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

April 26, 2007

Duke Power Company LLC
d/b/a Duke Energy Carolinas, LLC
ATTN: Mr. Bruce H. Hamilton
Vice President
Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION - INTEGRATED INSPECTION REPORT 05000269/2007002, 05000270/2007002, 05000287/2007002

Dear Mr. Hamilton:

On March 31, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Oconee Nuclear Station. The enclosed report documents the inspection results which were discussed on April 10, 2007, with you and 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.

Based on the results of this inspection, the NRC has identified one self-revealing finding of very low safety significance (Green), which was determined to be a violation of NRC requirements. However, because of the very low safety significance and because the issue was entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section VI.A of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States 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, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Oconee facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and any response 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,

/RA/

James H. Moorman, III, Chief
Reactor Projects Branch 1
Division of Reactor Projects

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

Enclosure: NRC Integrated Inspection Report 05000269/2007002,05000270/2007002
05000287/2007002 w/Attachment: Supplemental Information

cc w\encl: (See page 3)

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Letter to Bruce H. Hamilton from James H. Moorman, III dated April 26, 2007
SUBJECT: OCONEE NUCLEAR STATION - INTEGRATED INSPECTION REPORT 05000269/2007002, 05000270/2007002, 05000287/2007002

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REGION II

Docket Nos:	50-269, 50-270, 50-287
License Nos:	DPR-38, DPR-47, DPR-55
Report No:	05000269/2007002, 05000270/2007002, 50-287/2007002
Licensee:	Duke Power Company LLC
Facility:	Oconee Nuclear Station, Units 1, 2, and 3
Location:	7800 Rochester Highway Seneca, SC 29672
Dates:	January 1, 2007 - March 31, 2007
Inspectors:	D. Rich, Senior Resident Inspector A. Hutto, Resident Inspector E. Riggs, Resident Inspector P. Fillion, Senior Reactor Inspector (Section 4OA2.2b.(2)) J. Hamman, Reactor Inspector (Section 4OA2.2b.(2))
Approved by:	James H. Moorman, III, Chief Reactor Projects Branch 1 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000269/2007002, IR 05000270/2007002, IR 05000287/2007002, 01/01/2007 - 03/31/2007; Oconee Nuclear Station, Units 1, 2, and 3; Maintenance Effectiveness.

The report covered a three-month period of inspection by the onsite resident inspectors and announced regional-based inspections conducted by two reactor inspectors. One Green non-cited violation was identified. The significance of the finding is indicated by the 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. A self-revealing non-cited violation (NCV) of Technical Specification (TS) 5.4.1 was identified for failure to adequately implement the procedure requirements for thrust end bearing installation on motor driven emergency feedwater (MDEFW) Pump 1A, resulting in thrust bearing failure following extended pump operation in response to a Unit 1 reactor trip.

  The inspectors determined that the licensee's failure to adequately implement their procedure for thrust end bearing installation was a performance deficiency. The finding was considered to be more than minor because it affected the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. The finding was determined to be of very low safety significance since the pump operated for approximately 28 hours, which is greater than its 24-hour mission time. (Section 1R12)

B. Licensee-Identified Violations

None

REPORT DETAILS

Summary of Plant Status:

Unit 1 began the report period at 100 percent rated thermal power (RTP). On February 15, 2007, the unit tripped due to an external grid fault at the Jocassee Hydroelectric Station switchyard. Following troubleshooting of the 4160V breaker transfer circuits, the unit was brought on-line on February 23, 2007, and achieved 100 percent RTP on February 24, 2007. The unit operated at or near 100 percent RTP for the remainder of the inspection period.

Unit 2 began the report period at 100 percent RTP. The unit was reduced to approximately 88 percent RTP on January 13, 2007, to perform turbine valve movement testing. The unit was returned to 100 percent RTP on the same day. On February 15, 2007, the unit tripped due to an external grid fault at the Jocassee Hydroelectric Station switchyard. Following recovery, the unit was brought on-line on February 18, 2007, and achieved 100 percent RTP on February 20, 2007. On March 29, 2007, operators ran the Unit back to approximately 87 percent RTP due to the loss of a heater drain pump. Following repairs, the Unit was returned to 100 percent RTP on March 30, 2007, where it remained for the rest of the inspection period.

