UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8931

February 20, 2003

Tennessee Valley Authority
ATTN: Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT - NRC INSPECTION REPORT 50-260/02-05 AND 50-296/02-05

Dear Mr. Scalice:

On January 17, 2003, the Nuclear Regulatory Commission (NRC) completed a safety system design and performance capability inspection at your Browns Ferry Nuclear Plant. The enclosed report documents the inspection findings which were discussed on January 17, 2003, with
Mr. A. Bhatnagar and other members of your staff.

This inspection was an examination of 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 operating license. Within these areas, the inspection involved selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, the NRC has identified an issue that was evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that a violation is associated with this issue. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this finding as a non-cited violation, consistent with Section VI.A of the Enforcement Policy. If you deny this non-cited violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-001; and the NRC Resident Inspector at your Browns Ferry Nuclear Plant.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publically 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/

Charles R. Ogle, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos.: 50-260, 50-296
License Nos.: DPR-52, DPR-68

Enclosure: NRC Inspection Report 50-260,296/02-05
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket Nos.:	50-260, 50-296
License Nos.:	DPR-52, DPR-68
Report Nos.:	50-260/2002-05, 50-296/2002-05
Licensee:	Tennessee Valley Authority
Facility:	Browns Ferry Nuclear Plant
Location:	Corner of Shaw and Browns Ferry Roads Athens, AL 35611
Dates:	December 9-13, 2002 January 13-17, 2003
Inspectors:	J. Moorman, Senior Reactor Inspector (Lead Inspector) C. Smith, Senior Reactor Inspector K. Maxey, Reactor Inspector M. Maymi, Reactor Inspector F. Baxter, Electrical Systems Specialist (Contractor)
Accompanied by:	A. Vargas, Inspector Trainee R. Fanner, Inspector Trainee
Approved by:	Charles R. Ogle, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000260-02-05, 05000296-02-05; Tennessee Valley Authority; on 12/9-13/2002 and 01/13-17/03; Browns Ferry Nuclear Plant; Safety System Design and Performance Capability Inspection.

This team inspection was conducted by regional inspectors and a contract inspector. One green finding with a related non-cited violation was identified during this inspection. The significance of most inspection findings is indicted 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," Revision 3, dated July 2000.

Inspector Identified Findings

Cornerstone: Mitigating Systems

- Green. Failure to adequately accomplish a shutdown battery board surveillance procedure resulted in the accumulation of corrosion on several battery posts and inter-cell connectors of Unit 1/Unit 2 Shutdown Board Batteries A and B.

  A non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified. This finding is greater than minor because it would become a more significant safety concern if left uncorrected. Since this finding does not represent an actual loss of a safety function or screen as potentially risk significant due to a seismic, fire, flooding, or severe weather initiating event, the finding has very low safety significance. (Section 1R21.35.b)

REPORT DETAILS

1. REACTOR SAFETY

CORNERSTONES: Initiating Events, Mitigating Systems

1R21 Safety System Design and Performance Capability

The team selected components from the residual heat removal (RHR) system, residual heat removal service water (RHRSW) system, and the emergency equipment cooling water (EECW) system for inspection. This inspection also covered supporting equipment, equipment which provides power to these systems, and the associated instrumentation and controls. These components operate together to accomplish the risk-significant, containment heat removal function.

.1 System Needs

.11 Instrumentation

a. Inspection Scope

The team reviewed mechanical logic diagrams and electrical elementary diagrams to determine if RHR system operation was consistent with the Updated Final Safety Analysis Report (UFSAR) description and design criteria described in General Design Criteria Document BFN-50-7074. This review included an assessment of the logic for RHR system motors and selected system valves used for the low pressure coolant injection mode of RHR operation and for the containment heat removal function. The review of the containment heat removal function included the containment spray cooling subsystem and the suppression pool cooling subsystem. Interlocks described in the design criteria document were evaluated to determine if the equipment operation was consistent with the UFSAR description and approved design output drawings.

The team reviewed RHRSW system mechanical logic diagrams and electrical elementary diagrams. This review was conducted to determine if interlocks controlling the pump motors and selected valves were consistent with equipment operation as described in General Design Criteria Document BFN-50-7023 and the UFSAR.

The team reviewed RHR and RHRSW system mechanical logic diagrams and electrical elementary diagrams of system motors and selected system valves. This review was conducted to determine if interlocks used to control the RHR and the RHRSW System from outside the main control room were consistent with General Design Criteria Document BFN-50-7037 and the UFSAR.

b. Findings

No findings of significance were identified.

.12 Process Medium

a. Inspection Scope

The team reviewed design criteria information, pump vendor manuals, net-positive-suction-head (NPSH) calculations, and water supply rate calculations to verify that assumptions were consistent with design criteria and to determine if sufficient water volume was available for the RHR, RHRSW and EECW pumps. Surveillance procedures for the RHR, RHRSW, and EECW systems were reviewed to verify that acceptance criteria for system flows were consistent with design criteria and were being maintained. The team also reviewed operating experience responses and calculations related to the RHR system mini-flow bypass valves to determine if sufficient bypass flow would exist during accident conditions.

b. Findings

No findings of significance were identified.

