UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

June 11, 2010

Mr. R. M. Krich
Vice President, Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC COMPONENT DESIGN BASES INSPECTION - INSPECTION REPORT 05000390/2010006

Dear Mr. Krich:

On April 27, 2010, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Unit 1. The enclosed inspection report documents the inspection results, which were discussed at the site on April 2, 2010, with Mr. Greg Boerschig and other members of your staff, and again by phone on April 27, 2010 with Mr. Gary Mauldin and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents one NRC-identified finding of very low safety significance (Green) which was determined to be a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy because of its very low safety significance and because it was entered into your corrective action program. If you contest this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at the Watts Bar Nuclear Plant. In addition, if you disagree with the characterization of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II and the NRC Resident Inspector at the Watts Bar Nuclear Plant. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the

NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Binoy B. Desai, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-390
License No. NPF-90

Enclosure: Inspection Report 05000390/2010006
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Binoy B. Desai, Chief
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Letter to Rod M. Krich from Binoy B. Desai dated June 11, 2010

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC COMPONENT DESIGN BASES INSPECTION - INSPECTION REPORT 05000390/2010006

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-390

License Nos.: NPF-90

Report Nos.: 05000390/2010006

Licensee: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Unit 1

Location: Spring City, TN 37381

Dates: March 1 – April 27, 2010

Inspectors: R. Lewis, Senior Reactor Inspector (Lead)
J. Adams, Reactor Inspector
C. Even, Reactor Inspector
P. Lessard, Resident Inspector
J. Eargle, Reactor Inspector
A. Alen, Reactor Inspector (Trainee)
S. Kobylarz, Contractor
W. Sherbin, Contractor

Approved by: Binoy B. Desai, Chief
Engineering Branch 1
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000390/2010006; 3/1/2010 – 4/27/2010; Watts Bar Nuclear Plant, Unit 1; Component Design Basis Inspection.

This inspection was conducted by a team of four NRC inspectors from the Region II office, one resident inspector from Region II, one NRC inspector from the Region IV office, and two NRC contract inspectors. One Green finding, which was a non-cited violation (NCV), was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," (ROP) Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green. The team identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for the licensee's failure to update ERCW strainer mounting (seismic/structural) calculations to reflect the as-built conditions, a failure which was allowed to exist since commercial operations began. This calculation was then used in making acceptance conclusions for a modification installed in recent months. The licensee entered this condition into their corrective action program as Problem Evaluation Reports (PERs) 221018, 220754, and 223677 and took immediate actions to determine the seismic acceptability of the current installation, utilizing calculational conclusions of a similar installation at the licensee's Sequoyah Nuclear Plant.

The finding was determined to be more than minor because it was associated with the design control attribute within the Mitigating System's cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, in that there was reasonable doubt as to the operability of the ERCW strainers as a result of the performance deficiency. The team evaluated the finding to be of very low safety significance (Green) utilizing IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings" worksheet, as it was a calculational error subsequently determined to not result in an operability issue. No cross-cutting aspect was identified since the issue was not reflective of current licensee performance. (Section 1R21.2.5)

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components and operator actions for review using information contained in the licensee's Probabilistic Risk Assessment (PRA). In general, this included components and operator actions that had a risk achievement worth factor greater than 1.3 or Birnbaum value greater than 1 $X10^{-6}$. The components selected were located within the following systems: emergency raw cooling water (ERCW), engineering safety features (ESF) safety injection (SI), residual heat removal (RHR), auxiliary feed water (AFW), station 125VDC generation and distribution, and station AC distribution. The sample included nineteen components, four operating experience items, and four operator actions.

The team performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases had been correctly implemented and maintained. This design margin assessment considered original design issues, margin reductions due to modifications, or margin reductions identified as a result of material condition issues. Equipment reliability issues were also considered in the selection of components for detailed review. These reliability issues included items related to failed performance test results, significant corrective action, repeated maintenance, maintenance rule (a)1 status, RIS 05-020 (formerly GL 91-18) conditions, NRC resident inspector input of problem equipment, System Health Reports, industry operating experience and licensee problem equipment lists. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. An overall summary of the reviews performed and the specific inspection findings identified is included in the following sections of the report.

.2 Results of Detailed Reviews

.2.1 EDG Fuel Oil

a. Inspection Scope

The inspectors reviewed the plant technical specifications (TS), updated final safety analysis report (UFSAR), design criteria (DC), system descriptions (SDs), piping and instrumentation diagrams (P&IDs), and associated system lesson plans to establish an overall understanding of the design basis of the component. Design calculations (net positive suction head (NPSH), fuel oil consumption, etc) and system operating parameters were reviewed to verify that design bases and design assumptions had been appropriately translated between specifications, calculations, and component associated procedures. Walkdowns, interviews, and instrumentation reviews (specifically, day tank and underground storage tank level instruments) were performed to verify that the installed configuration would support the design basis function under accident/event conditions, that they had been maintained to be consistent with design assumptions, and that component operation and alignments were consistent with design and licensing basis assumptions. Testing procedures and their associated results were reviewed to verify that acceptance criteria for the tested parameters were supported by calculations or other engineering documents to ensure that the design and licensing bases were met, and to verify that individual test and/or analyses validated component operation under accident/event conditions. Interviews of system engineers, health report reviews, and walkdown results were utilized to verify that potential degradation was monitored or prevented, and that component replacement was consistent with in service/equipment qualification life. The licensee's response to and actions in light of USNRC Information Notice 2006-22 were reviewed to verify that applicable insights from operating experience had been applied to the selected components.

b. Findings

No findings were identified.