Unit 3 began the report period at approximately 100 percent RTP. The unit was reduced to approximately 88 percent RTP on February 3, 2007, to perform turbine valve movement testing. The unit was returned to 100 percent RTP on the same day, and operated at or near 100 percent RTP for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R01 Adverse Weather Protection

.1 Tornado Watch

a. Inspection Scope

The inspectors assessed whether the licensee responded appropriately to a tornado watch issued for the area surrounding the Oconee Nuclear Station on January 5, 2007. The inspectors reviewed operator actions to determine if operations personnel entered AP/0/A/1700/006, Natural Disaster; if efforts to align the 100 kV Power Path from the Lee Combustion Turbines were underway in accordance with Enclosure 5.4, Severe Weather, of AP/0/A/1700/006; and whether appropriate control room personnel reviewed Enclosure 5.1, Tornado Information.

b. Findings

No findings of significance were identified.

.2 Cold Weather (Actual Conditions)

a. Inspection Scope

The inspectors walked down cold weather protection features related to the protection of the borated water storage tanks (BWSTs) and the essential siphon system during a period of cold weather (<17F) that occurred on January 29, 2007. The inspectors observed the freeze protection circuit panels associated with Units 1, 2 and 3 BWSTs to verify that the circuits were functioning properly with no circuits in the trip position. The inspectors also utilized an infrared temperature measuring instrument to verify that the external insulation surface temperature of the BWST level instrument piping and emergency core cooling system (ECCS) piping read above ambient temperatures as a quantitative measure that the freeze protection circuits were performing their function. The inspectors also reviewed IP/0/A/1606/009, Preventive Maintenance and Operational Check of QA-1 Freeze Protection, to verify that the appropriate maintenance checks of freeze protections circuits, instrument enclosures, and insulation had been performed prior to the onset of cold weather. The inspectors assessed whether instrument enclosures were in place and piping insulation had been installed where appropriate.

b. Findings

No findings of significance were identified.

.3 Severe Weather Event (Snow and Significant Accumulation of Freezing Rain)

a. Inspection Scope

The inspectors ascertained whether the licensee responded appropriately to a Winter Storm Warning issued for the area surrounding the Oconee Nuclear Station on February 1, 2007. The inspectors determined if the licensee entered RP/0/B/1000/035, Severe Weather Preparations, in preparation for significant ice accumulations resulting from greater than 0.25 inches of freezing rain predicted by the National Weather Service. The inspectors assessed whether the applicable portions of Enclosures 4.1 through 4.15 of RP/0/B/1000/035 were completed, and if the licensee continued to monitor plant and weather conditions throughout the winter storm.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment

.1 Partial Walkdown

a. Inspection Scope

The inspectors conducted partial equipment alignment walkdowns to evaluate the operability of selected redundant trains or backup systems while the other train or system was inoperable or out-of-service. The walkdowns included, as appropriate,

reviews of plant procedures and other documents to determine correct system lineups, and verification of critical components to identify any discrepancies which could affect operability of the redundant train or backup system. Specific documents and drawings utilized for this inspection sample are listed in the Attachment to this report. The following four systems were included in this review:

- Unit 2 B Train Emergency Feedwater (EFW) while the A Train EFW was out-of-service (OOS) due to modification work on the nitrogen supply to 2FDW-315
- Primary Instrument Air (IA) compressor and the A Backup IA compressor/dryer while the B and C Backup IA compressors were OOS due to maintenance
- Unit 3 A and B MDEFW pumps while the Unit 3 turbine driven emergency feedwater (TDEFW) pump was OOS for maintenance and testing
- Standby Shutdown Facility (SSF), CT-5 transformer and cable trench, EFW, Switchyard, Blockhouses, Station Auxiliary Service Water (ASW) pump while both Keowee Hydroelectric Units (KHUs) were OOS for dual unit outage (inspection of KHU-1 and 2 turbines)

b. Findings

No findings of significance were identified.