.13 Heat Removal

a. Inspection Scope

The team reviewed completed surveillance procedures to verify that suppression pool and RHRSW intake water temperature limits were maintained within Technical Specification (TS) limits. Operating experience responses and NPSH calculations were also reviewed to verify that RHR system heat load inputs and temperature assumptions in calculations were consistent with design criteria and the UFSAR. The team also reviewed RHR heat exchanger vendor specification sheets, completed preventive maintenance work orders, and tube plugging analyses to determine if heat exchangers were being maintained, and monitored for degradation and efficiency. RHR seal heat exchanger modification and design calculations were also reviewed for consistency with design criteria. RHRSW heat exchanger outlet valves maintenance, surveillance testing, and stroke time trending documentation were also reviewed to determine if components were being maintained in working order and if deficiencies were corrected.

b. Findings

No findings of significance were identified.

.14 Electrical Power Source

a. Inspection Scope

The team reviewed electrical one-line drawings for 4160 Volt (V) alternating current (ac) Switchgear, 480 V ac MCCs, and 250 V direct current (dc) systems to determine if power sources for the RHR, RHRSW, and EECW systems would be available and adequate during accident conditions. The review focused on compliance with single failure criterion as outlined in IEEE 279-1968, “Proposed IEEE Criteria for Nuclear Power Plant Protection Systems,” with emphasis in sharing and interdependency of

Unit 2 and Unit 3 ac/dc systems with Unit 1. The team reviewed the dc and ac one line diagrams to verify that the supplies from the unit batteries and shutdown board batteries to redundant systems and subsystems would not result in the loss of any safeguard function on loss of any single battery. The team reviewed breaker coordination studies for RHR and RHRSW loads to verify proper coordination during accident conditions.

The team reviewed diesel generator loading calculations to determine if the RHR and RHRSW pump loads, and load sequence steps, were within the capacity and capability of the diesel generator. The review also determined that the load additions stemming from the RHRSW pump impeller modification had been included in the calculations.

The UFSAR stated that any diesel generator could be made available to any 4.16 kV shutdown board. The team reviewed design basis operating conditions to assess the validity of the licensee's position that the necessary switchgear and breaker lineup for this condition could be accomplished without the need for accompanying procedures, instructions, and precautions.

b. Findings

No findings of significance were identified.

.15 Operator Actions

a. Inspection Scope

The team reviewed selected emergency operating procedures (EOPs) which implemented the containment heat removal function. These EOPs provided guidance for alignment and monitoring of the RHR, RHRSW, and EECW systems during accidents as described in UFSAR Sections 4.8, "Residual Heat Removal System," Section 10.9, "RHR Service Water System," and Section 10.10, "Emergency Equipment Cooling Water System." The team discussed selected tasks with operations and training department personnel to understand operator actions and important equipment functions. This review was conducted to determine if operator actions under accident conditions as proceduralized by the EOPs were consistent with design and licensing requirements. The team observed performance of the applicable procedures on the Browns Ferry simulator during simulated accident conditions. These observations were conducted to determine if necessary instrumentation, alarms, indications, and controls were available to control room operators so that necessary decisions and equipment manipulations could be made under accident conditions.

b. Findings

No findings of significance were identified.

.2 Selected System Condition and Capability

.21 Installed Configuration

a. Inspection Scope

The team conducted a walk down of accessible portions of the areas described below with the electrical engineer to assess material condition. As part of the inspection, the team reviewed battery surveillance procedures and design documents, such as relay setting sheets and schematics, to verify that actual installation was consistent with the design basis.

- 250 V shutdown battery rooms A, B, C, D
- Unit 1, 2, and 3 main bank battery rooms
- Unit 1, 2, and 3 cable spreading rooms
- Unit 1, 2, and 3 electric board rooms
- Unit 3 diesel generator building

The team conducted a walk down of accessible equipment in the RHR, RHRSW, and EECW systems to assess material condition, identify degraded equipment, and verify that the installed configuration was consistent with design drawings. Equipment related to these systems included the RHR, RHRSW, and EECW pumps, pump discharge valves, RHR heat exchangers and seal coolers, and RHRSW heat exchanger outlet valves.

The team conducted a walk down of selected, accessible post-accident monitoring (PAM) instrument loop components. The walkdowns were performed to assess material condition and to determine if the installed configurations were consistent with approved instrument loop drawings. The team inspected field installed instrument loop components including process transmitters, power supplies, and analog computing elements in order to verify that instrument loop configurations were consistent with the plant's design and licensing bases.

b. Findings

No findings of significance were identified.

.22 Operations

a. Inspection Scope

The team reviewed RHR, RHRSW, and EECW systems corrective maintenance history and work orders to determine if the systems remained available and if operational challenges were promptly identified. Surveillance test results and vendor manuals were reviewed to verify that operational limits were consistent with design criteria. RHR system valve stroke time trending was also reviewed to verify system availability.

b. Findings

No findings of significance were identified.