.2.2 Turbine-driven Auxiliary Feedwater (TDAFW) Pump

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design basis of the component. Design calculations (i.e. minimum flow, run out protection, NPSH, overpressure prevention, and trip and throttle valve and ventilation fan voltage) and site procedures were reviewed against these bases to verify design assumptions had been appropriately translated into these documents. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. A component walkdown was conducted to verify that the installed configuration would support the design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Operating procedures for aligning AFW pumps during a station blackout (SBO), small break LOCA, or other event scenarios that cause a loss of main feed water were reviewed to verify that operation of this component was consistent with design basis requirements and analyzed conditions. Alternate flow paths and water sources, as well as possible diversion paths, were reviewed to verify that the process medium would be available and unimpeded during an accident. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents and that individual tests and/or analyses validated component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.3 Motor-driven Auxiliary Feedwater (MDAFW) Pressure Control Valves

a. Inspection Scope

The team reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (sizing/thrust, stroke time, differential pressure setpoints of operation, and seismic analysis) and system operating parameters were reviewed to verify that design bases and design assumptions had been appropriately translated between specifications, calculations, and component associated procedures. Walkdowns, interviews, and instrumentation reviews were performed to verify that the installed configuration will support its design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Testing procedures, their bases, and their associated results were reviewed to verify that acceptance criteria for the tested parameters are supported by calculations or other engineering documents to ensure that the design and licensing bases are met, and to verify that individual test and/or analyses validate component operation under accident/event conditions. Vendor documentation, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.4 AFW Discharge Level Control Valves

a. Inspection Scope

The team reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (sizing/thrust, stroke time, etc) and system operating parameters were reviewed to verify that design bases and design assumptions had been appropriately translated into design calculations and procedures. Modifications to the system were reviewed against design documents to verify that performance capability of selected components had not been degraded. Walkdowns, interviews, and instrumentation reviews were performed to verify that the installed configuration will support its design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Testing procedures, their bases, and their associated results were reviewed to verify that acceptance criteria for the tested parameters are supported by calculations or other engineering documents to ensure that the design and licensing bases are met, and to verify that individual test and/or analyses validate component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed to verify that potential degradation is monitored or prevented, and that component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.5 ERCW Strainers

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e. seismic, ERCW hydraulics, motor voltage and thermal overload protection/coordination) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. Equipment ratings and specifications were reviewed against design basis requirements to ensure that the equipment qualification is suitable for all expected conditions. A component walkdown was conducted to verify that the installed configuration will support the design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Operating procedures were reviewed against design basis documents to verify that strainer operations are supported by calculations or other engineering documents and that analyses validate component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

Introduction: The team identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control which requires that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. Specifically, the licensee did not correctly evaluate the seismic qualification of the anchorage of ERCW system strainers located in the main intake pumping station, to ensure that the strainers' mounting system in the floor would not fail during a seismic event. This calculation was then used in making acceptance conclusions for a subsequent modification installed in recent months.

Description: The team reviewed UFSAR Table 3.2-2 which describes the ERCW system automatic backwashing strainers as Seismic Class I. The team reviewed the seismic calculation for the strainers, titled; "Pressure Vessel Design Report Number DR-551 for S.P. Kinney 24" Model "A" Strainer," dated April 5, 1977. This calculation evaluated the strainer foundation as rigidly anchored to the floor with 24 mounting bolts. During a walkdown of the intake pumping station the team observed that the ERCW strainers as-constructed anchorage consisted of a sliding base assembly with 8 bolts that allowed for movement in the axial direction parallel to the inlet/outlet nozzles, and no restraint in the vertical (up) direction. Following the walkdown, the team requested TVA to provide the seismic analysis for the strainers that included the sliding base assembly, since the existing analysis of record with 24 bolts did not evaluate the as-constructed sliding base anchorage with 8 bolts.

As a result of the team's concern, TVA entered the issue into their corrective action program as PERs numbered 221018, 220754, and 223677. Lacking an appropriate calculation for seismic stresses in the strainer sliding base assembly, TVA performed an immediate operability determination which stated that the ERCW strainers at Watts Bar are similar to those at Sequoya Nuclear Plant, and were similarly mounted on sliding base assemblies. The stress report for the Sequoya Nuclear Plant's strainers was reviewed by TVA, and it was determined that the Watts Bar and Sequoya stresses were similar, and were similarly mounted on sliding base assemblies. TVA concluded that the strainers remained operable, and during the inspection, revised strainer seismic analyses to qualify the as-built sliding base assembly. The team reviewed the operability evaluation, and the revised analyses, and determined that the initial operability evaluation was appropriate, and that the analyses addressed the as-constructed configuration.

The team reviewed the ERCW piping cross-tie modification performed in 2009, and noted that DCN 52798 did not include this calculation as an affected calculation, but was used in making acceptance conclusions for nozzle loads. The revised seismic analyses performed on March 26, 2010 appropriately evaluated the modified piping configuration and nozzle loads.

Analysis: The team determined that the inadequate seismic analysis of the ERCW strainers' mounting systems was a performance deficiency. The finding was determined to be more than minor because it was associated with the design control attribute within the Mitigating System's cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, in that there was reasonable doubt as to the operability of the ERCW strainers as a result of the performance deficiency. The team evaluated the finding to be of very low safety significance (Green) utilizing IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings" worksheet, as it was a calculational error subsequently determined to not result in an operability issue. The licensee performed calculation revisions during the inspection and determined that adequate structural capability existed in the sliding base assembly holding the pumps in place. This finding was not assigned a cross-cutting aspect because the underlying cause was not indicative of current performance.