.2 Complete Walkdown of the Unit 2 Low Pressure Injection (LPI) System

a. Inspection Scope

The inspectors performed a system walkdown on accessible portions of the Unit 2 LPI system. The inspectors focused on verifying proper valve and breaker positioning, power availability, no damage to piping or cable tray structural supports, and material condition.

A review of Problem Investigation Process reports (PIPs) and open maintenance work orders was performed to verify that material condition deficiencies did not significantly affect the LPI system's ability to perform its design functions and appropriate corrective action was being taken by the licensee.

The inspectors conducted a review of the system engineer's trending data and system health reports to verify that appropriate trending parameters were being monitored and that no adverse trends were noted. Specific documents and drawings utilized for this semi-annual inspection sample are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

.1 Fire Area Walkdowns

a. Inspection Scope

The inspectors conducted tours in eleven areas of the plant to verify that combustibles and ignition sources were properly controlled, and that fire detection and suppression capabilities were intact. The inspectors selected the areas based on a review of the licensee's safe shutdown analysis and the probabilistic risk assessment based sensitivity studies for fire-related core damage sequences. Specific documents utilized for this inspection sample are listed in the Attachment to this report. Inspections of the following areas were conducted during this inspection period:

- SSF ASW pump room, Electrical Switchgear room, Diesel Generator room, and Control Room (4)
- Turbine Building (3)
- Unit 1/2 Control Room (2)
- Unit 2 Cable Spread Room (1)
- Unit 1 Reactor Building (Reactor Coolant Pump Oil Collection System) (1)

b. Findings

No findings of significance were identified.

.2 Fire Drill Observation

a. Inspection Scope

The inspectors observed the fire drill conducted on January 26, 2007, to assess the readiness of the licensee's capability to fight fires. A fire was simulated in a failed section of Unit 1 Hydrogen Coolant Purification piping. The inspectors evaluated the drill for the following attributes:

- command and control of the affected control room personnel
- protective clothing/self-contained breathing apparatus properly worn
- adequacy/appropriateness of fire extinguishing methods
- controlled access to the fire area by the fire brigade members
- adequacy of fire fighting equipment
- command and control effectiveness of the fire brigade leader
- adequate communications
- effectiveness of smoke removal gear

The inspectors also evaluated the self-contained breathing apparatus (SCBA) program by reviewing training records and associated course content summaries for initial and refresher training, the SCBA maintenance program and procedures, and assessed whether SCBAs were available and properly stored.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

.1 External Flooding (Standby Shutdown Facility)

a. Inspection Scope

The inspectors performed a walkdown of the SSF to verify that external flood protection features were consistent with the licensee's design requirements and risk analysis assumptions. The following flood protection features were inspected as part of the walkdown: flood protection walls and watertight door at the South entrance of the SSF; accessible cable and piping penetrations and seals; structural integrity of the building with regard to external flooding; and the building's floor drain and sump system. The inspectors also assessed whether the licensee identified problems and appropriately entered them into the corrective action program. The inspectors reviewed the results of the licensee's inspection of all the SSF's below grade penetrations as documented in PIP O-06-0740, SSF Sewage Lift Station Vent Line is Too Low to Prevent Backflow During a Turbine Building Flood.

b. Findings

No findings of significance were identified.

.2 Internal Flooding (Auxiliary Building)

a. Inspection Scope

The inspectors performed a walkdown of the Unit 1, 2 and 3 ECCS pump rooms to verify that internal flood protection features were consistent with the licensee's design requirements, risk analysis assumptions, and Auxiliary Building Flood design study. The following flood protection features were inspected during the walkdown: accessible cable penetrations, such as conduits; accessible piping penetrations; holes or unused penetrations in the floors of and walls between rooms. The inspectors reviewed MP/1,2,3/A/1705/018, Fire Protection -Penetration -Fire and Flood Barrier - Inspection and Minor Repair, which inspects the credited flood barriers in each pump room. The inspectors also assessed whether the licensee identified problems and entered them into the corrective action program at the appropriate level.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification

a. Inspection Scope

The inspectors observed licensed operator requalification simulator training on February 20 and 21, 2007, to verify that operator performance was adequate, evaluators were identifying and documenting crew performance problems, and training was being conducted in accordance with licensee procedures. The first scenario involved entry into multiple supplements of Emergency Operating Procedure (EOP) -1. The scenario involved manually tripping the reactor after detection of a steam generator tube leak, followed by evaluation of excessive heat transfer due to a steam line rupture. The second scenario involved entry into Abnormal Procedure (AP) -20 for loss of component cooling, entry into AP-32 for loss of letdown, and use of EOP-1 after manual trip of the reactor and loss of heat transfer due to loss of feed. The inspectors observed crew performance in terms of: communications; ability to take timely and proper actions; prioritizing, interpreting, and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; and timely control board operation and manipulation, including high-risk operator actions. Additionally, the inspectors observed oversight and direction provided by the shift supervisor, including the ability to identify and implement appropriate TS actions and properly classify the simulated event.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed the licensee's effectiveness in performing routine maintenance activities. This review included an assessment of the licensee's practices pertaining to the identification, scoping, and handling of degraded equipment conditions, as well as common cause failure evaluations. For each item selected, the inspectors performed a detailed review of the problem history and surrounding circumstances, evaluated the extent of condition reviews as required, and reviewed the generic implications of the equipment and/or work practice problem. For those systems, structures, and components (SSCs) scoped in the maintenance rule per 10 CFR 50.65, the inspectors determined whether reliability and unavailability were properly monitored and that 10 CFR 50.65 (a)(1) and (a)(2) classifications were justified in light of the reviewed degraded equipment condition. Pertinent documents reviewed are listed in the Attachment to this report. The inspectors reviewed maintenance effectiveness for the following items:

- WO 01641998, Replacement of the 2A Reactor Building Spray Pump's rotating element due to a leaking mechanical seal
- PIP O-07-0964, 1A MDEFW Pump Thrust end bearing replacement

b. Findings

Introduction: A Green self-revealing NCV of TS 5.4.1 was identified for failure to adequately implement the procedure requirements for thrust end bearing installation on MDEFW Pump 1A, resulting in thrust bearing failure following extended pump operation in response to a Unit 1 reactor trip.

Description: On February 15, 2007, Unit 1 experienced a generator lockout/reactor trip due to a fault at the Jocassee switchyard. During the trip, secondary auxiliary loads were lost due to a failure of the main feeder busses to fast transfer from the unit auxiliary transformer to the startup transformer. As a result, the main feed pumps tripped (due to a loss of condensate pumps) and emergency feedwater auto-started. The MDEFW pumps continued to operate to supply water to the steam generators during post trip cooldown. After approximately 28 hours of operation, the operators noted that the MDEFW Pump 1A outboard bearing temperature read approximately 360F, which is significantly above the normal operating temperature of approximately 130F. The MDEFW pumps were secured as the LPI system was on line to provide decay heat removal cooling.

Subsequent disassembly of the outboard pump bearing revealed that the oil slinger ring, which is relied upon to provide lubrication to the bearing, was not properly installed on the shaft oil ring sleeve. It had been left resting on the bearing end cover projection. The licensee's procedure for bearing installation, MP/1/A/1300/027, Pump - Bingham - Motor Driven Emergency Feedwater - Unit 1 - Disassembly, Repair and Assembly, instructs that the oil slinger ring be placed on to the oil ring sleeve from the end cover projection just prior closing up the bearing housing during assembly. This step was not performed the last time this procedure was performed for MDEFW Pump 1A in December 2000. The resultant lack of lubrication to the thrust end bearing resulted in significant damage to the ball bearing cage and wear to the ball bearings themselves. It was unlikely that the pump could have continued to operate without further damage to the bearing and pump shaft seals.

Analysis: The inspectors determined that the licensee's failure to adequately implement their procedure for thrust end bearing installation was a performance deficiency. The finding was considered to be more than minor because it affected the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. The finding was determined to be of very low safety significance (GREEN). This was based on the Phase 1 screening criteria found in MC 609, Appendix A, Attachment 1, as the finding did not result in an actual loss of safety function since the pump operated for approximately 28 hours, which is greater than its 24 hour mission time.

