UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

April 27, 2006

Duke Energy Corporation (DEC)
ATTN.: Mr. B. H. Hamilton
Site Vice President
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION - NRC COMPONENT DESIGN BASES INSPECTION REPORT 05000269/2006006, 05000270/2006006, 05000287/2006006

Dear Mr. Hamilton:

On March 16, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Oconee Nuclear Station. The enclosed report documents the inspection findings which were discussed on March 16, 2006, with Mr. David Baxter, Station Manager and other members of your staff.

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

The report documents one NRC-identified finding of very low safety significance (Green). This finding was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it had been entered into your corrective action program, the NRC is treating this issue as a non-cited violation in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this non-cited violation you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Oconee Nuclear Station.

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 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,

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

Docket Nos.: 50-269, 50-270, 50-287
License Nos.: DPR-38, DPR-47, DPR-55

Enclosure: NRC Inspection Report 05000269/2006006,05000270/2006006, 05000287/2006006 w/Attachment: Supplemental Information

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Sincerely,

/RA/

Charles R. Ogle, Chief
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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-269, 50-270, 50-287
License Nos.:	DPR-38, DPR-47, DPR-55
Report No.:	50-269/2006006, 50-270/2006006, 50-287/2006006
Licensee:	Duke Energy Corporation
Facility:	Oconee Nuclear Station, Units 1, 2, and 3
Location:	7800 Rochester Highway Seneca, SC 29672
Dates:	February 13, 2006 - March 16, 2006
Inspectors:	C. Julian, Team leader M. Maymi, Reactor Inspector M. Scott, Sr. Reactor Inspector H. Cambell, Contract Inspector L. Hajos, Contractor Inspector B. Miller, Reactor Inspector Trainee E. Michel, Reactor Inspector Trainee
Approved by:	Charles R. Ogle, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

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SUMMARY OF FINDINGS

IR 05000269/2006006, 05000270/2006006, 05000287/2006006; 02/13/2006 - 03/16/2006; Oconee Nuclear Station, Units 1, 2, and 3; Component Design Bases Inspection.

This inspection was conducted by a team of five NRC inspectors from the Region II office and two NRC contract inspectors. One Green finding, which was a non-cited violation, was identified during this inspection. 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," Revision 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green. The team identified a Green, non-cited violation (NCV) of Technical Specification 5.4.1.b for a non-conservative operator action setpoint in the Emergency Operating Procedures. Specifically, the 6 foot level setpoint for operator action to complete the BWST to Reactor Building Emergency Sump (RBES) swap over by closing the BWST suction valves did not include enough margin to preclude degradation or damage to the pumps due to vortex formation in the BWST in all cases. When the NRC notified the licensee of this condition, the licensee entered it into the corrective action program.

This finding is greater than minor because it is associated with the procedure quality attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring reliable, available, and capable systems that respond to initiating events to prevent undesirable consequences. This finding is of very low safety significance because no actual loss of safety function occurred and operators have been trained to identify loss of pump suction. This finding has been entered into the licensee's corrective action program as PIP O-06-01374. (Section 1R21.2.1.1)

B. Licensee-Identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Mitigating Systems and 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 two or Birnbaum value greater than 1E-6. The components selected were located within the high and low pressure safety injection, Borated Water Storage Tank, Keowee hydroelectric emergency power units, Standby Shutdown Facility, and vital electrical distribution systems. The sample selection included 25 components, seven operator actions, and six operating experience items. Additionally, the team reviewed two modifications by performing activities identified in IP 71111.17, Permanent Plant Modifications, Section 02.02.a. and IP 71111.02, Evaluations of Changes, Tests, or Experiments.

The team performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design issues, margin reductions due to modification, 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 included items such as failed performance test results, significant corrective action, repeated maintenance, Maintenance Rule (a)1 status, degraded conditions, NRC resident inspector input , 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 are included in the following sections of the report. A specific list of documents reviewed is included in the attachment to this report.

.2 Results of Detailed Reviews

.2.1 Detailed Component Reviews

.2.1.1 Borated Water Storage Tank (BWST) Level Transmitters

a. Inspection Scope

The inspectors reviewed relevant portions of the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), uncertainty calculations, Problem Investigation

Process reports (PIPs), work orders and completed surveillances related to the BWST level transmitters. Although specific scaling calculations were not available, the combination of calibration procedures and physical layout diagrams allowed for verification of transmitter elevations and resultant scaling. Further, the external layout and configuration of the transmitters was examined to the extent possible. A significant portion of the review was devoted to calculation OSC-2820, "Emergency Procedure Guidelines Setpoint", Rev. 31, where several operator actions regarding BWST level were evaluated.

b. Findings

Introduction: The team identified a Green, non-cited violation (NCV) of TS 5.4.1.b for a non-conservative operator action setpoint in the Emergency Operating Procedures. Specifically, the 6 foot level setpoint for operator action to complete the BWST to Reactor Building Emergency Sump (RBES) swap over by closing the BWST suction valves did not include enough margin to preclude degradation or damage to the pumps due to vortex formation in the BWST in all cases.

Description: In response to a Loss Of Coolant Accident (LOCA), the High Pressure Injection (HPI), Low Pressure Injection (LPI) and Reactor Building Spray (RBS) systems pump borated water from the BWST until the tank is nearly empty. Suction for the ECCS systems must then be transferred from the BWST to the Reactor Building Emergency Sump (RBES). The Oconee Emergency Operating Procedures (EOPs) direct the operators to monitor the decreasing BWST level, at 9 feet to open the suction valves to the RBES, and at 6 feet to close the suction valves from the BWST. Appendix E of calculation OSC-2820 used a methodology developed by Harleman, and contained in a reference included in the List of Documents Reviewed attached to this report, to calculate the BWST level margin that should be allowed to prevent vortex formation and potential air ingestion into the safety related pumps. The calculation concluded that a water level depth of 14.2 inches above the top of the BWST suction line was sufficient to adequately protect the pumps from subsequent potential air ingestion and potential degradation. When operator action times, valve stroke times and BWST level measurement uncertainties were included, an action setpoint of 6 feet BWST level was determined to be acceptable. At this level the operators were directed by the EOPs to begin closing the BWST suction valves LP-21 and LP-22.

The inspectors questioned if the vortex margin calculation was sufficiently conservative. The inspectors recognized that there are several analytical approaches for determining adequate suction water levels to avoid potential vortex-induced pump damage. When the conservative Hydraulics Institute method, contained in a reference included in the List of Documents Reviewed attached to this report, was applied, a depth margin of over 10 feet is recommended to preclude vortex creation for the specific tank suction geometry and high flow conditions at Oconee.

The licensee acknowledged that use of the Harleman method was not sufficiently conservative for pump protection and documented this deficiency in their corrective

action program by initiating PIP 06-01374.