Enforcement: 10 CFR 50, Appendix B, Criterion III, Design Control, states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. UFSAR Table 3.2-2 describes the ERCW system automatic backwashing strainers as Seismic Class I. Contrary to the above, prior to March 26, 2010, TVA did not perform the required evaluations of the ERCW strainers to ensure that they were seismically qualified in the as-constructed configuration with the strainers mounted on sliding base assemblies. Because this finding was of very low safety significance and was entered into the TVA corrective action program as problem evaluation reports (PERs) 221018, 220754, and 223677, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy. (NCV 05000390/2010-006-01, Inadequate Assessment of Seismic Qualification of ERCW Strainers)

.2.6 Thermal Barrier Booster Pump

a. Inspection Scope

The team reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e. minimum flow and NPSH) and site procedures were reviewed against these bases to verify design assumptions had been appropriately translated into these documents. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. A component walkdown was conducted to verify that the installed configuration would support design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Control panel indicators were observed and operating procedures reviewed to verify that component operation and alignments were consistent with design and licensing basis assumptions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents and that individual tests and/or analyses served to validate component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.7 Shutdown Gravity Drain Through 63-1

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e., minimum voltage and required torque/thrust) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. The inspector reviewed the calculations for the degraded voltage at the motor-operated valve (MOV) terminals, to ensure the proper voltage was utilized in the team's review of MOV torque calculations. A component walkdown was conducted to verify that the installed configuration would support design basis function under accident/event conditions and that the configuration had been maintained to be consistent with design assumptions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents and that individual tests and/or analyses served to validate component operation under accident/event conditions. System health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

Introduction. The team indentified an Unresolved Item (URI) regarding calculations that supported the degraded voltage protection scheme. The calculations that analyzed the Class 1E 6900 VAC and 480 VAC motor loads take credit for administratively limiting the minimum 161kV offsite power supply bus voltage and credit performance of the non-safety-related automatic load tap changers on the common station service transformers (CSSTs) to limit the minimum voltage on the Class 1E 6900 VAC and 480 VAC buses. The calculations did not evaluate the Class 1E 6900 VAC and 480 VAC motor loads at the worst possible case low voltages which could drop as low as the bottom end of the acceptable tolerance band of the degraded voltage relays.

Description. Offsite power is normally provided to the Class 1E 6900 VAC buses from the 161kV offsite power system through the CSSTs. The CSSTs have non-safety automatic load tap changers which are designed to maintain approximately 6900 VAC on the Class 1E buses through a dynamic range of 161kV offsite power supply voltages. The Class 1E 480 VAC buses are then powered from fixed-tap 6900/480VAC transformers powered from the respective Class 1E 6900 VAC buses.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Appendix 8-A, "Branch Technical Position PSB-1: Adequacy of Station Electric Distribution System Voltages," Rev. 2 (07/1981) is part of the licensing basis for the Watts Bar Nuclear Plant. This document states, in part, that the selection of under-voltage and time-delay setpoints shall be determined from an analysis of the voltage requirements of the Class 1E loads at all onsite distribution levels. Watts Bar calculation WBNEEBMSTI060029, "Degraded Voltage Analysis," Rev. 31, evaluated transient motor starting voltages at the beginning of a design basis loss of coolant accident (LOCA). This calculation was based on the voltages where the minimum 161kV offsite power supply bus voltage was limited by taking credit for administrative controls rather than assuming a worst-case 161kV offsite power supply voltage drop which would still allow voltage recovery to the degraded voltage relay reset setpoint (minus setpoint tolerance) before the expiration of the degraded voltage relay nominal 10 second time delay, and thereby leave the Class 1E 6900 VAC buses connected to the offsite power supply. In addition, calculations for motor starting during steady-state conditions credited voltage improvement based on performance of the non-safety related CSST automatic load tap changers instead of being based on worst-case conditions.

Summary. This issue is unresolved pending further inspection to determine (1) the actual worst-case voltage required to be analyzed on the Class 1E 6900 VAC and 480 VAC buses for safety-related loads in accordance with the facility licensing basis; and (2) the impact of not using the worst-case bus voltage afforded by the degraded voltage protection scheme in safety-related 6900 VAC and 480 VAC motor starting studies. Additionally, this issue is very similar to a URI reported in the Sequoyah Nuclear Plant's inspection report 05000327,328/2010007-01. (URI 05000390/2010006-02, Worst Case 6900 VAC Bus Voltage in Design Calculations)

.2.8 Accumulator Discharge Check Valves

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. External event analyses were reviewed against design specifications and requirements in order to verify that the equipment is adequately protected. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and/or analyses validate component operation under accident/event conditions. System health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.9 Accumulator

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Sizing calculations and site procedures were reviewed against these bases to verify design assumptions had been appropriately translated into these documents. Instrument maintenance and calibration procedures were reviewed in conjunction with the above to verify that instrumentation was maintained such that component inputs and outputs were suitable for application and would be acceptable under accident/event conditions. Interviews of system engineers, health reports and corrective action system reviews were utilized to verify that potential degradation was monitored or prevented, and that component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.10 High Pressure Cold Leg Injection Check Valves

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. External event analyses were reviewed against design specifications and requirements in order to verify that the equipment is adequately protected. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and/or analyses validate component operation under accident/event conditions. System health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.11 Motor Operated Containment Sump Supply Valves FCV-63-72 and -73 and Boron Injection Tank Isolation Valves FCV-63-25 and -26

a. Inspection Scope

The team reviewed the plant TS, UFSAR, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e., minimum voltage and required torque/thrust) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. The team reviewed the calculations for the degraded voltage at the MOV terminals, to ensure the proper voltage was utilized in MOV torque calculations. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. Control room indicators were observed and operating procedures reviewed to verify that component operation and alignments were consistent with design and licensing basis assumptions. Environmental qualification documents were reviewed to verify that the component is appropriately qualified to operate under the most limiting post accident conditions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents and that individual tests and/or analyses served to validate component operation under accident/event conditions. Vendor documents, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified. See the URI associated with paragraph 1R21.2.7.

