger cleaning requirements have already been implemented in the Preventative Maintenance Program at WBN.

NRC QUESTION 5

The following notes in Table 2 of the submittal attachment (Page 26) credit higher "current" cooling water flow rates: 2, 3, 5, 6, 7, 9 and 11. Provide a detailed discussion to explain why the current flow rates constitute the most limiting condition consistent with licensing basis assumptions.

RESPONSE TO QUESTION 5

The current flow rates to the equipment served by the ERCW System were established during the performance of Preoperational Test, PTI-067-02. Procedures and programs have been implemented to maintain the system flow balance that was established during the performance of the preoperational test.

The preoperational flow balance test (PTI-067-02) simulated the plant operating conditions listed in the following table and was based on the design requirements of the components served by the ERCW System. These operating modes were chosen to represent the normal plant operating conditions and also the controlling design basis events. It was necessary to test a variety of operating conditions as the equipment alignment varies from one operating condition to another and none of the modes requires the use of all the equipment served by the ERCW System at the same time.

ERCW System Preoperational Flow Balance Test Modes	
ERCW Train A	ERCW Train B
Normal Generation	Normal Generation
Appendix R	Not Applicable
Cold Shutdown	Cold Shutdown
LOCA	LOCA
Hot Shutdown	Hot Shutdown

During the test, the flow to the components was adjusted by the use of throttle valves to ensure each component received the flow required to fulfill its design basis requirements during all the operating mode simulations. The final valve positions were documented in the preoperational test data package and were incorporated into Technical Instruction TI-31.08, "Flow Balancing Valves Setpoint Postions." As stated in TI-31.08, this instruction ". . . serves as a reference for positioning of flow control valves (FCV's) and throttling valves (THV's) in order to maintain required flow balance."

Piping System Design

TVA experienced problems in establishing and maintaining acceptable flow in raw water piping systems in the 1970s. As a result, Mechanical Design Standard DS-M3.5.1, "Pressure Drop Calculation for Raw Water Piping and Fittings," was developed by TVA to present methods for calculating the pressure drop in full-flowing raw water piping systems. The design standard imposed penalties on the flow coefficient and a diameter reduction to account for corrosion buildup in carbon steel piping systems.

The original design of the ERCW piping system utilized carbon steel piping throughout the system. During the construction phase, the piping system was reanalyzed using the design standard's criteria to determine the locations in the system that would be adversely impacted by the buildup of corrosion in the carbon steel piping. As a result of the analysis, the main supply and discharge headers that are buried in the ground were cleaned and lined with a cement mortar lining to improve and protect the long-term condition of the piping. In addition, most of the small piping (8-inch and smaller), with some exceptions, was replaced with stainless steel piping to eliminate the concern about corrosion buildup in the smaller diameter piping adversely affecting the flow through the system. The corrosion buildup and the increase in fouling resistance in the larger piping located in the plant had a smaller impact on flow through the piping due to the larger cross-sectional flow area, so that piping was not replaced. In addition, the 18-inch supply and return piping to the containment spray heat exchangers 1A-A and 1B-B is normally laid-up with treated demineralized water, and the supply piping to the auxiliary feedwater pumps is stainless steel.

The implementation of these design changes helped ensure that the flow resistance in the piping system has remained similar to the flow resistance of the system at the time the preoperational test system flow balance was performed. TVA has implemented various programs to chemically treat the raw water system and to ensure the piping system is maintained in a clean condition by monitoring the piping system for silt, sediment, and biofouling and it is cleaned when these conditions do occur. These programs are described below in more detail.

Throttle Valve Positions and ERCW Pump Performance

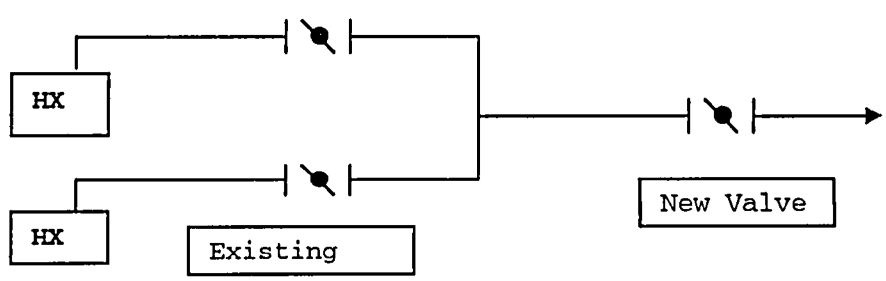
In order to verify that the flow balance established during the preoperational test of the ERCW system has been maintained, the current positions of the throttle valves documented in Technical Instruction TI-31.08 were compared with the positions documented in the preoperational flow balance test results data package. In addition, the ERCW pump surveillance test results were compared with the pump performance data in the preoperational test results data package.