.23 Design

a. Inspection Scope

The team reviewed electrical system design calculations and procedures to verify that design bases and design assumptions had been appropriately implemented. The team reviewed setpoint calculations for electrical supply breakers and protective relays for Shutdown Board A to verify that it had adequate protection and capability to transfer power sources. The team reviewed voltage drop and short circuit calculations for RHR and RHRSW pump motors and selected motor-operated valves (MOVs) for RHR Pump B suction, discharge, and recirculation line isolation valves. This review was performed to determine if motors and MOVs had adequate voltage during worst case loading scenarios.

The team reviewed the design change that modified and replaced the RHRSW pump impellers. This review was conducted to determine if all parameters affecting the electrical equipment and distribution system, including motor capability, electrical loading, diesel generator capacity, cable sizing, and voltage drop had been addressed, and if they were consistent with the design basis.

The team reviewed the design change that replaced the 4160 V GE Magne-blast breakers with Siemens vacuum breakers. This review was conducted to determine if the effect on battery loading had been considered, that voltage transients associated with vacuum breaker application had been addressed, and that seismic and floor loading concerns were addressed.

The team reviewed BFN mild environmental calculations to determine if the minimum battery room temperature for the unit batteries and shutdown board batteries would not fall below the 60 F value (40 F for Shutdown Board Battery SB-3EB), used in the battery load study calculations.

The team reviewed NPSH calculations for the RHR, RHRSW/EECW pumps to determine if there was sufficient NPSH available, and to verify calculation assumptions were consistent with design criteria. Vendor manuals and specification sheets for the RHR and RHRSW pumps and heat exchangers were also reviewed to verify design specifications were appropriately translated into design criteria documents, calculations, procedures and tests.

The team reviewed selected instrumentation loop uncertainty calculations for PAM instruments that are used by the operations staff to accomplish the containment heat removal function. These reviews were conducted to determine if the instrument ranges were adequate for the process parameter being monitored as specified in Regulatory Guide 1.97, Revision 3. Additionally, the reviews were conducted to verify compliance with TS requirements for PAM instruments and that the instruments were sufficiently

accurate to perform their design function without safety or operational limits being exceeded.

The team reviewed selected surveillance procedures used for the calibration and functional test of PAM instruments. This review was performed to determine if the surveillance procedures ensured that the PAM instruments were calibrated in accordance with as found/as left values delineated in the instrument uncertainty calculations of record.

b. Findings

No findings of significance were identified.

.24 Testing

a. Inspection Scope

The team reviewed test records for Shutdown Board A supply breakers and protective relays to determine if adequate breaker protection was being maintained. In addition, the team reviewed calibration records for selected RHR and RHRSW pump motor protective relays to determine if they were being calibrated and tested in accordance with test procedures and design documents.

The team reviewed performance and service test data, along with weekly surveillance procedures for the main bank and shutdown board batteries to verify that proper maintenance was performed and that acceptance criteria as specified in IEEE 450-1987 was met.

The team reviewed RHR, RHRSW, and EECW flow path valve alignment and pump flow surveillance tests to verify that these were consistent with design requirements and to confirm ongoing performance was being maintained. Surveillance testing results for the suppression pool and drywell spray nozzles were also reviewed to verify that TS were being met and that the systems would perform their design functions. The surveillance test acceptance criteria was reviewed to determine consistency with design basis requirements.

b. Findings

No findings of significance were identified.

.3 Selected Components

.31 Voltage Drop Calculations

a. Inspection Scope

The team reviewed the 250 V dc Train A relay logic circuits for a potential common cause failure. These relays were selected for review because their failure would render RHR Train A incapable of performing its design function. The licensee prepared

Calculation ED-Q0999-870066 in order to address potential common cause failure of these relays caused by inadequate control voltage. The team reviewed the calculation to verify that minimum voltage acceptance criteria for dc relay coil pickup voltages had been specified. Additionally, the team reviewed Attachment "I" which was prepared for analyzing circuits having more than three relays in parallel. This review was performed to verify that positive margin was available between the required bus voltage and the available bus voltage which ensured that the minimum dc relay coil pickup voltages would be achieved.

The licensee prepared Calculation EDQ0057920034 to determine the load flow in the auxiliary power system and the maximum and minimum voltages at medium voltage switchgear and low voltage MCCs. The team reviewed the calculation for potential common cause failure of selected RHR system MOVs to verify that minimum voltage acceptance criteria had been specified for these MOVs. Additional review of the calculation for the selected RHR system MOVs was also conducted to verify that positive margin was demonstrated for the MOVs' minimum terminal voltages.

b. Findings

No findings of significance were identified.

.32 Component Inspection

a. Inspection Scope

The team reviewed problem event reports and surveillance test results to assess the licensee's actions to verify and maintain the reliability and availability of the following components: RHR pump discharge check valves, recirculation line check valves and pump suction valves as well as RHR common recirculation isolation valves and crosstie valves. The team also reviewed completed preventive maintenance work orders for these components to verify that the proper frequency for completion was maintained, that the work was completed, and that problems were identified when required.

The team reviewed the maintenance history for the RHRSW pump motors and their associated relays. The team also reviewed installation records for Shutdown Board A breakers. This review was conducted to verify that potential degradation was monitored or prevented and that component maintenance and replacement were consistent with vendor recommendations.