.2.12 Instrument Air to Service Air Isolation Valve

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e. valve operator capability and nitrogen bottle sizing) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. Equipment ratings and specifications were reviewed against design basis requirements to ensure that the equipment qualification is suitable for all expected conditions. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component’s performance capability and were appropriately incorporated into relevant drawings and procedures. A component walkdown was conducted to verify that the installed configuration will support design basis function under accident/event conditions and have been maintained to be consistent with design assumptions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and/or analyses validate component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.13 Motor-Driven Auxiliary Feedwater (MDAFW) Pump

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, P&IDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e. system hydraulic resistance, minimum flow, run-out protection, NPSH, vortex, seismic analysis) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. Equipment ratings and specifications were reviewed against design basis requirements to ensure that the equipment qualification is suitable for all expected conditions. A component walkdown was conducted to verify that the installed configuration will support design basis function under accident/event conditions and have been maintained to be consistent with design assumptions. Control room indicators were observed and operating procedures reviewed to verify that component operation and alignments are consistent with design and licensing basis assumptions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and/or analyses validate component operation under accident/event conditions. Vendor documentation, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.14 RHR Shutdown Cooling Suction MOVs FCV-74-1 and FCV-74-2

a. Inspection Scope

The team reviewed the plant TS, UFSAR, SDs, P&IDs and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculations (i.e., minimum voltage and required torque/thrust) and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. The inspector reviewed the calculations for the degraded voltage at the MOV terminals to ensure the proper voltage was utilized in MOV torque calculations. The team requested and reviewed system modifications over the life of the component to verify that the subject modifications did not serve to degrade the component's performance capability and were appropriately incorporated into relevant drawings and procedures. A component walkdown was conducted to verify that the installed configuration would support design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. Control room indicators were observed and operating procedures reviewed to verify that component operation and alignments were consistent with design and licensing basis assumptions. Environmental qualification documents were reviewed to verify that the component is appropriately qualified to operate under the most limiting post accident conditions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents and that individual tests and/or analyses served to validate component operation under accident/event conditions. Vendor documents, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified. See the URI associated with paragraph 1R21.2.7.

.2.15 SI Pump A Motor

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. Design calculation for pump brake horsepower during a design basis accident, EPMMGDU041593, “Brake Horsepower Analysis for Safety-Related Components,” Revision 19 and relay setting calculation, E31840810004, “6.9-kV Shutdown Board Safety Injection Pumps,” Revision 2, and site procedures were reviewed against these bases to verify design assumptions have been appropriately translated into these documents. Equipment ratings and specifications were reviewed against design basis requirements to ensure that the equipment qualification is suitable for all expected conditions. Control room indicators were observed and operating procedures reviewed to verify that component operation and alignments are consistent with design and licensing basis assumptions. Test procedures and recent test results were reviewed against design basis documents to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and/or analyses validate component operation under accident/event conditions. Vendor documentation, system health reports, preventive and corrective maintenance history, and corrective action system documents were reviewed in order to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.16 Station DC Power Sources

a. Inspection Scope

The team reviewed the plant TS, UFSAR, DC, SDs, and associated system lesson plans to establish an overall understanding of the design bases of the component. The battery and charger loading and sizing calculation, EDQ00023620070003, “125V DC Vital Battery System Analysis,” Revision 4, and voltage calculation, EEBMSTI110004, “125V DC Voltage Analysis,” Revision 61, were reviewed, as were maintenance and operational procedures, in order to verify that design bases and design assumptions had been appropriately translated into design calculations and procedures. Test procedures and recent testing results were reviewed in order to verify that acceptance criteria for tested parameters were supported by calculations or other engineering documents to ensure that design and licensing bases are met and that individual tests and or analyses validated component operation under accident/event conditions. Battery room temperature evaluations were reviewed to verify that the equipment qualification was suitable for the environment expected under all conditions. Modifications to the system were reviewed against design documents to verify that performance capabilities of selected components had not been degraded. The inspectors conducted a walkdown of the batteries and their associated chargers, reviewed vendor manuals and construction drawings, and performed focused field inspections to verify that the installed configuration would support its design basis function under accident/event conditions and that the equipment was properly protected. Interviews with system engineers and maintenance personnel were conducted, and system health reports, component maintenance history and licensee corrective action program reports were reviewed to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.17 Reactor Vessel Level Indication for Reduced Inventory and Mid-Loop Operations

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DBDs and associated system lesson plans to establish an overall understanding of the design bases of the component. Instrument control drawings, setpoint and loop uncertainty calculations were reviewed to verify that design bases and design assumptions have been appropriately translated. Calibration procedures and testing results were reviewed to verify that acceptance criteria for tested parameters are supported by calculations or other engineering documents and that individual tests and or analyses validate component operation under accident/event conditions. The inspectors conducted a walkdown of the instrument, reviewed vendor manuals and construction drawings, and performed alignment verifications to verify that the component’s installed configuration will support its design basis function under accident/event conditions. Interviews with system engineers and maintenance personnel were conducted, system health reports, component maintenance history and licensee corrective action program reports were reviewed to verify that potential degradation is monitored or prevented and the component replacement is consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.2.18 Common Station Service Transformers C and D