Using the Reddy-Pickford methodology, contained in a reference included in the List of Documents Reviewed attached to this report, the licensee concluded that vortex prevention will require approximately 5.1 feet level remaining in the BWST. The PIP addressed current operability of the BWST by stating that BWST isolation will be initiated at 6 feet and simulator validation has shown that the level will not decrease below 3.32 feet worst case. The licensee consulted with the pump vendors and were told that the pumps can tolerate up to 5% gas by volume without distress and 5% to 10% gas by volume for up to an hour. A conservative calculation assuming total voiding of the BWST suction piping with additional pump suction from the sump flow path, predicted a 7.5% void fraction. A short term corrective action documented in the PIP is to raise the BWST normal level and the operator action setpoints to ensure that the RBES swap occurs above levels in which air entraining vortexing is expected to occur. A longer term action as documented in the PIP at the end of the inspection is to perform a plant modification to install a vortex suppressor in the BWSTs of all three units.

Analysis: Failing to provide adequate procedure guidance to preclude damage or degradation to the RBS, LPI and HPI pumps on BWST to RBES swap over in the EOPs is a performance deficiency. This finding is greater than minor because it is related to the procedure quality attribute of the Mitigating Systems cornerstone and affects the objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. This finding is of very low safety significance because although the RBS, LPI and HPI pumps could be damaged or degraded during a LOCA, the actual safety system function is not lost due to the availability of third standby LPI and HPI pumps and the tolerance of LPI pumps to short term air entrainment. Additionally, the procedures caution the operators to monitor pump parameters for indication of suction loss and the operators receive training on this phenomenon.

Enforcement: TS 5.4.1.b requires that written procedures shall be established covering Emergency Operating Procedures. Procedures EP/1, 2, 3/A/1800/001 Emergency Operating Procedure, were written, in part, to fulfill this requirement. Contrary to TS 5.4.1.b, appropriate instructions were not provided in procedures EP/1, 2, 3/A/1800/001 Emergency Operating Procedure, for operator actions setpoint for BWST to RBES swap over at a level in the BWST that would preclude pump damage or degradation due to vortex formation in the BWST in all cases. Because the licensee took actions to enter this item into their corrective action program (PIP O-06-01374), this violation is identified as a non-cited violation (NCV) consistent with Section VI.A of the NRC Enforcement Policy, and is identified as NCV 05000269, 270, 287/2006006-01, Non-Conservative EOP Procedure Setpoint for Operator Action to Accomplish BWST to RBES Swap Over on Low BWST Level.

.2.1.2 Keowee Hydroelectric Generator Wheel Pit (Turbine) Vacuum Breaker/Air Admission Valve

a. Inspection Scope

The inspectors reviewed the operation, testing, and maintenance of vacuum breaker valves MT-25 installed on the Keowee Hydro Units. This included a review of calculations, maintenance and corrective action documents, and discussions with cognizant licensee personnel. This review was performed to verify that the valves continue to operate in accordance with their design basis.

b. Findings

The licensee could not provide the inspectors an analysis of the potential consequences to Keowee operability of the vacuum breaker valves failing open or failing to open. Available design documentation (calculation KC-0085 and technical manual KM-200-158) state that "these valves are required to open following a load rejection from power to limit vacuum inside the turbine case. This action is to prevent the turbine from being exposed to a water column separation. Following a column separation, flooding or "back slapping" of the turbine could occur. This action could damage the turbine thrust bearing and cause the unit to fail." The inspectors determined that these vacuum breakers have not been included in a preventive maintenance program (PIP 06-01183) and have not been in scope for the maintenance rule and license renewal. The inspectors were concerned that normal operational testing may not be adequate to detect valve degradation. In addition, design aspects of the MT-25 vacuum breakers such as possible failure modes and significance were not available for review by the inspectors. This issue remains unresolved pending the inspectors' review of the licensee's determination of any impacts the potential vacuum breaker failures could have on the Keowee emergency power function. Accordingly, this item is identified as URI 05000269, 270, 287/2006006-002, Possible Vacuum Breaker Failure Impact to Keowee Emergency Power Function.

.2.1.3 LPI to HPI Pump Suction Header Manual Valves LP-54 and LP-56

a. Inspection Scope

Manual valves LP-54 and LP-56 are normally open valves in the flow path used to align the HPI pumps in piggyback mode. The team reviewed preventive and corrective maintenance work order history, and corrective action documents to verify the reliability and availability of manual valves LP-54 and LP-56. In addition, the team reviewed Design Basis Documents (DBD), periodic test and operating procedures that manipulate these manual valves to verify the configuration of these valve was adequately controlled.

b. Findings

No findings of significance were identified.

.2.1.4 Reactor Building Sump Suction Isolation Valves LP-19 and LP-20

a. Inspection Scope

Motor operated valves (MOV) LP-19 and LP-20 are used to align LPI pump suction to the containment recirculation sump. The team reviewed preventive and corrective maintenance work order history, maintenance rule component status, and corrective action documents to verify the reliability and availability of MOVs LP-19 and LP-20.

In addition, the team reviewed DBDs, periodic stroke time test procedures, stroke time trends, actuator open/close thrust margin calculations, and test acceptance criteria to verify these were consistent with system design bases. The team also reviewed common cause failure issues to verify these were addressed and corrective actions were adequate.

b. Findings

No findings of significance were identified.

.2.1.5 LPI Pump Discharge Check Valves LP-31, LP-33, and LP-35

a. Inspection Scope

Check valves LP-31, 33, and 35 are used during LPI pump operation and prevent backflow through the pump when the pump is not running and the LPI headers are cross-connected. The team reviewed corrective maintenance work order history, and corrective action documents to verify the check valves were reliable and periodically inspected. In addition, the team reviewed DBDs, and completed test procedures to verify that the check valves stroked open allowing sufficient flow from the LPI pump, and prevented backflow.

b. Findings

No findings of significance were identified.

.2.1.6 RCS/LPI Isolation LP-1 and LPI Hot Leg Suction Isolation LP-2

a. Inspection Scope

The team reviewed preventive and corrective maintenance work order history, maintenance rule component status and corrective action documents to verify the reliability and availability of MOVs LP-1 and LP-2. These MOVs are used to align the Reactor Coolant System (RCS) for decay heat removal. In addition, the team reviewed DBDs, periodic stroke time test procedures, stroke time trends, actuator open/close thrust margin calculations, and test acceptance criteria to verify these were consistent with system design bases. The team also reviewed an LP-1 pressure interlock, which prevents an inadvertent opening of the MOV during normal operation, signal testing and

calibration procedures to verify that the interlock setpoint is being maintained and tested.

b. Findings

No findings of significance were identified.