The team also reviewed design changes of RHR and RHRSW system related equipment accomplished through the licensee's design change process to verify that system and equipment functions were appropriately evaluated and maintained. These design changes included RHRSW pump impeller replacement and weight addition, EECW strainer rotation, and RHR pump seal heat exchanger bypass valve installation.

The team performed a walkdown of the RHRSW rooms to assess the material condition of the equipment, and the ability of the RHRSW pump motors to obtain sufficient cooling air under both adverse natural phenomenon (no wind), and licensee imposed air flow restrictions (placement of tarps on the open overhead grating). The team also assessed

the capability of the electrical equipment to operate in the presence of several directly impinging water leaks.

The team reviewed the 480 V ac distribution system to determine if the number of ground faults occurring on this ungrounded system was indicative of ongoing degradation of the insulation systems of 480 V ac equipment because of the ungrounded methodology utilized.

b. Findings

No findings of significance were identified.

.33 Equipment/Environment Qualification

a. Inspection Scope

The team reviewed harsh environmental data for the RHR pump rooms to determine if the RHR motors were rated for continuous operation in the worst case 140 F ambient temperature conditions.

b. Findings

No findings of significance were identified.

.34 Operating Experience

a. Inspection Scope

The team reviewed the licensee's evaluations and corrective actions for the following notifications to verify that applicable insights from operating experience have been applied to the selected components.

> NRC Generic Letter 98-04: Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment.
>
> NRC Information Notice 02-01: Metalclad Switchgear Failures and Consequent Losses of Offsite Power
>
> NRC Information Notice 02-04: Wire Degradation at Breaker Cubicle Door Hinges

The team reviewed RHR system related operating experience evaluations for applicability to the station and corrective action status. These included operating experience related to the RHR mini-flow bypass valve function and RHR system heat load inputs into temperature analyses.

b. Findings

No findings of significance were identified.

.35 Component Degradation

a. Inspection Scope

On December 11, 2002, the team walked down accessible portions of 250 V dc Shutdown Battery Rooms A, B, C, and D with an electrical engineer to assess material condition of these components.

b. Findings

Introduction: The team identified a green finding and non-cited violation for failure to adequately accomplish a shutdown battery board surveillance procedure. As a result, corrosion was allowed to accumulate on several battery posts and inter-cell connectors of Unit 1/Unit 2 Shutdown Board Batteries A and B.

Description: During an inspection of the dc power supply systems on December 11, 2002, the team identified several cells in shutdown board Batteries A and B with corrosion evident on the posts and inter-cell connectors. The team also identified cracked covers on many of the battery cells. These deficiencies were brought to the attention of licensee personnel at this time. The team reviewed surveillance Procedure 0-SR-3.8.4.1(I), "Weekly Check for Shutdown Board A and B Batteries," Revision 3. Step 7.3.21 of this procedure stated "**VERIFY** all dust/flame arrestors and covers are in place and **ISSUE** WO to replace any damaged, cracked, or missing arrestors and/or covers. Otherwise, **N/A** WO#." [emphasis in original; WO - work order] Also, Step 7.3.22 stated "**INSPECT** all battery connections for general cleanliness and corrosion buildup and if cleaning is necessary, **ISSUE** WO, otherwise, **N/A** WO." [emphasis in original] During the second week of the inspection, the team observed corrosion on the posts and inter-cell connectors in shutdown board Battery A. After this observation, the team reviewed completed copies of this surveillance performed on December 10, 2002, December 17, 2002, December 24, 2002, December 31, 2002, and January 7, 2003. Even though some posts and inter-cell connectors exhibited obvious signs of corrosion, no work order to remove the corrosion buildup or PER to evaluate the condition was generated as a result of these surveillances. Also, the licensee did not issue a work order to address the vent cap degradation. The team concluded that on these five occasions, Surveillance Procedure 0-SR-3.8.4.1(I) was not performed adequately.

Analysis: This finding represented a licensee performance deficiency because it involved the failure to adequately perform a surveillance procedure. This finding adversely affects the equipment performance attribute of the mitigating systems cornerstone and is greater than minor because it would become a more significant safety concern if left uncorrected. Excessive corrosion of the battery posts and inter-cell connectors could eventually degrade the battery to the point of producing a loss of current carrying capability and excessive voltage drop. Foreign material entry into a battery cell through cracked, loose, or missing battery covers could result in

contamination of battery acid and a reduction in battery capacity. Since this finding does not represent an actual loss of a safety function or screen as potentially risk significant due to a seismic, fire, flooding, or severe weather initiating event, the finding has very low safety significance (Green).

Enforcement: 10 CFR 50 Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states that activities affecting quality shall be accomplished in accordance with documented instructions. The TVA Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A, Rev. 12, Section 6.1.1, states that activities affecting quality shall be accomplished in accordance with procedures and instructions. On December 10, 2002, December 17, 2002, December 24, 2002, December 31, 2002, and January 7, 2003, surveillance Procedure 0-SR-3.8.4.1(I), "Weekly Check for Shutdown Board A and B Batteries," Rev. 3, was performed and a work order was not issued to correct existing corrosion buildup on battery posts and inter-cell connectors or to correct cracked covers. The licensee entered this issue into the corrective action program as Problem Evaluation Report 02-016954. Because this violation was of very low safety significance and was entered into the licensee's corrective action program, it is being treated as a non-cited violation consistent with Section VI.A.1 of the NRC Enforcement Policy, and is identified as NCV 50-260/02-05-01, "Failure to Adequately Accomplish a Shutdown Battery Board Surveillance Procedure."