The following is a summary of the review:

Of the 103 ERCW flow balancing valves listed in TI-31.08, 79 of the valves are currently in the position that was established during the performance of the preoperational flow balance test. Four of the valves are valves which have been added to the ERCW System; this leaves 20 valves which have different positions. These valves are discussed as follows:

Diesel Generator Throttle Valves

The throttle valves associated with the diesel generator ERCW system accounts for 12 of the changes. TVA implemented a design change to resolve problems with cavitation downstream of the eight existing valves used to throttle flow to the diesel generator jacket water heat exchangers. Each diesel generator has two jacket water heat exchangers. Four new valves were installed in the common discharge piping downstream of the two existing valves. The new valves were adjusted in combination with the upstream valves to reduce the pressure drop across the upstream valves and subsequently, to reduce cavitation in the piping downstream of the existing valves while maintaining the required flow to the heat exchangers as shown in the simplified diagram.



Existing valves: 1-THV-067-0510A, -0510B, -0515A, -0515B; and 2-THV-067-0510A, -0510B, -0515A, -0515B

New valves: 1-THV-067-8020-A, -8021-B; and 2-THV-067-8020-A, -8021-B

ERCW Strainer 2A-A Backwash and Flush Throttle Valves

The throttle valves associated with the ERCW Strainer backwash and flush piping accounts for two of the changes. The valves are

2-FCV-067-0009A-A (Backwash Valve) and -0009B-A (Flush Valve). The valves were closed slightly. This permits a small decrease in the amount of flow through the valves, but does not affect the flow distribution of the piping downstream of the strainers due to their functions as strainer backwash, or flush valves located in the strainer backwash and flush piping.

Safety Injection Pump Room Cooler 1A-A and 1B-B Throttle Valves

Valve 1-THV-067-0604A-A was changed from 1/4 of a turn from closed to 1/2 of a turn from closed. Valve 1-THV-067-0604B-B was changed from 1/2 of a turn from closed to 1 turn from closed. These changes improved flow slightly, and reduced the chance of blockages occurring at the valves with a negligible impact on the overall flow balance.

Containment Spray Pump Room Cooler 1A-A and 1B-B Throttle Valves

Valve 1-THV-067-0605A-A was changed from 1/2 of a turn from closed to 5/8 of a turn from closed. Valve 1-THV-067-0605B-B was changed from 1/2 of a turn from closed to 1 turn from closed. These changes improved flow slightly, and reduced the chance of blockages occurring at the valves with a negligible impact on the overall flow balance.

Penetration Room Coolers 1B1 and 2B3 and Pipe Chase Cooler 1B Throttle Valves

Throttle valve 1-THV-067-0608B-B was changed from 1/4 of a turn from closed to 1/2 of a turn from closed. These changes improved flow slightly, and reduced the chance of blockages occurring at the valve with a negligible impact on the overall flow balance.

Throttle valve 1-THV-067-0611B-B was changed from 1/4 of a turn from closed to 3/4 of a turn from closed. These changes improved flow slightly, and reduced the chance of blockages occurring at the valve with a negligible impact on the overall flow balance.

Throttle valve 2-THV-067-0610B-B was changed from 1/2 of a turn from closed to 1/4 of a turn from closed. The slight change has not affected the ability of Penetration Room Cooler 2B3 (Elevation 737.0) to perform its design basis function as there was a 220 percent flow margin between the actual flow and the required design flow. The other coolers in the associated subgroup of coolers, Penetration Cooler 2B1 (Elevation 692.0), Penetration Cooler 2B2 (Elevation 713.0), and Pipe Chase Cooler 2B, are not required for Unit 1 only operation and receive flow for lay-up purposes.