.2.1.7 LPI Coolers (Decay Heat Removal Coolers)

a. Inspection Scope

The LPI coolers are cooled by the Low Pressure Service Water (LPSW) system. The team reviewed DBDs, performance test calculations that verify heat removal capability, system health reports, and test acceptance criteria to verify they were consistent with design basis. In addition the team reviewed LPSW flow test and flow balance verification procedures, LPSW corrective action documents, completed flow test results, and adequate flow verification calculations to verify availability and reliability of LPSW to the LPI coolers, and to verify degraded conditions are being addressed.

b. Findings

No findings of significance were identified.

.2.1.8 Standby Shutdown Facility (SSF) Auxiliary Service Water (ASW) Pump to Steam Generator (SG) Throttle Valve CCW-268

a. Inspection Scope

The team reviewed preventive and corrective maintenance work order history, maintenance rule component status, and corrective action documents to verify the reliability and availability of MOV CCW-268. This MOV is a normally closed valve used to throttle flow to the SGs when the SSF ASW system is required. In addition, the team reviewed DBDs, valve data sheet calculations, actuator open/close thrust margin calculations, a valve replacement modification, stroke test procedure, test acceptance criteria, and MOV trend reports to verify acceptance criteria were consistent with system design bases, and to verify MOV design margins were being maintained.

b. Findings

No findings of significance were identified.

.2.1.9 SSF Sump Pump Discharge Check Valves CCW-312 and CCW-313

a. Inspection Scope

Check valves CCW-312 and 313 are credited for closing during a seismically induced Turbine Building Flood to prevent back flow from the yard drain system into the SSF

pump room. The team reviewed preventive and corrective maintenance work order history, preventive maintenance procedures and completed work orders, and corrective action documents to verify the check valves were reliable and periodically inspected.

In addition, the team reviewed DBDs, and a completed temporary test procedure that verified the check valves stroked open, and also prevented backleakage when operating the alternate sump pump.

b. Findings

No findings of significance were identified.

.2.1.10 MOVs HP-24 & HP-25: BWST to HPI Pump Suction Valves

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), DBDs, and associated drawings to determine the design basis performance requirements of these valves. Further, PIPs, work orders, system health reports and surveillances were reviewed to assess the operating history and general performance of these valves.

b. Findings

No findings of significance were identified.

.2.1.11 MOVs LP-15 & LP-16: LPI Discharge to HPI Suction Valves, (PiggyBack Valves)

a. Inspection Scope

The inspectors reviewed the UFSAR, TS, DBDs, and associated drawings to determine the design basis performance requirements of these valves. Further, PIPs, work orders, system health reports and surveillances were reviewed to assess the operating history and general performance of these valves.

b. Findings

No findings of significance were identified.

.2.1.12 LPI PUMPS

a. Inspection Scope

The inspectors reviewed the UFSAR, TS, DBDs, and associated drawings to determine the design basis performance requirements of these pumps. Also, TAC documentation (Test Acceptance Criteria), PIPs, work orders, system health reports and surveillances were reviewed to assess the operating history and general performance of these pumps.

b. Findings

No findings of significance were identified.

.2.1.13 LP-28, Manual BWST Isolation Valves

a. Inspection Scope

These valves are locked open on each unit to align the BWST to the suction of the ECCS pumps. Further, they must be capable of being closed after a postulated tornado event, as well as to prevent reverse flow from the containment sump during a LOCA. The LPI DBD, TS 3.5.3, flow diagrams and surveillance procedures were reviewed by the inspectors to establish design basis performance requirements. In addition, PIPs, work orders and system health reports were reviewed to assess the operating history and general performance of these valves.

b. Findings

No findings of significance were identified.

.2.1.14 MOVs LP-103 & LP-104: Post-LOCA Boron Dilution Isolation Valves

a. Inspection Scope

The inspectors reviewed the DBD, and associated drawings to determine the design basis performance requirements of these valves. Further, PIPs, work orders, system health reports and surveillances were reviewed to assess the operating history and general performance of these valves.

b. Findings

No findings of significance were identified.

.2.1.15 High Pressure Injection (HPI) Pump and Motor Coolers

a. Inspection Scope

The team reviewed the UFSAR, DBDs, TS, Selected Licensee Commitments (SLC), calculations, and drawings to identify design basis information for the HPI pumps and the pump motor cooler cooling sources. The team also reviewed HPI pump flow tests, bearing oil analysis, vibration data trends, HPI system health reports, bearing and stator temperature data trends, flow rate and differential pressure trends, and corrective action documents. These documents were reviewed to verify HPI pump design margins were being maintained and to confirm that the licensee was entering problems which could affect system performance into the corrective action program, and initiating appropriate corrective actions.

The team also verified that the HPI pump motor coolers had adequate cooling by reviewing the availability and reliability of all cooling sources. The review included motor cooler flow rate trends, completed procedures which verified minimum required flow to the motor coolers from the LPSW and HPSW sources, and which also verified system check valves function to open and/or prevent backflow. In addition, LPSW to HPI cooler maintenance rule a(1) status and associated corrective actions were reviewed to verify these were adequate and commensurate with risk significance.

To verify the availability of the Auxiliary Service Water (ASW) system cooling flow path to the HPI pump motor coolers, the team reviewed the completed temporary procedures performed to verify adequate flow and check valve operation. The team also reviewed ASW to LPSW flow path check valve preventive maintenance and piping inspections that verified sections of piping that were not maintained dry were not degraded by fouling or blockage.

b. Findings

No findings of significance were identified.

.2.1.16 LPI to HPI Pump Suction Header Check Valves LP-55 and LP-57

a. Inspection Scope

Check valves LP-55 and LP-57 are used when aligning HPI pumps in piggyback mode to allow flow from LPI discharge header to the suction of the HPI pumps. The team reviewed preventive and corrective maintenance work order history, and corrective action documents to verify the check valves were reliable and periodically inspected. In addition, the team reviewed DBDs, and completed test procedures that verified the check valves stroked open allowing sufficient flow to the HPI pump suction, and prevented backleakage from the opposite train when closed.

b. Findings

No findings of significance were identified.

.2.1.17 Pressurizer Power Operated Relief and High Point Primary Vent Valves

a. Inspection Scope

The team reviewed DBDs to establish the design basis equipment capability of the pressurizer power operated relief and primary high point vent valves. These valves are used in the emergency procedures for forced cooling. The team reviewed testing and operational history of the valves. Also, the team reviewed the corrective action documents for the valves for the past three years.

b. Findings

No findings of significance were identified.

.2.1.18 Main Turbine Generator Condenser Isolation Valves and the Circulating Water Pump Isolation Valves

a. Inspection Scope

The team reviewed the design basis and equipment capability for the main generator condenser isolation and the circulating water pump discharge isolation valves. The team reviewed the turbine flood design basis documents and corrective action documents for the last 10 years and work orders for the last 3 years. Select problems with the valves were reviewed in depth including periodic testing results. The team discussed technical details with maintenance personnel, valve engineers, operators, and system engineers.

b. Findings

No findings of significance were identified.