.4 Identification and Resolution of Problems

a. Inspection Scope

The team reviewed RHR, RHRSW, and EECW system related problem event reports to verify design problems were identified and entered in the corrective action program. This included problem event reports related to the EECW strainer failures and leakages.

The team inspected the extent and quality of engineering support in identifying and resolving instrumentation and control problems by evaluating their technical support in determining the immediate cause of instrumentation problem; and their continued support in the extent of condition review and development of corrective actions to address the root causes of the instrumentation problem. The team reviewed the developed corrective actions for selected PERs in order to evaluate the technical adequacy of the corrective actions for ensuring proper recurrence control of the identified instrumentation problem.

Findings

b. No findings of significance were identified.

4. OTHER ACTIVITIES

4OA6 Management Meetings

The lead inspector presented the inspection results to Mr. A. Bhatnagar, and other members of the licensee's staff at an exit meeting on January 17, 2003. The licensee acknowledged the findings presented. Proprietary information is not included in this inspection report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

T. Abney, Licensing Manager
A. Bhatnagar, Site Vice President
P. Chadwell, Operations Support (Ops Procedures)
J. Davenport, Licensing Engineer
K. Harvey, System Engineer
R. Jones, Plant Manager
T. Langley, Licensing Supervisor
B. Moll, Systems Engineering Manager
T. Trask, Design Engineering Manager
R. Wiggal, Site Engineering Manager
J. Elmerick, Mechanical Design Engineer

NRC

B. Holbrook, Senior Resident Inspector
J. Starefos, Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-260/02-05-01	NCV	Failure to Adequately Accomplish a Shutdown Battery Board Surveillance Procedure (Section 1R21.35.b)

Attachment

LIST OF DOCUMENTS REVIEWED

Technical Specifications and Technical Requirements Manual

TS 3.6.2.3, Residual Heat Removal (RHR) Suppression Pool Cooling
TS 3.6.2.4, Residual Heat Removal (RHR) Suppression Pool Spray
TS 3.6.2.5, Residual Heat Removal (RHR) Drywell Spray
TS 3.5.1, ECCS - Operating
TS 3.7.1, Residual Heat Removal Service Water (RHRSW) System and Ultimate Heat Sink (UHS)
TS 3.7.2, Emergency Equipment Cooling Water (EECW) System and Ultimate Heat Sink (UHS)
TR 3.5.3, Equipment Area Coolers

Updated Final Safety Analysis Report (UFSAR)

Section 4.8, Residual Heat Removal System
Section 10.9, RHR Service Water System
Section 10.10, Emergency Equipment Cooling Water System

MISCELLANEOUS DOCUMENTS

L44 89012 802, Diesel Generator Evaluation Report, dated 1/20/89
US NRC Safety Evaluation, Emergency Diesel Generator Loading Analysis, TAC Nos. 62260/62264, dated 12/21/89

GEI-28803B, Type PJC Instantaneous Overcurrent Relays
BFN-VTD-G080-1151, Instructions for General Electric Time Overcurrent Relays Types IAC66K Forms 51 and Up, 1/17/01

T&CS Relay Information and Setting: 4 KV Shutdown Board A, B, C, D, 3EA, 3EB, 3EC, 3ED

GE Nuclear Energy Report GENE E12-00148-02, Rev 0, July 1997, Debris Loads report for sizing of Browns Ferry ECCS Pump Suction Strainers,(proprietary)

GE Nuclear Energy Report GENE E12-00148-01, Rev 0, ECCS Suction Strainer Hydraulic Sizing Report

OE 020213001, Core Spray and HPCI Surface Temperature for HVAC Design
OE 020389001, Reduced ECCS Flow Due to RHR Mini-Flow Valve Opening/Closing Time
OPL171.044, Residual Heat Removal (RHR) System, Rev. 10
SPP-10.7, Housekeeping/Temporary Equipment Control, Rev. 0

Stroke Time Trending for Unit 2 FCVs 23-34, 23-40, 23-46, 23-52, 74-24, 74-07, 74-30, 74-98, 74-99, 74-100, and 74-101, 1999-2003

Letter - November 10, 1998 -Burzynski to NRC; “Browns Ferry Nuclear Plant (BFN), Sequoyah Nuclear Plant (SQN), and Watts Bar Nuclear Plant (WBN), 120-Day Response Generic Letter 98-04, “ Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment,”dated July 14, 1998.”