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs and associated system lesson plans to establish an overall understanding of the design bases of the component. Load flow calculations were reviewed in conjunction with coordination calculations to verify that station offsite power would be available and unimpeded during accident/event conditions. Support system calculations and vendor information were reviewed in order to verify that energy sources, including those used for control functions would be available and adequate during accident/event conditions. The inspectors conducted a walkdown of the transformers and their associated auxiliaries, reviewed vendor manuals and construction drawings, and performed focused field inspections to verify that the installed configuration would support its design basis function under accident/event conditions and that the equipment was properly protected. Interviews with system engineers and maintenance personnel were conducted, system health reports, component maintenance history and licensee corrective action program reports were reviewed to verify that potential degradation was monitored or prevented.

b. Findings

No findings were identified.

.2.19 Molded Case Circuit Breakers (MCCBs) for MCC RMOV Bd 1B1-B or 1A1-A

a. Inspection Scope

The inspectors reviewed the plant TS, UFSAR, DC, SDs and associated system lesson plans to establish an overall understanding of the design bases of the component. Coordination and short circuit calculations were reviewed along with maintenance and testing procedures to verify that design bases and design assumptions had been appropriately translated into design calculations and procedures. A component walkdown was conducted to verify that the installed configuration would support design basis function under accident/event conditions and had been maintained to be consistent with design assumptions. System health reports, component maintenance history and licensee corrective action program reports were reviewed to verify that potential degradation was monitored or prevented and the component replacement was consistent with in service/equipment qualification life.

b. Findings

No findings were identified.

.3 Review of High Risk and Low Margin Operator Actions

a. Inspection Scope

The team performed a margin assessment and detailed review of four risk significant and time critical operator actions. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times. For the selected operator actions, the team performed a walkthrough of associated Emergency Operating Procedure, Abnormal Operating Procedures, Annunciator Response Procedures, and other operations procedures with plant operators and engineers to assess operator knowledge level, adequacy of procedures, availability of special equipment when required, and the conditions under which the procedures would be performed. Detailed reviews were also conducted with operations and training department leadership, and through observation and utilization of a simulator training period to further understand and assess the procedural rationale and approach to meeting the design basis and UFSAR response and performance requirements. Operator actions were observed on the plant simulator and during plant walk downs.
Operator actions associated with the following events/evolutions were reviewed:

- Operator Response to Loop and Restoration of Offsite Power
- Operator Response to ATWS
- Operator Actions for Control of Refueling Canal drain Plugs
- Operator Actions for SI Termination prior to Challenging PORVs with Water

b. Findings

No findings were identified.

.4 Review of Industry Operating Experience

a. Inspection Scope

The team reviewed selected operating experience issues that had occurred at domestic and foreign nuclear facilities for applicability at the Watts Bar Nuclear Plant. The team performed an independent applicability review for issues that were identified as pertinent to the Watts Bar Nuclear Plant and these items were selected for a detailed review. The issues that received a detailed review by the team included:

- GL 2007-01, Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients
- IN 06-15, Vibration-Induced Degradation and Failure of Safety-Related Valves

- GL 1998-02, Loss of Reactor Coolant Inventory and Associated Potential for Loss of Emergency Mitigation Functions While in a Shutdown Condition
- IN 06-22, New Ultra-Low-Sulfur Diesel Fuel Oil Could Adversely Impact Diesel Engine Performance

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA6 Meetings, Including Exit

On April 2, 2010, the team presented the inspection results to Mr. Greg Boerschig and other members of the licensee staff prior to leaving site. The inspection remained open pending the team's efforts to bring closure to a concern regarding the adequacy of calculational methodology pertaining to degraded voltage design requirements of certain safety related motor operated valves. This issue was subsequently identified as an unresolved item and a final exit was conducted by telephone on April 27, 2010 with Mr. Gary Mauldin and other members of the licensee staff. All proprietary information reviewed as part of the inspection was returned to the licensee in accordance with prescribed controls.

ATTACHMENT: SUPPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

Ron Cox, Electrical Design Manager
Robert Kirkpatrick, Design Engineering Manager
Stuart Switzer, Operations Unit Manager
Mike Brandon, Licensing Manager
Gary Mauldin, Engineering Director

NRC personnel

Mike Pribish, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000390/2010006-01	NCV	Inadequate Assessment of Seismic Qualification of ERCW Strainers (Section 1R21.2.5)

Opened

05000390/2010006-02	URI	Worst Case 6900 VAC Bus Voltage in Design Calculations (Section 1R21.2.7)

LIST OF DOCUMENTS REVIEWED

Licensing Documents

TS, Current
UFSAR, Current
SER and Supplements

Design Basis Documents (Functional System Descriptions)

N3-003B-4002, Auxiliary Feedwater System, Rev 15
N3-030AB-4001, Auxiliary Building Heating, Ventilation, Air Conditioning System (30, 31, 44), Rev. 29
N3-063-4001, Safety Injection System, Rev. 26
N3-067-4002, Essential Raw Cooling Water System, Rev. 25
N3-070-4002, Component Cooling System, Rev. 15
N3-074-4001, Residual Heat Removal System, Rev. 14