.2.1.19 Keowee Hydroelectric Generator Wheel Pit (Turbine) Sump Pumps

a. Inspection Scope

The team reviewed the design basis and equipment capability for the two turbine sump pumps located in the wheel pit. The sump pumps empty the wheel pit and keep turbine shaft packing water out of the shaft's lower guide bearing. The team verified the safety-related power sources, reviewed the adequacy of equipment performance testing and maintenance work orders, and assessed potential common cause failure mechanisms. System related corrective action documents were reviewed to assess the recent performance history of the equipment.

b. Findings

No findings of significance were identified.

.2.1.20 BWST: Structural Considerations of the Tank

a. Inspection Scope

The inspectors reviewed the UFSAR, structural calculations and relevant PRA data to determine the tank design basis. The inspectors also reviewed past Civil/Coating Inspection Reports of the tanks for all three units, PIPs, and work orders, to verify that the tanks continue to meet their design basis.

b. Findings

No findings of significance were identified.

.2.1.21 Transformers CT-3 and CT-4

a. Inspection Scope

The team reviewed work orders, procedures, PIPs, and test records for transformers CT-3 and CT-4. The cognizant system engineer was interviewed and a work order addressing replacement of wiring in CT-4 control cabinet was reviewed (98573929-01). Also, affected design calculations were reviewed and the team performed a partial system walk-down of Unit 1, 2 and 3 Main Step Up and Start Up transformers. This review was accomplished to verify that the components continue to perform to their documented design basis.

b. Findings

No findings of significance were identified.

.2.1.22 HPI Pump C, Switchgear TD, Circuit Breakers N1, N2, E1, E2, S1 and S2

a. Inspection Scope

The team reviewed calculations, drawings, maintenance procedures, and vendor data on the equipment that supplies power from offsite to engineered safety feature buses. The team reviewed the protective relaying calculations for the 4 kilovolt (kV) Class 1E service motors to determine if the protection and coordination were within the motors' allowable thermal limits and operating conditions. The team performed a partial system walk-down of the Unit 1, 2 and 3 4 kilovolt (V) and 480volt (V) switchgears, located in the turbine building. The team reviewed the licensing commitments contained in the UFSAR to determine the requirements for the settings of the degraded and loss of voltage relays.
The team reviewed the basis for the setpoint, whether the settings allow for proper operation of all loads, and whether all required loads were analyzed to operate successfully during the period of set time delay. The team reviewed the surveillance procedures for the loss of voltage relays to determine compliance with the pick up and drop out limits. The team reviewed two years of maintenance history records on the 4kV breakers. This review was accomplished to verify that the components continue to perform to their documented design basis.

b. Findings

No findings of significance were identified.

.2.1.23 Emergency Power Switching Logic

a. Inspection Scope

The team reviewed the logic diagrams and test procedures for circuits that control the Emergency Power Switching Logic. Logic diagrams were reviewed to determine whether the switching between various sources of power would occur as described in the UFSAR and DBD. The setpoint, time delays and the associated tolerances for relays were reviewed to determine whether the scheme would perform properly and would avoid spurious trips.

b. Findings

No findings of significance were identified.

.2.1.24 Auto Transfer Features

a. Inspection Scope

The team reviewed logic diagrams, test procedures and calculations for circuits that control the automatic transfer of power sources for the engineered safety feature buses. Logic diagrams were reviewed to determine whether the transfer from station auxiliary power to offsite startup power would occur immediately for unit trip scenarios, and after main generator trip for accident scenarios. The setpoint, time delays and the associated tolerances for voltage relays were reviewed to determine whether the transfer scheme would allow sufficient voltage decay to preclude damage to motors, but still avoid spurious transfer to the onsite emergency source. The team also reviewed elementary and logic diagrams, and calculations for the fast transfer of non-engineered safety feature buses to the offsite source to determine whether it would result in spurious actuation of engineered safety feature bus under-voltage protection, protect the motors or disrupt load sequencing on the engineered safety feature buses.

b. Findings

No findings of significance were identified.

.2.1.25 Engineered Safety Feature Bus Load Shed, Load Sequencing, and Breaker Coordination/Fault Protection

a. Inspection Scope

The team reviewed calculations, drawings, relay setting and test reports to determine whether engineered safety feature load shed schemes, load sequencing, and bus protection were adequate to assure availability of engineered safety feature loads within the times assumed in the safety analysis, and to prevent spurious tripping of buses. The team reviewed the setpoints and time delays for undervoltage relays used in the load shed scheme, as well as power supplies and setpoints for the discrete timing relays

used in motor starting circuits. The team also reviewed surveillance procedures and test reports for time delay relays to determine whether actual setpoints were consistent with the intended design.

b. Findings

No findings of significance were identified.

.3 Review of Low Margin Operator Actions

a. Inspection Scope

The team performed a margin assessment of a sample of risk significant, time critical operator actions. Where possible, margins were determined by the review of the assumed design basis, engineering modeling, and UFSAR stated response times and job performance times. For the selected operator actions, the team performed a walk through of associated Emergency Procedures, Abnormal Procedures, Annunciator Response Procedures, and other operations procedures with appropriate training personnel or plant operators to assess operator knowledge level, adequacy of procedures, and availability of special equipment when required. The following operator actions were reviewed:

High pressure recirculation - operator failure to initiate *
Low pressure recirculation - operator failure to initiate *
High pressure injection - failure to throttle HPI pumps *
Flooding - auxiliary and turbine building
Borated water storage tank - failure to make up during piping break *
Decay heat removal - operator response to loss of DHR
Turbine bypass valves - failure to close on demand

The licensee had validated the time critical actions (TCA) in a performed surveillance run by operations support personnel. The team compared the times generated in the surveillance against the model times in a engineering developed model and subsequent calculation (OSC-2820). The inspectors walked down several EP action locations in the plant, observing for usability of instructions and equipment and observing that the time critical valves are appropriately tagged as time critical. Job performance measures developed by training for the non-licensed operators were observed in the plant during walk downs.

The inspectors observed unpracticed and cold-to-the-scenario operator training personnel performance on the above asterisked actions. The observation occurred on the Oconee control room simulator. The training personnel were checking the scenarios to be used during operator annual requalification testing for problems. The TCAs imbedded in the scenarios were timed for comparison to those times found in the validation surveillance.

Activity points in the emergency procedures and abnormal procedures were compared with the basis documents. The loss of DHR was discussed with operations support personnel procedure writers. The discussion covered the differences between the units, sequence of actions, and timeliness of the operator actions and their options.

b. Findings

No findings of significance were identified.