Enforcement: TS 5.4.1 requires that procedures shall be established, implemented and maintained covering the applicable procedures recommended in Regulatory Guide 1.33. Regulatory Guide 1.33, Section 9.a, requires procedures for maintenance that can affect the performance of safety-related equipment. Contrary to the above, the licensee failed to adequately implement their procedure for the MDEFW Pump 1A thrust end bearing assembly. Because the finding was determined to be of very low safety significance and has been entered into the licensee's corrective action program (PIP O-07-0964),

this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000269/2007002-01, Failure to Follow the Installation Procedure for the MDEFW Pump 1A Thrust End Bearing.

1R13 Maintenance Risk Assessment and Emergent Work Evaluations

a. Inspection Scope

The inspectors evaluated the following attributes for the seven selected SSCs and activities listed below: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and (4) that maintenance risk assessments and emergent work problems were adequately identified and resolved.

- PIP O-07-0431, Unit 1, Engineered Safeguards (ES) Channel B, Reactor Building (RB) Narrow Range (NR) Pressure indication became erratic resulting in the Unit 1 ES Analog Channel B RB Pressure Test-Operate Switch being placed in the test position
- Restoration of 1 DIA vital inverter with the Unit 1 ES Analog Channel B, RB Pressure Test-Operate Switch in the test position due to erratic indications
- Yellow Operational Risk Assessment Monitor (ORAM) risk condition, Unit 3 TDEFW pump Complex/Critical Activity Plan
- WO 1724615, Leak sealing of 1B core flood tank
- Orange ORAM risk condition, SSF unavailable concurrent with 2CCW-10 control power failure (PIP 07-0584)
- Orange ORAM risk condition, Critical Activity Plan for Keowee Dual Outage (Inspection of KHU-1 & 2 Turbines) and PIP O-07-0671, Plant Operations Review Committee Meeting for Keowee Dual Outage
- Orange ORAM risk condition, Complex/Critical Activity Plan for Testing of Unit 2 LPI Valves

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed selected operability evaluations affecting risk significant systems, to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether continued system operability was warranted; (3) whether other existing degraded conditions were considered; (4) if compensatory measures were involved, whether the compensatory measures were in place, would work as intended, and were appropriately controlled; and (5) where continued operability was considered unjustified, the impact on TS limiting conditions for operation (LCOs). The inspectors reviewed the following seven operability evaluations:

- PIP O-06-8891, Air Handling Unit (AHU) 1-6, Low Pressure Service Water (LPSW) outlet pipe has a pin-hole leak
- PIP O-07-0138, SSF HVAC Service Water pump failed acceptance criteria
- PIP O-07-0271, Breaker 1X lockout (KHU-1 auxiliaries power supply)
- PIP O-07-0490, Unit 3 TDEFW pump elevated vibrations
- PIP O-07-0831 and -0836, PCB-9 failed to close
- PIP O-07-0910, Pressure test of 2LP-7 to determine seat leakage revealed that leakage was actually on 2LP-69
- PIP O-07-0412, Qualification of Teleperm XS modules used in Keowee governor

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications

a. Inspection Scope

The inspectors reviewed two modification packages related to a safety significant system to verify that the associated systems' design bases, licensing bases, and performance capability would be maintained following the modifications; and that the modifications would not leave the plant in an unsafe condition. The associated 10 CFR 50.59 screenings/evaluations were also reviewed for technical accuracy and to verify license amendments were not required. Documents reviewed are listed in the Attachment to this report. The inspectors reviewed the following modification packages:

- OD 500844, Install SSF PDW Isolation Valves
- OD 500907, Install SSF Sewage System Valve

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (PMT)

a. Inspection Scope

The inspectors reviewed PMT procedures and/or test activities, as appropriate, for selected risk significant systems to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform its safety function. The inspectors observed testing and/or reviewed the results of the following six tests listed below. Other utilized drawings and documents are listed in the Attachment to this report.