N3-32-4002, Compressed Air System, Rev. 8
N3-68-4001, Reactor Coolant System, Rev. 28
WB-DC-30-27, AC and DC Control Power Systems – (Unit 1 / Unit 2), Rev. 29
WB-DC-40-57, AMSAC, Rev. 4
WB-DC-40-64, Design Basis Event Design Criteria, Rev.12

Drawings

05-35262-01(FlowServe Dwg No.), Y-Globe Strainer, Rev C
0-75W1508-1, 500kV Switchyard Main Single Line, Rev. 1
1-15E500-2, Station Auxiliary Power System, Rev. 39
1-45W600-46-6, Wiring Diagrams Feedwater Pump & Turbines Schematic Diagrams, Rev. 24
1-45W700-1, Key Diagram 120V AC & 125V DC Vital Plant Control Power System, Rev. 29
1-45W703-1, Wiring Diagrams 125V Vital Battery Board I Single Line – Sheet 1, Rev. 47
1-45W706-2, Wiring Diagram 120V AC Vital Inst Pwr Bds 1-II & 2-II Connection Diagram – Sheet 2, Rev. 63
1-45W706-3, Wiring Diagram 120V Vital Instr Pwr Bds 1-III & 2-III Connection Diagram – Sheet 3, Rev. 48
1-45W724-1, 6900V Shutdown Board 1A-A Single Line, Rev. 24
1-45W724-2, 6900V Shutdown Board 1B-B Single Line, Rev. 24
1-45W751-1, 480V Reactor MOV BDS 1A1-A & 2A1-A, Rev. 48
1-45W751-2, 480V Reactor MOV BDS 1A1-A & 2A1-A, Rev. 28
1-45W751-6, 480V Reactor MOV BDS 1A2-A & 2A2-A, Rev. 44
1-45W751-7, 480V Reactor MOV BDS 1B1-B & B12-B, Rev. 53
1-45W751-9, 480V Reactor MOV BDS 1B1-B & 2B1-B, Rev. 38
1-45W751-11, 480V Reactor MOV BDS 1B2-B & 2B2-B, Rev. 48
1-45W756-2, Wiring Diagrams 480V Cont & Aux Bldg Vt Bd 1A1-A & 2A1-A Single Line Sh-2, Rev. 69
1-45W760-3-1, Main & Aux Feedwater System Schematic, Rev. 23
1-45W760-63-1, Wiring Diagrams Safety Injection System Schematic Diagram, Rev. 10
1-45W760-63-6, "Wiring Diagrams Safety Injection System Schematic Diagram," Revision 8
1-45W760-67-14, Wiring Diagrams ERCW System Schematic Diagrams, Rev. 11
1-45W760-74-2, Residual Heat Removal Schematic Diagrams, Rev. 16
1-47A595-10, Set-up Parameters for Air Operated Valves – Set-up Box for 1-PCV-003-0132, Rev 0
1-47A8910-63-10, Mechanical Table Of Motor Operated Valve Requirements, Rev. 3
1-47A8910-63-11, Mechanical Table Of Motor Operated Valve Requirements, Rev. 2
1-47A8910-63-14, Mechanical Table Of Motor Operated Valve Requirements, Rev. 2
1-47A8910-63-15, Mechanical Table Of Motor Operated Valve Requirements, Rev. 2
1-47A8910-74-01, Mechanical Table Of Motor Operated Valve Requirements, Rev. 2
1-47A8910-74-02, Mechanical Table Of Motor Operated Valve Requirements, Rev. 2
1-47W610-3-3, Electrical Control Diagram Auxiliary Feedwater System, Rev. 22
1-47W610-63-1, Electrical Control Diagram Safety Injection System, 07/21/1990
1-47W610-63-2, Safety Injection Control Diagram, Rev. 13
1-47W610-74-1, Electrical Control Diagram Residual Heat Removal System, 07/23/1990
1-47W611-1-1, Electrical Logic Diagram Main and Reheat System, Rev. 13

1-47W611-3-3, Auxiliary Feedwater System Logic Diagram, Rev. 10
1-47W611-3-4, Electrical Logic Diagrams Auxiliary Feedwater System, Rev. 18
1-47W611-63-4, Electrical Logic Diagram Safety Injection System, 07/23/1990
1-47W611-63-5, Electrical Logic Diagram Safety Injection System, 01/27/1992
1-47W611-74-1, Logic Diagram Residual Heat Removal, Rev. 5
1-47W802-2, Flow Diagram Auxiliary Feedwater, Rev. 53
1-47W803-3, Flow Diagram Main and Auxiliary Feedwater, Rev 31
1-47W810-1, "Flow Diagram Residual Heat Removal System," Revision 18
1-47W811-1, "Flow Diagram Safety Injection System," Revision 52
1-47W813-1, "Flow Diagram Reactor Coolant System," Revision 35
1-47W813-1, Flow Diagram Reactor Coolant System, Rev. 43
1-47W840-1, "Flow Diagram Fuel Oil Atomizing Air & Steam," Revision 42
1-47W845-1, Flow Diagram, Essential Raw Cooling Water System, Rev. 56
1-47W846-1, Flow Diagram, Control and Service Air, Rev. 38
1-47W848-1, Flow Diagram, Control Air, Rev. 24
1-75W1504, 500kV Switchyard Main Single Line, Rev. 10
1-75W1505, 500kV Switchyard Main Single Line, Rev. 19
1-75W500, Single Line, Rev. 18
1-75W503, 161kV Transformers Main Single Line, Rev. 8
1-75W530-1, CSST C&D CLG Sys & LTC-X Schematic, Rev. 3
1-75W530-2, CSST C&D CLG Sys & LTC-X Schematic, Rev. 3
37W206-2, Flow Diagram, Mechanical Intake Pumping Station, Rev.FF
37W206-5, Flow Diagram, Mechanical Intake Pumping Station, Rev. P
37W206-7, Flow Diagram, Mechanical Intake Pumping Station, Rev. S
38N219, Miscellaneous Steel, ERCW Intake Pumping Station Equipment Supports, Rev. D
47W476-4, Mechanical Containment Drains and Embedded Piping, Rev. 8
90-258771, Model CL85 Level Monitor, Rev. 1
E-272992 (Copes-Vulcan Dwg No.), Series D-100 Valve Assembly with Mod. D-100-160 RA Actuator, Rev 4
E45B17700-6B, Wiring Diagrams 480V C & A Bldg Vt Bd 1A1-A Conn Diag – Compt 6B, Rev. H
Vendor Drawing No. 551, S.P. Kinney 24 inch Model "A" Strainer, Rev. 5
Vendor Drawing Number 5-44143-A, Ametek, Inc., Heat Exchanger Size 4-Y-42, Rev. 0