.4 Review of Industry Operating Experience

a. Inspection Scope

The team reviewed selected operating experience issues that had occurred at several other nuclear facilities for applicability to this facility. The issues that received review by the team were:

NRC Generic Letter 98-02, Loss of Reactor Coolant Inventory and Associated Potential for Loss of Emergency Mitigation Functions While In a Shutdown Condition.

NRC Information Notice 95-03, Supplements 1 & 2, Loss of Reactor Coolant Inventory and Potential Loss of Emergency Mitigation Functions While In a Shutdown Condition.

NRC Bulletin 88-10, Nonconforming Molded-Case Circuit Breakers.

NRC Bulletin 88-04, Potential Safety Related Pump Loss, Minimum Flow Concerns.

NRC Generic Letter 88-17, Loss of Decay Heat Removal.

NRC Information Notice 90-55, Recent Operating Experience on Loss of Reactor Coolant Inventory While in Shutdown Condition.

b. Findings

No findings of significance were identified.

.5 Review of Permanent Plant Modifications

a. Inspection Scope

The team reviewed two modifications related to the selected risk significant components in detail to verify that the design bases, licensing bases, and performance capability of the components have not been degraded through modifications. The team reviewed the modification package, implementation procedure, 50.59 evaluation, calculations, post-modification testing results, corrective action documents, and performed an independent walkdown of the observable portions of the modification. The team reviewed the modifications in accordance with IP 71111.17, Permanent Plant Modifications, Section 02.02.a and IP 71111.02, Evaluations of Changes, Tests, or Experiments.

The following modifications were reviewed:

Modification NSM ON-33106, Emergency Sump Return Line.

Modification NSM ON-23093, LPI Passive Cross-Connect Modification.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4AO6 Meetings, Including Exit

Exit Meeting Summary

On March 16, 2006, the team presented the inspection results to Mr. D. Baxter, Station Manager, and other members of the licensee staff. Licensee representatives acknowledged their understanding of the inspection results. No proprietary information was reviewed during this inspection or included in the report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee:

K. Alter, Engineering Supervisor
D. Baxter, Station Manager
C. Brown System Engineer AC systems
N. Clarkson, Sr. Engineer, Regulatory Compliance
T. Grant, Engineering Supervisor
L. Nicholson, Manager, Safety Assurance
J. Rowell, Electrical Engineer
J. Smith, Technical Specialist, Regulatory Compliance
J. Stevens, System Engineer DC systems
J. Weast, Engineer, Regulatory Compliance

NRC

A. Hutto, Resident Inspector
E. Riggs, Resident Inspector
M. Shannon, Senior Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Open/Closed

NCV 05000269, 270, 287/2006006-01	Non-Conservative EOP Procedure Setpoint for Operator Action to accomplish BWST to RBES swap over on Low BWST Level (Section 1R21.2.1.1)

Open

URI 05000269, 270, 287/2006006-02	Possible Vacuum Breaker Failure Impact to Keowee Emergency Power Function (Section 1R21.2.1.2)

LIST OF DOCUMENTS REVIEWED

Problem Investigation Process reports (PIPs)

04-04595, Digital EFW Control Mod Canceled
00-02322, 3-CCW-22 failed to close
01-01794, 2CCW-20 failed to close automatically
01-02697, Scaffolding blockage of 3CCW-21 and -22
02-00106, Turbine Building Supersystem Flood MR A(1)
03-06781, 1CCW-20 limit switch problem
02-00106, Turbine Building Supersystem Review
03-06781, 1CCW-20 would not open
04-02597, 2CCW-24's OAC a point did not match valve position
03-03166, Condenser outlets did not go shut as expected
02-02114, 50 PIPS that constitute degraded/non-conforming conditions (NCI) per NSD 203
04-04089, Procedures do not require SLC 16.911 condition A to be entered when 2CCW-41 is closed
04-06825, 2CCW-30 actuator is broken
03-01890, Calculations do not reflect EOP preferences
01-00936, Siphon header out of service
04-02623, OCCW-101 is non seismic
00-01467, TS not clear about ESV trains
05-05285, Discrepancies in documents for Modes 5 and 6
00-01416, Reviewing calc OSC-551 for requested support calc
00-02045, NLOs ETQS tasks
05-08243, Potential SLC for Keowee support equipment
05-08474, KHU-2 AC Turbine sump pump “inop”
04-05841, KHU-2 2 TS-2 valve needs repair
03-03928, Critical time action needs to be expanded
94-1685, NRC DEV 94-24-05 Disagrees with Pipe Class of HPIP Recirculation Line
97-4133, SA-97-10(ON)(SITA)(HPI/LPI) HPI/SPI SITA Audit, 11/19/97
98-0707, PIP O-098-0150 SITA Audit identified a possible problem with not having a zero ref. of the BWST on the drawing, 4/30/98
00-3686, Unit Three RCS Leakage > 0,2 gpm, 11/15/2000
00-4064, Check Valves CCW-312 and CCW-313 Should be Included in the ONS Testing Program, 11/21/00
03-2226, 2B & 1C HPI Pump Motor Vibration Increased Following New Pump Installation, 04/22/03
03-5188, 1CCW-268 Failed to Remain Closed While Stroke Testing from the Open Position, 08/16/03
03-8217, 1CCW 268 Valve Was Not Fully Closing, 12/18/03
04-1436, 3LPSW-251 Not Controlling Flow Within Procedure Limits, 03/18/04
04-3327, 2C HPI Pump Needs Rebaselining, 05/19/04
04-3496, 3LPSW-251 Did Not Control as Expected, 05/24/04
04-4108, Unexpected Entry into TS 3.10 due to 2CCW-268 Failed to Operate During Stroke Test, 06/18/04

04-4824, SSF Sump Pump 1 Running Continuously Due to Failed Open Check Valve on SSF Sump Pump 2, 07/24/04
04-5365, Unplanned Entry into TS 3.5.2 and SLC 16.6.12 due to Having Low Bearing Cooling Water Flow to 3C HPI Pump Bearing Cooler, 08/18/04
04-6365, SSF Sump Room Size Calculation, 09/29/04
04-6811, 3LPSW-251 Not Controlling Properly in Automatic, 10/14/04
04-8724, Contact for LP-1 RC Pressure Interlock is Not QA-1, 12/14/04
05-1128, 3B HPI Pump Motor Vibration Readings Greater than Required Action Level, 02/15/05
05-1272, 3B HPI Pump Did Not Meet Vibration Acceptance Criteria, 02/21/05
05-2898, Need Stronger Barrier to Prevent Loss of Configuration Control and/or Loss of Decay Heat Removal Barrier, 04/24/05
05-3223, 1LPSW-159, HPI Pump Motor Temperature Control Outlet Valve, Found Closed, 05/04/05
05-3770, Oconee SSF Risk Reduction Review, 05/31/05
05-4359, Unit 1 LPSW System MR a(1) due to Repetitive MPFFs Associated with LPSW Flow to the HPI Motors, 06/30/05
05-4776, 1B HPI Pump has Two Vibration Points in the Alert Range, 07/24/05
05-6829, Material Found in 2LP-19 & 20 Suction Piping from RBES, 10/24/05
05-6982, 2LPSW-252 Did Not Operate Properly, 10/28/05
05-7036, Station ASW Pump Suction Pipe Inspection Revealed Interior Tubercle Formation, 10/29/05
05-7146, FME Discovered in CCW Piping, 11/01/05
05-7616, Vibration Value for 2C HPI Pump Outside Acceptance Criteria, 11/11/05
06-0637, ASW Pump Low Flow, 02/03/06
04-02106, Weld 2-LP-0189-5 Found to be Below Minimum Wall Thickness in a 4" Area