- PT/3/A/0600/012, Unit 3 Turbine Driven Emergency Feedwater Pump Test following bearing replacement
- PT/3/A/0600/013, 3A Motor Driven Emergency Feedwater Pump Test following lubrication
- PT/0/A/0620/009, Keowee Hydro Operation, Encl. 13.1, KHU-1 Operability Verification and Encl. 13.3, KHU-1 Overhead Power Path Operability Verification following activities associated with the inspection of the KHU-1 turbine
- PT/0/A/0620/009, Keowee Hydro Operation, Encl. 13.2, KHU-2 Operability Verification and Encl. 13.4, KHU-2 Overhead Power Path Operability Verification following activities associated with the inspection of the KHU-2 turbine
- WO 01673693-08, MT-25 post maintenance test following valve replacement.
- PT/2/A/0152/015, Main Steam (MS) System Valve Stoke Test (MS-93) following N_2 Modification

b. Findings

No findings of significance were identified.

1R20 Outage Activities

a. Inspection Scope

The inspectors conducted reviews and observations for selected outage activities to ensure that: (1) the licensee considered risk in developing the outage plan; (2) the licensee adhered to the outage plan to control plant configuration based on risk; (3) that mitigation strategies were in place for losses of key safety functions; and (4) the licensee adhered to operating license and TS requirements. Between February 15 - 24, 2007, the following activities related to the Unit 1 forced outage were reviewed for conformance to applicable procedures and selected activities associated with each evaluation were witnessed:

- Plant cooldown
- Mode changes from Mode 3 (hot shutdown) to Mode 4 (cold shutdown)
- Shutdown decay heat removal
- Plant heatup/mode changes
- Reactor Startup
- Power Escalation

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors witnessed surveillance tests and/or reviewed test data of the six risk-significant SSCs listed below, to assess, as appropriate, whether the SSCs met TS, Updated Final Safety Analysis Report (UFSAR), and licensee procedure requirements.

The inspectors also determined if the testing effectively demonstrated that the SSCs were ready and capable of performing their intended safety functions. In addition to the specific surveillance tests, the inspector reviewed supporting drawings and documents that are listed in the Attachment to this report.

- PT/1/A/0600/012, Unit 1 Turbine Driven Emergency Feedwater Pump Test (IST)
- PT/0/A/0600/021, SSF Diesel Generator Operation
- PT/2/A/0600/013, 2B Motor Driven Emergency Feedwater Pump Test (IST)
- PT/3/A/0150/008B, Unit 3 Reactor Building Emergency Hatch Leak Rate Test
- PT/0/A/0400/005, SSF Auxiliary Service Water Pump Test (IST)
- PT/0/A/0251/010, ASW Pump Test (IST)

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications

a. Inspection Scope

The inspectors reviewed documents and observed portions of the installation of Temporary Station Modification OD 101364A, Leak Seal Injection of the 1A SG, B Loop MS transducer. Among the documents reviewed were system design bases, the UFSAR, TS, system operability/availability evaluations, and the 10 CFR 50.59 screening. The inspectors observed, as appropriate, that the installation was consistent with the modification documents, was in accordance with the configuration control process, adequate procedures and changes were made, and post installation testing was adequate.

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation

a. Inspection Scope

The inspectors observed and evaluated a simulator/plant based emergency preparedness drill held on March 20, 2007. The drill scenario involved a steam generator tube rupture that resulted in an Alert. The scenario progressed to a site area emergency when a steam line break occurred downstream of the faulted generator. A general area emergency was declared based on dose calculations at the site boundary. The operators were observed to determine if they properly classified the event and made the appropriate notifications for both the alert and site area emergency conditions. Notification sheets were reviewed for accuracy and to verify that protective action recommendations were made in accordance with the licensee's emergency plan

procedures. The inspectors observed the post-drill critique to verify that the licensee captured any drill deficiencies or weaknesses.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

Cornerstone: Barrier Integrity

The inspectors reviewed the Reactor Coolant System Leakage PI data reported for all three units for the fourth quarter of 2006 to determine the accuracy and completeness of the submitted data against requirements in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 4. This verification was completed by reviewing: surveillance test records of measured reactor coolant system identified leakage, control room operator logs, daily status reports, and PIPs.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems

.1 Daily Screening of Corrective Action Reports

As required by Inspection Procedure (IP) 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed daily screening of items entered into the licensee's corrective action program. This review was accomplished by reviewing copies of PIPs, attending daily screening meetings, and accessing the licensee's computerized database.