Station Air Compressor B Throttle Valves

Throttle valve 0-THV-067-0635B-S was changed from 1 turn from closed to 1 and 1/4 turns from closed. Throttle valve 0-THV-067-0632B-S was changed from 3/4 turn from closed to 1 turn from closed. These minor adjustments have a negligible effect on the flow distribution to the other equipment in the Station Air Compressor Group. These compressors do not perform a safety related function.

Spent Fuel Pump and Thermal Barrier Booster Pump Space Cooler Throttle Valve

Throttle valve 1-THV-067-0646B-B was changed from 3/4 turn from closed to 1/2 turn from closed. This adjustment has potentially reduced the flow to the cooler. This cooler does not perform a primary safety related function but does cool pumps important to plant operation.

ERCW Pump Performance

TVA evaluated the ERCW pump performance levels during the preoperational test against the current surveillance test results. The evaluation of ERCW Pump Performance involved comparing the preoperational test pump performances with the current ASME Section XI test performance data. The preoperational test obtained head versus flow values at several different flow rates and used the results to generate flow versus head curves for each pump. The ASME Section XI tests obtain a single flow versus head data set. The ASME Section XI test is performed at a flow rate of 9,500 gpm. Since the preoperational test did not use a flow rate of 9,500 gpm in the performance of those tests, calculations were used to determine the corresponding head at 9,500 gpm by using the curve generated by the preoperational test results. The calculated values for the pump head were then compared with the recent ASME Section XI test results to determine the variance between the preoperational test results and the ASME Section XI test results. The summary of the results is shown in the table below.

ERCW Pump	Preoperational Test Head @ 9500 gpm	Latest ASME Section XI Test Head @ 9500 gpm	% Difference Using Polynomial Curve Fit	% Difference Using Linear Equation between 2 closest points
A-A	252.85 ft	244.60 ft	-3.26	-3.11
B-A	231.35 ft	247.13 ft	6.82	7.07
C-A	239.56 ft	237.66 ft	-0.79	-0.59
D-A	234.66 ft	233.27 ft	-0.59	-0.17
E-B	243.63 ft	244.14 ft	0.21	0.44
F-B	235.78 ft	246.27 ft	4.45	4.83
G-B	246.71 ft	251.07 ft	1.77	2.08
H-B	241.60 ft	255.45 ft	5.73	6.19

The only reduction in pump performance noted is the 3.26 percent reduction in developed head at the 9,500 gpm flow point for the A-A pump; however, the A-A pump's performance is still within an acceptable operating range when compared with the other ERCW pumps. The ERCW System Description specifies the minimum ASME Section XI test point as 220 feet at 9,500 gpm.

Monitoring and Maintaining the ERCW System

In order to verify that the flow balance established during the preoperational test of the ERCW system has been maintained, the following WBN procedures and instructions have been implemented to monitor and maintain the ERCW System in an acceptable operating condition.

TS Surveillance Instructions 0-SI-67-901-A, "Essential Raw Cooling Water Pump A-A and Pump C-A Performance Test," 0-SI-67-901-B, "Essential Raw Cooling Water Pump E-B and Pump G-B Performance Test," 0-SI-67-902-A, "Essential Raw Cooling Water Pump B-A and Pump D-A Performance Test," and 0-SI-67-902-B, "Essential Raw Cooling Water Pump F-B and Pump H-B Performance Test," verify the operational readiness of the ERCW pumps by performing periodic surveillance tests.

Instruction TI-67.000, "Raw Water Program," describes the WBN Raw Water Program. This program is designed to mitigate biological fouling with chemical treatment, remove silt and foreign material with periodic flushes, and to monitor the system condition using a variety of techniques.