Procedures

PT/0/A/0129/033, Time Critical Verifications, Rev. 2
AP/2/A/1700/026, Loss of Decay Heat Removal, Rev. 16
OMP-4-02, Verification and Validation Process for APs, EOP, and Support Procedures, Rev. 13
EP/1/A/1800/001, Oconee Unit One Emergency Procedures, Rev. 34
NADP-3, Managing the Operating Experience Program, Rev. 3
IP/0/A/3011/013 Molded Case Circuit Breaker Test and Inspection
AP/1/A/1700/024, Loss of LPSW, Rev. 18
MP/0/A/1200/078, Valve-Pacific-Swing Check- Disassembly, Repair and Reassembly, Rev. 16
OP/1,2,3/A/1104/002 D, Restoration of HPI Injection, Rev. 12, 16, 16
OP/1,2,3/A/1103/11, Draining and Nitrogen Purging RCS, Rev. 64, 63, 61
OP/1,2,3/A/1104/04, Low Pressure Injection System, Rev. 111, 123, 116
PT/1,2,3/A/0150/54, LP-15 and LP-16 Leak Test, Rev. 5, 2, 4
PT/1,2,3/A/0150/67, LP-40 and LP-41 Leak Test, Rev. 3, 2, 4
PT/1,2/A/0152/006, Condenser Circulating Water System Valve Stroke Test, Rev. 12, 16
PT/1,2,3/A/0204/007, Reactor Building Spray Pump Test, Rev. 84, 72, 80
PT/1/A/0600/010, “Reactor Coolant Leakage”, Rev. 071
IP/0/A/0203/001A, Low Pressure Injection System Borated Water Storage Tank Level Instrument Calibration, Rev. 33

Completed Performance Tests

PT/1/A/015/006 , 1CCW-10, test id 10188, 1/18/2006 (TYPICAL for 1/2/3-CCW 10-13 and 20-25)
PT/0/A/0129/033, Time Critical Verifications, Revision 2, performed 9 to 11, 2005
PT/2/A/0610/001L & PT/2/A0610/001J, Load Shed Channel Verification
PT 0/A/0120/033, Discrepancies Process Record Time Critical Action Verification 9/28/02 to 10/6/02 - AB Flood
PT 0/A/0120/033, Discrepancies Process Record Time Critical Action Verification 11/ 2005, enclosure 13.10
IP/0/A/031/003 B, Engineered Safeguards System Analog Channel A RC Pressure Channel Calibration, completed 04/16/05,11/02/05, 12/08/04
PT/1,3/A/025/023, LPSW System Flow Test, completed 12/11/03, 12/12/04
PT/1,2/A/025/072, LPSW System Flow Balance Verification, completed 05/11/05, 11/21/05
PT/1/A/0152/012, Low Pressure Injection System Valve Stroke Test, 05/02/05
PT/1,2/A/0202/011, High Pressure Injection Pump Test, completed 08/22/04, 11/12/04, 08/24/04
PT/1,2/A/0203/006 A, Low Pressure Injection Pump Test - Recirculation, completed 08/24/03, 01/18/05, 10/30/04
PT/1/A/0203/006 B, Low Pressure Injection Pump Test - Decay Heat, completed 11/27/03
PT/1/A/0203/013, 1LP-55 and 1LP-57 Check Valve Test, completed 0813/03, 02/17/05
PT/1,2,3/A/0230/015, High Pressure Injection Motor Cooler Flow Test, completed 12/19/05, 02/02/06
PT/1,2,3/A/0251/024, HPI Full Flow Test, completed 04/27/05, 05/20/04, 12/15/04
TT/1,2,3/A/0251/50, ASW to HPI Pump Motor Cooler Flow Test, completed 11/27/95, 05/20/96, 07/10/95
IP/0/A/0203/001A, Low Pressure Injection System Borated Water Storage Tank Level Instrument Calibration, completed 4/4/05 & 12/29/03
TT/0/A/0400/033, SSF Sump Pump, SSF Sump Pump Discharge Check Valve, and SSF Pump Room Water In-Leakage Test, completed 02/21/06

Performance Measures Observed in the Simulator or Plant (February 2006)

CRO–097, Align HPI/LPI Piggyback Mode Following a SBLOCA
CRO-019, Initiate Forced High Pressure Injection Cooling
NLO-004, Manually Bypass the KI Inverter
NLO-022 Align and Start the Station Aux Service Water Pump
CRO-004, Performed Required Actions for Failed LPI Train
NLO-033A, Align “B” LPSW Pump power from alternate Unit
CRO-021, Isolate a Main Steam Line Rupture
CRO-027, Align ECCS Suction From Emergency Sump
NEO Time Critical Task 1146501, Perform outside the control room actions to control Auxiliary Building flooding
NEO Time Critical Task 1140304, Perform LPI operations during time critical tasks

Licensee Audits

PIP 02-02916, Audit GO-02-13(NPA)(OPS)(ALL) Operations and Training
PIP 01-03545, Audit 1-O0DBG-055-01, Design Basis Group Initiatives
PIP 01-03546, Level II Assessment of Risk Significant Time Critical Actions

Work Orders

98618741, K2, repair AC GBO pump . High vibration (TYPICAL, Keowee hydro units wheel pit components)
98625740 PM B1T-13 4160V Breaker (E1-2)
98676711 Refurbish Breaker for B2T-08
98631217 PM on Breaker & Relays in BIT-6
98683858-01 - Degraded Grid Under Voltage Relays 27YBDGX
98683859-01 - Degraded Grid Under Voltage Relays 27YBDGY
98683860-01 - Degraded Grid Under Voltage Relays 27YBDGZ
98573929-02 Replace wiring in CT-4 Control cabinet
98100667 & 98625990, PM Check Valve 1HP-194 & 2HP-194, completed 6/15/97 & 4/07/04
98377225, 98545755, & 98660647, PM Check Valve 3LPSW-503, completed 11/16/01, 05/10/03, & 11/08/04
98427212 & 98695228, PM Check Valve 1LPSW-502, completed 03/31/02, 04/16/05
98545734 & 98660628, PM Check Valve 3LPSW-502, completed 05/14/03, 11/08/04
98583350 & 98390073 PM Check Valve 1HP-486 & 2HP-486, completed 10/13/03 & 5/19/01
98625819 & 98719938, PM Check Valve 2LPSW-502, completed 04/04/04, 11/02/05
98696537, U1 BWST Level Instrument Calibration, completed 4/4/05
98613979, U1 BWST Level Instrument Calibration, completed 12/29/03
98677772 & 98600130, PM Check Valve CCW-100, completed 10/16/03, 03/02/05
98679351, Inspect/Repair CCW-313 for Proper Operation, completed 08/04/04
98697869, Disassemble and Examine Valve CCW-312, completed 09/13/05