Procedures

Abnormal Operating Instructions
0-AOI-57-1A, Loss of Offsite Power (161 and 500 KV) Station Blackout, Rev. 50

Operating Instructions
0-OI-57D, DC Electrical System, Rev. 64
0-OI-57B, 480 V/240 V AC Electrical System, Rev. 105
0-OI-23, Residual Heat Removal Service Water System, Rev. 54
2-OI-74, Residual Heat Removal System, Rev. 110

Alarm Response Procedures
1-ARP-9-4, Rev. 26

General Engineering Specification G-55, Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants, Rev. 11

Modification and Addition Instruction
MAI-5.3, Protective Coatings, Rev 29

Technical Instruction
0-TI-417, Inspection of Protective Coated Surfaces Within the Primary Containment and on the exterior surface of the Drywell Head and Torus, Rev. 0, effective date 3/16/2001.

Electrical Preventive Instruction
EPI-0-000-MOT002, Oil Lubricated Motors, Rev. 37

General Operating Instruction
0-GOI-300-2, Electrical, Rev. 59
0-GOI-200-3, Hot Weather Inspection, Rev. 1

Technical Instruction
0-TI-346, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting - 10CFR50.65, Rev. 18, effective date - 3/15/02

Surveillance Instruction
1-SI-4.5.B.11, RHR Unit 1 X-tie for Unit 2 Operability, Rev. 30, effective 9/17/2002

Emergency Operating Instruction
2-EOI Appendix 17C, RHR System Operation, Suppression Chamber Sprays, Rev. 9

2-EOI Appendix 17B, RHR System Operation, Drywell Sprays, Rev. 8

Calculations

ED-Q0057-920034, 4KV & 480V Busload and Volt Drop, 9/5/02
ED-Q0248-870041, 250 V DC Battery Load Study, Rev. 25
ED-Q0248-870042, 4160 V Shutdown Board Batteries Load Study, Rev. 9
ED-Q2000870071, Diesel Load Study, Rev. 18
ED-Q2000-87548, 4 KV Shutdown Board Breaker Protective Setting, Rev. 2
ED-Q2211-890144, Setpoint and Scaling Calculations 4 KV Bus Degraded Voltage Relays, Rev. 0
ED-Q3000-910224, 4 KV Shutdown Boards 3EA, 3EB, 3EC and 3ED Breaker Protective Device Time Characteristic Coordination Curves Att. 3, Rev. 0
ED-Q3057920035, Diesel Load Study, Rev. 25
ND-Q0999-910030, Summary of Mild Environmental Conditions for BFN, Rev. 8
R14 940909 111, Unit 2 Primary Containment Uncontrolled Coatings Log, Rev. 11, 4/23/01
MD-Q0023-870123, Available NPSH for RHRSW Main Pumps, Rev. 5
MD-Q0023-880121, RHRSW Pump River Water Supply Rate Analysis, Rev. 2
MD-Q0074-87017, RHR Pump Operation Without EECW Cooling of Seal Heat Exchangers, Rev. 0
BWPM2-STUDY 943-3, RHR Seal Cooler Cooling Requirements (EECW), Rev. 0
MD-Q0999-970046, NPSH Evaluation of Browns Ferry RHR and CS Pumps, Rev. 4
MD-Q0023-980143, RHR Heat Exchanger Tube Plugging Analysis for Power Uprate to 3458 MW, Rev. 0
CD-Q0999-890077, Detuning the BFNP RHRSW-EECW Pumps, Rev. 4
MD-Q0074-960020, Analytical Limits for RHR Minimum Flow Bypass, Rev. 2
MD-Q3999-990019, Unit 3 Sludge Generation Rate - Suppression Pool (Torus), Rev. 0
MD-Q2999-970062, Unit 2 Cycle 9 Sludge Generation Rate in Torus, Rev. 0

Drawings

CCD 2-47E225-103, Harsh Environmental Data, El 519.0, Rev. 0
CCD 3-47E225-103, Harsh Environmental Data, El 519.0, Rev. 6
CCD 3-47E225-100, Harsh Environmental Data Drawing Series Index, Notes and References, Rev. 6
CCD 0-45E701-1, Wiring Diagram Battery BD 1, Panels 1-7 Single Line, Rev. 43
CCD 0-45E702-1, Wiring Diagram Battery BD 2, Panels 1-7 Single Line, Rev. 38
CCD 0-45E703-1, Wiring Diagram Battery BD 3, Panels 1-7 Single Line, Rev. 38
CCD 3-45E709-2, Wiring Diagram Shutdown Bds 250 V Btry & Chgr Single Line, Rev. 15
CCD 0-45E709-1, Wiring Diagram Shutdown Bds 250 V Btry & Chgr Single Line, Rev. 25
CCD 1-45E712-1, Wiring Diagram 250 V Reactor MOV Bd 1A, Rev. 9
CCD-0-45E710-1, Wiring Diagram Instr & Controls DC & AC Power Key Diagram, Rev. 11
CCD 0-45E724-1, Wiring Diagram 4160 V Shutdown Bd A Single Line, Rev. 17
CCD 0-45E724-2, Wiring Diagram 4160 V Shutdown Bd B Single Line, Rev. 22
CCD 0-45E724-3, Wiring Diagram 4160 V Shutdown Bd C Single Line, Rev. 24
CCD 0-45E724-4, Wiring Diagram 4160 V Shutdown Bd D Single Line, Rev. 20