Calculations

04082090612, Shutdown Board Feeder to Auxiliary Feedwater Pump, Rev. 1
048-018-AFW, System Level Review for Watts Bar AFW system Air Operated Valves, Rev 4
0HC-GLC-S043085, WBN AFW Minimum CST Water Level Required to Support the AFW System, Rev. 6
0-HCG-LCS-043085, WBN Auxiliary Feedwater minimum Condensate Storage Tank (CST) water level required to support the AFW System, Rev 6
0-LT-18-38, "Demonstrated Accuracy Calculation for 0-LT-18-38," Revision 5
1-L-68-399A, Setpoint and Scaling Document, Rev. 2
1-L-68-399B, Setpoint and Scaling Document, Rev. 2
1-PDT-3-132A-B, Demonstrated accuracy calculation for MDAFW pump protection differential pressure control loops, Rev 3
1-PS-3-139A, Demonstrated Accuracy Calculation for CST Header Pressure Switches, Rev. 2

1-T-1-18A, Setpoint and Scaling Document, Rev. 0
1-TS-001-017A-A, Demonstrated Accuracy Calculation, Rev. 3
85-K-S002, ERCW Strainer Sliding Base HPFP Strain Anchorage, Revisions 1 and 2
B18 92 1002 269, Documentation of MOV Design Basis Review and Thrust/Torque Requirements, Rev. 4
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E31840810004, 6.9-kV Shutdown Board Safety Injection Pumps, Rev. 2
EDQ00023620070003, 125V DC Vital Battery System Analysis, Rev. 4
EEB-MS-TI08-008, 480V 1E Coordination/Protection, Rev. 135
EEBMSTI110004, 125V DC Voltage Analysis, Rev. 61
EMP-018-BAL, Evaluation of required thrust for balanced disk globe AFW PCVs and Turbine Driven LCVs at Watts Bar Nuclear Power Station, Rev 0
EPM·AAP·081090, "Diesel Generators Fuel Oil 7-Day Capacity and Level Setpoint" Revision 5
EPM-AAP-092088, "Diesel Generator One-Day Tank Volume and Minimum Level," Revision 3
EPM-CPH-082592, Documentation Of MOV Design Basis Review And Thrust/Torque Requirements And Valve And Actuator Capability Assessment For 1-FCV-74-1, 05/22/2003
EPM-CPH-082692, Documentation Of MOV Design Basis Review And Thrust/Torque Requirements And Valve And Actuator Capability Assessment For 1-FCV-74-2, 08/29/1995
EPM-CPH-1011992, Documentation Of Design Basis Review, Required Thrust/Torque Calculations, And Valve And Actuator Capability Assessment For Valve 1-FCV-63-72, 11/16/2007
EPM-CPH-102092, Documentation Of Design Basis Review, Required Thrust/Torque Calculations, And Valve And Actuator Capability Assessment For Valve 1-FCV-63-73, 11/16/2007
EPM-DTN-070692, Documentation Of Design Basis Review, Required Thrust/Torque Calculations, And Valve And Actuator Capability Assessment For Valve 1-FCV-63-25, 11/02/2000
EPM-DTN-071392, Documentation Of Design Basis Review, Required Thrust/Torque Calculations, And Valve And Actuator Capability Assessment For Valve 1-FCV-63-26, 11/02/2000
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EPM-JKJ-011191, WBN-AFW System-Pump NPSH Calculation, Rev. 4
EPM-KBO-110189, "RCS Midloop Operation- Analysis of Available Flows from CVCS Pump Normal Charging Line and Gravity Drain from the RWST," Revision 3
EPMMGDU041593, Brake Horsepower Analysis for Safety-Related Components, Rev. 19
EPM-MGF-102089, "Diesel Generator Fuel Oil NPSH," Revision 0
EPM-MGF-I01189, "Pressure Drop for Diesel Generator Fuel Oil System," Revision 1
EPM-OED-070391, AFW Pump Performance Curves and Design Margins, Rev 7
EPM-OED-070391, Equations for AFW Pump Performance Curves, Rev. 9
EPM-PBK-012191, HVAC Cooling Load and Room Temperature Calc: TSAFW Pump Room, Rev. 5
EPM-PTC-120594, ERCW Pressure Drop Calc, Rev. 12
EPM-RAS-012490, ERCW Strainer Backwash, Rev. 1