Calculations

OSC-8493, Hydraulic Analysis to Support Unit 3 LDST-RBES Return Line Modification, Rev. 1
OSC-4300 Protective Relaying Calculations (Undervoltage) following appendices Rev. 10
OSC-4200 Appendix P - 87T Transformer Differential Type HU Relays, Rev. 7
OSC-4300 Appendix H - 51TN Transformer neutral over-current relays Rev. 6
OSC-3120 Electrical Protective Relay Settings & Breaker coordination Rev. 11
OSC-2060 Oconee Unit 2, Voltage & Load Flow Study, Rev.19
OSC-2061 Oconee Unit 3, Voltage & Load Flow Study, Rev. 14 (page 38 - 47), short circuit portion.
OSC-2061, Appendix O, Unit 3 LBLOCA analysis when fed from the 230kV switchyard and pre-outage calculation 3eOC22, Rev. 17
OSC-8113 125VDC Vital Instrumentation and Control Load Profile, Battery Sizing and Voltage Analysis, Rev. 0
OSC-5749 6.9kV & 4.16kV Auxiliary System Transfer Analysis
OSC-2042, HPI Pump Motor Upper Bearing Cooling Report, Rev. 5
OSC-2651, Reactor Building Normal and Emergency Sump Level Instrument Loop Accuracy Calculation ON-LWDLT113, 120; ON-LPILT3P, 112, Rev. 5
OSC-2820, “Emergency Procedure Guidelines Setpoint”, Rev. 31
OSC-3189, BWST Level Uncertainty, Rev. 6
OSC-3993, Unit 1 LPI Heat Exchanger Performance Calculation, Rev. 12
OSC-4156, Unit 2 LPI Heat Exchanger Performance Calculation, Rev. 12
OSC-4269, CCW-268/CCW-410, CCW-287 and CCW-411 Valve Data Sheet Calculation NSM ON-52882 (SSF Type IV), Rev. 5
OSC-4338, Unit 3 LPI Heat Exchanger Performance Calculation, Rev. 9

OSC-5674, Unit 1 Generic Letter 89-10 MOV Calculation, Rev. 21
OSC-5675, Unit 2 Generic Letter 89-10 MOV Calculation, Rev. 22
OSC-7043, Unit 1 and Unit 2 Post Outage RBCU and LPI Cooler Flow Verification, Rev. 9
OSC-8176, GL 89-10 Review for Valves CCW-268 and CCW-287, Rev. 0
OSC-8441, U2 LPI Hydraulic Calculation, Rev. 7
OSC-8441, Unit 2 LPI Hydraulic Calculation for NSM ON 23093, Rev 7
OSC-7632, LPI System Passive Cross-Connect Modification NSM ON-X3093

Modification Documents

NSM ON-33106, Reactor Building Emergency Sump Return Line Modification, Rev. 1
NSM ON-23093, EOPI Passive LPI Cross Connect.
NSM ON-52882, Replacement of SSF ASW Valves 1/2/3CCW-268, Rev. 0

Drawings

OFD-101A-3.2, Flow Diagram of High Pressure Injection System, Rev. 37
0-2705, One Line Diagram 120VAC & 125VDC Station Auxiliary Circuits Instrumentation Vital Buses, Rev. 72
0-2700, One Line Diagram Relays & Meters 19kV, Rev. 14
0-702-A One Line Diagram 6900V & 4160V Auxiliary Systems, Rev. 27
0-2703 One Line Diagram Station Auxiliary circuits 600/208V Rev. 49
0-2703-B One Line Diagram Station Auxiliary circuits 600/208V Rev. 53
0-2703-G One Line Diagram Station Auxiliary circuits 600/208V Rev. 67
OEE-117-2 Elementary Diagram 4160V switchgear No. B1T Start-up breaker Unit No. 1 Rev. 16
OLD-2000 (sheets 01, 03, 04, 07, 10, 12, 14, 16, 20) 4kV Logic Diagrams Rev. 0
OLD-2005-01 Logic Diagram Keowee Emergency Start Channel A, Rev. 0
OM 2300-0024.001 Vendor Drawing No. NP254562 CT3 Transformer nameplate
OFD-101A-1,2,3.3, High Pressure Injection System (Charging Section), Rev. 19, 20, 19
OFD-102A-1,2,3.1, Low Pressure Injection System (Borated Water Supply & LPI Pump Suction), Rev. 49, 42, 50
OFD-102A-1,2,3.2, Low Pressure Injection System (LPI Pump Discharge), Rev. 43, 38, 31
OFD-121D-1.2, Emergency Feedwater System (Auxiliary Service Water), Rev. 14
OFD-124B-1,2,3.1, Low Pressure Service Water System (Auxiliary Building Services), Rev. 51, 57, 48
OFD-124C-1.3, High Pressure Service Water System (Auxiliary Building), Rev. 15
OFD-133A-2.5, Condenser Circulating Water System (SSF Auxiliary Service), Rev. 42
OM 201.H-0202 001, Non-Nuclear Instrumentation Schematic Diagram Reactor Coolant RC Pressure Control, Rev. D1

System Design Basis Documents

OSS-254.00-00-1003, Flood, Section 20.2.14, Revision 20
OSS-0254.00-00-1047, Keowee Turbine Sump (TS) Pump System, Revision 8
OSS-0254.00-00-4005, Design Basis Event, Revision 17
OSS-0254.00-00-2000, 4kV Essential Auxiliary Power System, Rev. 13
OSS-0254.00-00-1000, Emergency Feedwater and the Auxiliary Service Water Systems, Rev. 40

OSS-0254.00-00-1001, High Pressure Injection and Purification & Deborating Demineralizer Systems, Rev. 32
OSS-0254.00-00-1002, High Pressure Service Water System, Rev. 24
OSS-0254.00-00-1005, Standby Shutdown Facility Auxiliary Service Water System, Rev. 22
OSS-0254.00-00-1008, SSF Diesel Support Systems, Rev. 25
OSS-0254.00-00-1039, Low Pressure Service Water System, Rev. 34
OSS-0254.00-00-1028, Low Pressure Injection and Core Flood System (LPI), Rev. 26