CCD 3-45E724-6, Wiring Diagram 4160 V Shutdown Bd 3EA Single Line, Rev. 26
CCD 3-45E724-7, Wiring Diagram 4160 V Shutdown Bd 3EB Single Line, Rev. 18
CCD 3-45E724-8, Wiring Diagram 4160 V Shutdown Bd 3EC Single Line, Rev. 27
CCD 0-45E724-9, Wiring Diagram 4160 V Shutdown Bd 3ED Single Line, Rev. 21
CCD 3-45E732-5, 480 V Diesel Aux Bd 3EA Single Line, Rev. 24
CCD 1-45E749-2, Wiring Diagram 480 V Shutdown Bd 1B Single Line, Rev. 22
CCD 2-45E749-1, Wiring Diagram 480 V Shutdown Bd 1A Single Line, Rev. 30
CCD 2-45E749-2, Wiring Diagram 480 V Shutdown Bd 1B Single Line, Rev. 22
CCD 2-45E749-3, Wiring Diagram 480 V Shutdown Bd 2A Single Line, Rev. 38
CCD 2-45E749-4, Wiring Diagram 480 V Shutdown Bd 2B Single Line, Rev. 34
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CCD 2-45E751-1, Wiring Diagram 480 V Reactor MOV Bd 2A Single Line, Rev. 55
CCD 1-45E751-3, Wiring Diagram 480 V Reactor MOV Bd 1B Single Line, Rev. 18
CCD 2-45E751-3, Wiring Diagram 480 V Reactor MOV Bd 2B Single Line, Rev. 39
CCD 3-45E779-8, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 19
CCD 3-45E779-9, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 12
CCD 3-45E779-10, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 30
CCD 2-45E779-18, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 24
CCD 3-45E779-47, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 11
CCD 3-45E779-49, Wiring Diagram 480 V Shutdown Aux Power Schematic Diagram, Rev. 11
CCD 3-15E500-3, Key Diagram of Normal & Standby Auxiliary Power System, Rev. 39
E-4-458299, 4000 Volt Motors, Motor Data-Sheet 1, Rev. 4
2-47E811-1, Flow Diagram Residual Heat Removal System, Rev. 56
1-47E858-1, Flow Diagram RHR Service Water System, Rev. 37
2-47E858-1, Flow Diagram RHR Service Water System, Rev. 17
1-47E859-1, Flow Diagram Emergency Equipment Cooling Water, Rev. 57
2-47E859-1, Flow Diagram Emergency Equipment Cooling Water, Rev. 26

Maintenance

½-ETU-SMI3-A.4, Procedure for Making 48 Month Relay Calibrations on 4 KV Shutdown Board A, Rev. 8
3-ETU-SMI-3-3EA.4, Procedure for Making 48 Month Relay Calibrations on 4KV Shutdown Board 3EA, Rev. 12A
0-SR-3.3.8.1.1 (A), 4 KV Shutdown Board A Degraded Voltage Relay Calibration and Functional Test, Rev. 0
0-SR-3.8.4.1(I), Weekly Check for Shutdown Board A and B Batteries, Rev. 3
0-SR-3.8.6.2(I), Quarterly Check for Shutdown Board A and B Batteries, Rev. 5
1-SR-3.8.4.1(1), Weekly Check for 250 V Main Bank Number 1 Battery, Rev. 3
1-SR-3.8.4.4(MB-1), Main Bank 1 Battery Modified Performance Test, 5/14/2001
1-SR-3.8.6.2(1), Quarterly Check for 250 V Main Bank Number 1 Battery, Rev. 4

Problem Evaluation Reports (PERs)

PER 01-011003-000, Motor Winding Temperature Alarms with Tarps Over RHRSW Pump Rooms, dated 10/20/01
PER 02-005928, RHRSW Motor High Winding Temp., dated 6/2/02
PER 01-000849-000, RHRSW Sump Pump Trips, dated 5/23/00
PER 99-012974-000, RHRSW Motor Winding Temperature Alarms, dated 11/29/99
PER 98-014331-000, Battery Room Min. Temperature, dated 12/02/98
PER 98-013705-000, Missing vendor data in Calculation ED-Q3999-920106, dated 11/19/98
PER 02-016352-000, Revisions to FSAR section 8.6, dated 1/16/03
PER 01-007987-000, Evaluate EECW Strainer Failures and Effect of Manually Rotating Strainers, 08/05/01
PER 01-005915-000, EECW Strainer B Excessive Oil Leakage, 06/13/01
PER 00-004060-000, EECW Strainers Oil Leaks and Worm Gear Reducers Installed Incorrectly, 04/25/00
PER 99-011825-000, B EECW Strainer Outboard Bearing Without Grease and With Water Intrusion, 10/21/99
PER 01-009733-000, B EECW Strainer Will Not Rotate Declaring the Strainer and Pumps Inoperable, 09/12/01

PERs and Work Orders Generated During This Inspection

WO 02-016229-000, RHRSW A3 pump packing leak, dated 12/11/02

PER 02-016249-000, Technical Specifications and the FSAR contain different values for the temperature used in the suppression pool cooling analysis, 12/11/02

PER 02-016318-000, Schematic 0-45E765-5, Rev 29, has relays labeled “TD1AA” and “TD2AA” instead of “TD1A” and “TD2A,” 12/12/02