EPM-RKF-012591, AFW Orifice Pressure Drop for Recirculation Lines (Miniflow), Rev 3
EPM-SMC-110292, Backup Nitrogen Supply for AFW LCVs and Main Steam PORVs, Rev. 6
EPM-SWH-101489, Operational Limits for ERCW Instruments 0-PDS-67-431A, -447A, & 1-2-PDS-67-9AA/B, -10AA/B, Rev. 5
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WAT-D-8584, TVA Watts Bar Nuclear Plant Units 1 & 2 Maximum Allowable Thrusts, 06/25/1991
WBN-EEB-EDQ-199901001, AC Auxiliary Power System Analysis, Rev. 55
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WBNEEBMSTI060029, Degraded Voltage Analysis, Rev. 31
WBNOSG4-0233, "Midloop Design Information Calculation," Revision 4
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WCAP 16286-P, Watts Bar Unit 1, Replacement Steam Generator Program NSSS Report, Section 4.2.3, Inadvertent Operation of Emergency Core Cooling System, Rev. 2
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95337, Air in AFW ERCW Suction Piping
148567, TDAFW Pump Trip and Throttle Valve Steam Leak
217486, TDAFW Pump Trip and Throttle Valve Leaking Past Seat
163110, 1B ERCW Strainer Keeps Developing a High DP
134604, Thermal Barrier Booster Pump Reference Value Worksheets
140305, MDAFW Pmp 1B-B discharge PCV failed stroke test IAW 1-SI-901-B. (date initiated 3/17/2008)
140415, AFW Pump 1B-B Loss of Suction During Start. (date initiated 3/18/2008)
144420, AFW pump 1B-B 1-PCV-3-132 Stroke Time. (date initiated 5/7/2008)
172697, NCO850451002-Check motor-driven auxiliary feedwater pumps for overheating of the thrust bearings. (date initiated 6/1/2009)
03-003951-000, Adequacy of available voltage supplied to CSST C & D LTC, 02/03
9687, Unplanned Entry Into LCO 3.7.5, Action B, TDAFW Pump DC Fan Failure
99325, AFWP 1B-B oil in alert range. (date initiated 3/16/2006)
148716, "Review NRC IN-2006–22," December 4, 2006

123235, MDAFW Pump 1B oil sample. (date initiated 4/12/2007)
127498, “Not compatible parts lists in WO,” July 14, 2007
139596, Valve Seismic Limit Exceeded, 03/05/2008
164915, MDAFWP 1B oil analysis. (date initiated 3/3/2009)
212779, CDBI Self Assessment WBN-ENG-F-10-004 Finding, 01/09/2010
217125, Implement MOV Magnesium Rotor Inspection, 02/10
214855, MOV Magnesium Rotor Inspection Plan, 02/10
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0-TRI-0-1, 18 Month Periodic Testing of Molded Case Circuit Breakers Protecting 1E Buses from Non-1E Loads and Associated Circuits, Rev. 13
1-51-63-907, “Residual Heat Removal Hot Leg and Cold Leg Injection Check Valve Testing During Refueling Outages,” Revision 1
1-SI-0-4, Section 1.0, SG PORV/AFW N2 Control Station Checklist, Rev. 23
1-SI-3-901-B, Motor Driven Auxiliary Feedwater Pump 1B-B Quarterly Performance Test, Rev 13
1-SI-3-920, Valve Position Indication Verification AFW System, Turbine Driven AFW Train, Rev. 6
1-SI-3-923-B, AFW pump 1B-B Comprehensive test, Rev 3
1-SI-72-3, Containment Refueling Canal Drains, Rev. 4
1-TRI-0-1, 18 Month Periodic Testing of Penetration Overcurrent Protection Type Molded Case Circuit Breakers, Rev. 12
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1-SI-3-19, 18 Month Channel Calibration of SG 4 TDAFW Level Control Loop 1-LVL-3-175, performed 09/24/09
1-SI-3-901-B, Motor Driven Auxiliary Feedwater Pump 1B-B Quarterly Performance Test, Rev 13, (7/29/06, 11/16/06, 1/12/07, 4/4/07, 6/26/07, 9/17/2007, 12/10/07, 6/26/08, 8/18/08, 11/10/08, 2/9/09, 5/15/09, 9/1/09, 2/9/10)
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1-SI-3-903-B, Valve Full-Stroke Exercising During Plant Operation, AFW Train-B performed 08/11/09, 12/03/09, and 01/31/10
1-SI-3-908, Valve Full Stroke Exercising During Plant Operation-TDAFW, performed 01/07/10, 10/02/09 and 07/06/09
1SI-3-920, Valve Position Indication Verification AFW System TDAFW Train, performed 09/02/09
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1-SI-3-923-B, AFW pump 1B-B Comprehensive test, Rev 3 2-PT-82J, 2J Emergency Diesel Generator Slow Start Test, Rev 48, (3/18/08, 10/16/09)
1-SI-3-924-S, AFW Pump 1A-S Comprehensive Pump Test, performed 10/18/09
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03-011224-000, SIS Accum Tank N2 HDR Inlet Pressure Control, 07/04
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222769, Discrepant Condition Identified in SR 151815 was not Documented in the Corrective Action Program in a Timely Manner, 3/25/2010
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223190, Calculation WBN-OSG4-136 inaccurately credits both Fan 1 and Fan 2 as running post-LOCA, when only the DC fan should be, 3/25/2010
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223508, Bonnet Flange of 1-FCV-74-2-B Has Residual Grease, 3/31/2010
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