Instructions TI-67.001, "Component Flow Blockage Testing - Essential Raw Cooling Water (Train A)," and TI-67.002, "Component Flow Blockage Testing - Essential Raw Cooling Water (Train B)," perform monthly surveillances of various safety-related coolers to determine if flow blockage has occurred in the piping associated with the cooler. This is done by measuring the flow through the cooler. This information is tracked and trended to determine if the piping supplying the coolers is blocked or the flow is being restricted. Although not an actual flow balance test, the data collected during these surveillances can be compared with the data collected during the normal operating mode flow balance simulation in preoperational test PTI-067-02. The flow rates obtained during the performance of TI-67.001 and TI-67.002 while the plant is in normal operation are consistent with the flow rates obtained during the performance of the normal mode test simulation in PTI-067-02. Variations in system alignment from the preoperational test alignment prohibit a direct correlation of the flow rates. The preoperational test simulation assumed ERCW Train A and B had two ERCW pumps in operation during the preoperational test flow balance. This is not always the case during normal plant operation. In addition, the flow balance test assumed equipment was in service that only operates intermittently during normal plant operation.

Instructions TI-67.003, "Component Flow Blockage Testing Utilizing Ultrasonics Essential Raw Cooling Water-(Train A)," TI-67.004, "Component Flow Debris/Foreign Material Testing Utilizing Ultrasonics Essential Raw Cooloing Water-(Train B)," TI-67.005, "ERCW A-Train System Flush Online," TI-67.006, "ERCW B-Train System Flush - Online," TI-67.007, "ERCW A-Train Ystem Flush - Refueling Outage," and TI-67.008, "ERCW B-Train System Flush - Refueling Outage," perform examinations to determine if piping segments are blocked and implement flushes to ensure the piping system and associated equipment are clear of obstructions. These instructions ensure the components not specifically addressed in TI-67.001 and TI-67.002 will still receive the required flow during various plant operating conditions.

Chemical treatment of the ERCW to control the clams, zebra mussels, microbiologically induced corrosion (MIC), and slime that can invade the ERCW system is performed using Chemistry Manual Chapters 4.04, "BCDMH Injection For Control of Clams Slime And MIC," 4.05, "Non-Oxidizing Biocide Injection for Control of Asiatic Clams, Zebra Mussels, and MIC," 4.08, "Non-Oxidizing Biocide Injection Into the Auxiliary Feedwater ERCW B Supply Line For Control Of Asiatic Clams, Zebra Mussels," and 4.09, "Non-Oxidizing Biocide Injection During ERCW Pump Test for Control of Asiatic Clams, Zebra Mussels, and MIC."

In summary, TVA has implemented various plant procedures, instructions, and programs to monitor and maintain the condition of the ERCW system to ensure the ERCW System's preoperational test flow balance has been maintained and the ERCW System can still fulfill its design basis requirements.

NRC QUESTION 6

Note 7 in Table 2 of the submittal attachment (Page 26) indicates that actual heat loads were used as a basis to reduce the amount of heat that is required to be rejected. Provide a detailed discussion to explain why this is a valid approach consistent with the plant licensing basis with respect to the worst case conditions that must be assumed.

RESPONSE TO QUESTION 6

Determination of normal maximum and post accident (LOCA) temperatures in areas served by safety related chilled water supplied heating, ventilating and air conditioning (HVAC) systems have historically been based upon very conservative cooling load assumptions concerning cables, electrical panels, etc. This has resulted in chillers which use ERCW as an ultimate heat sink being significantly over-designed. In an effort to obtain more accurate and realistic values, cooling loads representative of both normal full power operation and post LOCA/high energy line break (HELB) (inside primary containment) for all rooms served by the Shutdown Board Room (SDBR), Electrical Board Room (EBR), and Main Control Room (MCR) HVAC systems were updated in 2000 and 2001. These heat loads were based upon actual measured data obtained during full power operation of Unit 1 (References 6 and 7).

Each of these systems utilizes chillers which reject heat to the ERCW system. Data collected and documented in walk down packages were used as design input to compute the cooling loads for each of these systems on a per room basis. Scaling factors were developed and documented in References 1 and 2 to predict post design basis LOCA/HELB (inside primary containment) cooling loads when additional equipment such as Emergency Core Cooling System (ECCS) pumps, Emergency Gas Treatment System (EGTS), Auxiliary Building Gas Treatment (ABGTS), etc., would be running. An additional margin of 10 percent was added to each computed value. The results of these calculations indicate a reduction in the total design cooling load of approximately 34 percent for the EBR areas, 50 percent for MCR areas, and 75 percent for SDBR areas.