PER 02-016352-000, Wording of FSAR Sections 8.6.4.1 and 8.6.2.2 not entirely correct,12/13/2002

PER 02-016954-000, Various plant batteries have cracked caps and evidence of minor seepage. Corrosion evident on shutdown board batteries, 12/30/02

Nuclear Station Modifications

DCN No. T40676A, Replace Various GE 4 kV Magne-Blast Breakers with Siemens 4 kV Vacuum Type Breakers, Rev. 4
DCN T40220C, Replacement of RHRSW Impellers, dated 6/8/99
DCN 50851, Placement of Additional Weights on RHRSW Pumps to Reduce Vibration, Rev. A
DCN T40220, RHRSW Pump Impeller Replacement, Rev. C
DCN T40199, Install Isolation and Bypass Valves for RHR Pump Seal Heat Exchangers, Rev. A
EDC 50911, EECW Strainers Rotation, Rev. A
ECN E-0-P7071, Revise Motor Adaptor Plate Dimensions and Tolerances, Rev. 1

Design Criteria Document

BFN 50-7200C, 250 V DC Power Distribution System, Rev. 6
BFN-50-728, Physical Independence of Electrical Systems, Rev. 10
BFN-50-7074, Residual Heat Removal System, Rev. 10
BFN-50-7067, Emergency Equipment Cooling Water System, Rev. 12
BFN-50-7023, Residual Heat Removal Service Water System, Rev. 10
BFN-50-7064A, Primary Containment System, Rev 13.

Calibration Records for the Following Components

RHR Pump 2A
RHR Pump 3A
RHR SW Pump A1
RHR SW Pump A2
RHR SW Pump A3
4KV SD BD A BKR 1614
4KV SD BD A BKR 1716
4KV SD BD A BKR 1818
4KV SD BD A BKR 1824

Completed Surveillances for the Following Components

Shutdown Board Battery A
Shutdown Board Battery B
Main Bank Number 1 Battery

Technical Manuals/Vendor Information

BFN-VTD-B260-0040, Installation, Operation and Maintenance Instruction for Bingham-Willamette 18"x24"x28" Single Stage CVIC Pumps, Rev. 3

BFN-VTM-B580-0010, Vendor Technical Manual for Byron Jackson Pumps, Rev. 15

BFN-VTD-P160-0030, Instruction Manual for Perfex Residual Heat Removal Heat Exchanger, Rev. 6

Completed Work Orders

WO 97-003912-000 and WO 02-001410-000, Eddy Current Test RHR Heat Exchanger 2B and 2C, completed 10/13/97 and 10/02/02

WO 02-008198-000 and WO 02-008194-000, PM Performance for RHR Heat Exchanger 2B and 2D, and 2A and 2C, both completed 11/08/02

WO 02-003424-000, WO 00-4717-000, WO 00-1687-000 and WO 95-03698-00, PM Inspection for 2-MVOP-023-0040 and 2-MVOP-023-0052, completed 04/30/02, 02/22/01, 04/11/01 and 06/09/95

WO 94-09296-00, WO 00-011721-000, PM Inspection for 2-MVOP-074-0030 and 2-MVOP-074-0024, completed 10/10/94 and 03/07/01

WO 94-06975-000, WO 00-001685-000, 94-11035-00 and WO 95-15760-00, PM Inspection for 2-MVOP-074-0099, 2-MVOP-0074-0100, and 2-MVOP-0074-0101, completed 09/05/95, 04/09/01, 12/08/94, and 05/10/96

Completed Surveillances and Tests

2-SR-3.6.2.5.2(I) and 2-SR-3.6.2.5.2(II), Residual Heat Removal System Loop I (Loop II) Drywell Spray Header Air Test and Header Inspection, both completed 04/19/99
2-SR-3.5.1.6(RHR I) and 2-SR-3.5.1.6(RHR II), Quarterly RHR System Rated Flow Test Loop I (Loop II), completed 10/03/02, 07/11/02 and 07/26/02, 10/18/02
2-SR-3.5.1.2(RHR I) and 2-SR-3.5.1.2(RHR II), Monthly RHR Valve Lineup Verification Loop I (Loop II), completed 11/02/02, 11/30/02 and 10/09/02, 11/16/02
0-SR-3.6.2.4.2, Torus (Suppression Pool) Nozzle Test, completed 04/24/99, 04/26/99, 05/01/00
2-SI-4.5.C.1(3), RHRSW Pump and Header Operability and Flow Test, completed 07/10/02, 08/19/02
0-SR-3.7.1.1, Monthly RHRSW Flow Path Valve Lineup Verification, completed 10/20/02, 11/17/02
0-SR-3.7.2.2, Monthly EECW Flow Path Valve Lineup Verification, completed 11/23/02, 10/26/02
0-SI-4.5.C.1(4), EECW System Annual Flow Rate Test, completed 04/22/02, 02/09/02, 06/24/02, 09/12/02
3-SI-4.5.C.1(2), EECW Pump Operation, completed 09/25/02
0-SI-4.5.B.2b, Torus Nozzle Test, completed 02/14/93