Miscellaneous Documents

Technical Specifications (TS) & Selected Licensee Commitments (SLCs)
Auxiliary, Reactor, Turbine, and Building Flood Analysis Notebook, Probabilistic Assessment SAAG File No. 465
NRC Inspection Report 05000269,270, 287/20020012 95001 Close Out of Auxiliary Building Flood
Valve: RC, CCW, LPI, HPI, and LPSW IST test data for the last three years
EOP/TBD Revision 9 Deviation Document
Oconee Design Study ONDS-0340, Auxiliary Building Internal Flooding Evaluation, 11.7.00
#74-1152414-10, AREVA Technical Document, Chapter IV.J, Loss of Decay Heat Removal System Operation, date 12/31/2005
Critical Manual Valves Health Report, Report Period 2005
Oconee Updated Final Safety Analysis Report
Molded Case Circuit Breaker Health Report 2005T3
HPI Pumps Motor Inboard and Outboard Oil Analysis Results, 2002-2006
HPI Pumps Vibration Analysis Results, 2003-2006
HPI Pumps Motor Bearing and Stator Temperature Data Trending, 2003-2006
HPI Pumps Flow and Differential Pressure Trending, 1992-2006
Test Acceptance Criteria Sheets, Valves 1/2/3LP-1,2,19,20 & 1/2/3CCW-268
Memorandum, “Regulatory Compliance Position on Crediting Containment Overpressure for non Bounding LOCAs”, 4/1/2004
Check Valve Health Report, Report Time Period: 2004T2,
Stroke Time Data Trending, Valves 1/2/3LP-1,2,19,20 & 1/2/3CCW-268, 2003-2005
MOV Margin Report, Valves 1/2/3CCW-268 & 1/2/3LP-1,2,19 & 20
System Functional Failures, HPI, LPI, SSF and LPSW, 2003-2006
HPI Pump Motor Cooler LPSW Normal and Emergency Supply Flow Trending, 1995-2006
Health Reports, Low Pressure Injection, High Pressure Injection, Low Pressure Service Water, Standby Shutdown Facility, Miscellaneous Heat Exchangers, Check Valves, Preventive Maintenance Living Program, 2004T3, 2005T3
SA-00-39 (ON)(NPAS)(SITA), 09/2000
OAC Detailed Design Specification, “Continuous Reactor Coolant Leakage Monitor”, 520-65ONS00-12
Motor Operated Valves Health Report, Report Time Period: 2005T3
IST LPI Pump Developed Head Test Data, Trending over Jan-06 through Dec-05, (compiled results taken from PT/*/0203/06A, B)
51-5043764-00, Areva Engineering Information Record Oconee Unit 2 CF/LPI/DHR LBB Evaluation for Reduced Weld Thickness
TT/2/A/150/070, ON-23093 LPI Cross Connect Post Modification Test, Rev 000

References On Vortex Margin Calculations

"Selective Withdrawal from a Vertically Stratified Fluid", 8th Congress International Association Hydraulic Research, August, 1959, Donald R. F. Harleman, Robert L. Morgan, Robert A. Purple.

"Pump Intake Design", ANSI/HI 9.8-1998, Hydraulic Institute.

"Vortices at Intakes in Conventional Sumps", Dr. Y. R. Reddy and J. A. Pickford, Water Power March 1972.

PIPs Written As A Result Of This Inspection

PIP 06-0893 Identified a discrepancy in OSC 2820 on BWST level
PIP 06-01051 The mass of the PZR steam does not appear to be accounted for
PIP 06-01183 No PMs have been performed on Keowee MT-25, also piping may need to be included in the License Renewal Scope
PIP 06-01189 BWST level uncertainty calculation OSC -3189 does not reflect vacuum breaker mod
PIP 06-01190 LPI Design Basis Document states 400 psi interlock on LP-1 is not tested, but it is
PIP 06-01205 1LP-4 not placed back on the time critical component list
PIP 06-01160 Inaccuracies in OSC -3120, Breaker Coordination
PIP 06-01084 Typo on a one-line drawing (.66hp Vs 66hp)
PIP 06-01374 Evaluate BWST vortex
PIP 06-01442 Two JPMs that may need to be time critical in training but currently are not
PIP 06-01425 Seismic analysis for valve MT-25 piping could not be located
PIP 06-01475 Keowee vacuum breaker valve MT-25 stuck partially open after shutdown
PIP 06-01854 During the recent NRC Component Design Basis Inspection a number of calculation problems/issues were identified.
PIP 06-01160 Calculation needs to be updated to be as-built following station modification.

LIST OF ACRONYMS

AC	-Alternating Current
ADAMS	-Agency wide Documents Access and Management System
ANSI	-American National Standards Institute
AP	-Abnormal Procedure
ASW	-Auxiliary Service Water
BWST	-Borated Water Storage Tank
CCW	-Condenser Circulating Water
CFR	-Code of Federal Regulations
DBD	-Design Basis Document
DC	-Direct Current
DEC	-Duke Energy Corporation
DHR	-Decay Heat Removal
ECCS	-Emergency Core Cooling Systems
EFW	-Emergency Feedwater

EOP	-Emergency Operating Procedure
GL	-Generic Letter
HPI	-High Pressure Injection
HPSW	-High Pressure Service Water
IP	-Inspection Procedure
IR	-Inspection Report
ISI	-Inservice Inspection
IST	-Inservice Testing
KHU	-Keowee Hydroelectric Unit
LDST	-Letdown Storage Tank
LOCA	-Loss Of Coolant Accident
LPSW	-Low Pressure Service Water
LPI	-Low Pressure Injection
MOV	-Motor Operated Valve
NCV	-Non-Cited Violation
NDE	-Non-Destructive Examination
NRC	-Nuclear Regulatory Commission
NRR	-Nuclear Reactor Regulation
NSD	-Nuclear System Directive
ONS	-Oconee Nuclear Station
PARS	-Publicly Available Records
PIP	-Problem Investigation Process report
PM	-Preventive Maintenance
PMT	-Post-Maintenance Testing
PRA	-Probabilistic Risk Assessment
PT	-Performance Test
RB	-Reactor Building
RBES	-Reactor Building Emergency Sump
RBS	-Reactor Building Spray
RCS	-Reactor Coolant System
Rev.	-Revision
RII	-Region II
SDP	-Significance Determination Process
SG	-Steam Generator
SLC	-Selected Licensee Commitments
SSF	-Standby Shutdown Facility
TS	-Technical Specification
TCA	-Time Critical Action
UFSAR	-Updated Final Safety Analysis Report
URI	-Unresolved Item
UT	-Ultrasonic Examination
WO	-Work Order