NRC QUESTION 7

Note 9 in Table 2 of the submittal attachment (Page 26 & 27) indicates that increased ERCW flow rates are credited, whereas the discussion on Page 21 indicates that increased flow rates were not credited for the EDG jacket water heat exchanger. Please provide clarification for the above discrepancy. Also, provide a detailed discussion to explain how the engineering judgment was validated.

RESPONSE TO QUESTION 7

Note 9 discusses the evaluation of the EDG jacket water heat exchangers and the effects of the higher temperatures on the piping stress analysis and supports.

A quantitative analysis was performed to evaluate the heat transfer performance of the EDG jacket water heat exchangers. This analysis used the existing design flow rates for the ERCW cooling water with the ERCW temperature of 88 degrees F (Reference 1).

The engineering judgment applied to the evaluation of the effect of the increased ERCW temperature on the piping and support calculations (Reference 4). The nominal preoperational test data flow rates were used to determine the effective temperature increase in the associated piping and its affect on the existing piping and support analyses. This is described in Section 3.15 on Pages 18 and 19, of the Attachment to the May 8, 2006 submittal.

NRC QUESTION 8

TVA indicated that the TVA Tennessee River system is capable of providing water beyond the 30 days (up to one year without any rainfall) as stated in the Updated Final Safety Analysis Report (Page 28). Provide a detailed discussion to explain why this capability is not able to maintain the UHS below the current 85°F temperature limit.

RESPONSE TO QUESTION 8

The above statement was included in the UFSAR to indicate that reservoir system upstream of WBN maintains sufficient storage (even at low winter pool elevations) to provide a flow of at least 2,000 cubic feet per second (cfs) in the Tennessee River at WBN. This flow guarantees an acceptable submergence and water supply for the ERCW pumps in the event of a Loss of Downstream Dam (LODD) (Chickamauga).

NRC QUESTION 9

TVA indicated that since ERCW flow margins above the existing flow requirements were utilized in validating acceptable performance at the higher ERCW temperature, specific evaluations will be performed prior to unit operations above 85°F. The performance of these specific evaluations will validate any margin based inputs utilized in the original analyses that determined acceptable performance could be achieved at the higher ERCW temperature. As indicated in the above item 2, validation of the available flow margins that are being credited is requested in support of the staff's review of the proposed change. Furthermore, provide additional discussion detailing specifically how these evaluations will be performed to assure conservative results consistent with licensing basis assumptions.

RESPONSE TO QUESTION 9

TVA will provide the response to this question in a separate submittal by February 16, 2007.

References:

1. Calculation MDQ00008220030077 Rev. 0, "Emergency Diesel Generator Jacket Water Heat Exchanger Evaluation"

2. Calculation MDQ00006720030078 Rev. 0, "88°F UHS Impact On ERCW Cooled Components"

3. Calculation MDQ00006720030079 Rev. 0, "88°F UHS Impact On HVAC/ESF Coolers"

4. Calculation N3-PA-092 Rev. 0, "Evaluation Of Impact Of 88F ERCW (Ultimate Heat Sink) On Safety Related Piping And Pipe Supports"

5. Calculation WBNOSG4-136 Rev. 14, "Steady State DBE LOCA Temperatures For The Auxiliary Building"

6. Calculation WBNMEBMDQ0031000048 Rev. 0 "Cooling Load Analysis for Rooms Served by the Shutdown and 480V Board and Battery Room HVAC Systems"

7. Calculation MDQ00003120010065 Rev. 0 "Cooling Load Analysis for Rooms Served by the Main Control Room and Electrical Board Room HVAC Systems"

8. Calculation EPM-JN-010890 Rev. 10, "Performance Of CCS Heat Exchangers"

9. Technical Instruction TI-78.004 Rev. 0, "Guidance For Implementing Higher SFP Heat Loads"

10. PER 7602, Diesel Generator Jacket Water Heat Exchangers have Unconservative Fouling Factors

Enclosure 2

TENNESSEE Valley Authority
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
DOCKET NO. 50-390

REVISED COMMITMENTS

1) The UFSAR will be revised to address single-train RHR cool down restrictions for ERCW temperatures above 85 degrees F which consists of holding the unit at 350 degrees F until 26 hours after reactor shutdown with cooling provided by the steam generators prior to transitioning to RHR cooling.