.2 Focused Review

a. Inspection Scope

The inspectors performed an in-depth review of two issues entered into the licensee's corrective action program. The samples were within the mitigating systems cornerstone and involved risk significant systems. The inspectors reviewed the actions taken to determine if the licensee had adequately addressed the following attributes:

- Complete, accurate and timely identification of the problem
- Evaluation and disposition of operability and reportability issues

- Consideration of previous failures, extent of condition, generic or common cause implications
- Prioritization and resolution of the issue commensurate with safety significance
- Identification of the root cause and contributing causes of the problem
- Identification and implementation of corrective actions commensurate with the safety significance of the issue.

The following issues and corrective actions were reviewed:

- LPSW System Health
- Review of 230 kV line to ground fault causing a dual unit trip, and subsequent failure of the Unit 1, 4 kV fast transfer

b. Findings

(1) LPSW System Health

The licensee made progress on numerous projects to upgrade the LPSW system and combat system aging. Modifications have recently progressed on replacement of reactor building auxiliary cooling units, replacement of non-seismically designed piping in vital areas, and replacement of piping containing threaded connections. Except for several pinhole leaks that have occurred on the system, the licensee has assessed system piping wall thickness to be at acceptable values. Modifications to address vulnerabilities related to NRC Generic Letter 96-06 (water-hammers) are not complete. By letter dated February 14, 2007, the licensee provided information to the NRC indicating that piping modifications to reactor building auxiliary coolers have been completed, but modifications to reactor building cooling units will not be completed until fall 2009. Resolution of this issue has not been timely, considering 2009 will be nine years later than the licensee's original commitment to complete any necessary modifications.

(2) 230 kV Line Fault and 4 kV Fast Transfer Failure

On February 15, 2007, a line-to-ground fault on a 230 kV bus at the Jocassee switchyard resulted in operation of the main generator loss-of-field relays on Oconee Units 1 and 2. The Jocassee switchyard is directly connected to the switchyard at the Oconee plant through two transmission lines; but, faults on the transmission system do not normally result in tripping of generators located remote from the point of fault. A second issue concerned Unit 1 non-safety-related condensate/feedwater auxiliary equipment failing to fast transfer to an alternate source of power following the unit trip. This resulted in a loss of main feedwater pumps and actuation of EFW.

During a routine switching operation of a 230 kV circuit breaker at Jocassee switchyard, the z-phase failed to open due to a broken operating rod. As designed, a nearby no-load, motor-operated, disconnect switch received an open signal. Since current was still flowing in the z-phase, the no-load switch opened under load. This caused arcing at the switch contacts and a fault-to-ground on the z-phase. The fault was in the zone of protection of one current differential relay, which operated to trip the appropriate circuit breakers. Since one of the circuit breakers that should have tripped for this fault was

the failed circuit breaker, the breaker failure scheme should have initiated tripping of appropriate circuit breakers to de-energize the fault. However, the breaker failure scheme did not operate properly. The control logic for the differential current relay was such that a contact from the lockout relay short-circuited the operating coils of the relay to prevent damage to the coils and thyrite stack. This meant that the breaker failure scheme depended on a seal-in relay contact (in the differential current relay) to give indication to the breaker failure scheme that a trip signal had been sent to the circuit breaker. The problem was that the seal-in relay coil was in series with the breaker failure initiation relay coil, and the impedances of these two relays were not compatible for proper circuit operation. The result was that the seal-in relay de-energized; thereby, removing the trip signal indication from the breaker failure scheme. Eventually, other protective relays operated to clear the fault. The fault was not rapidly cleared, but it was sustained for a relatively long period of time.

The root cause of the broken operating rod was determined to be that the breaker had operated in excess of vendor rated capability for a number of cycles. The circuit design problems with the breaker failure scheme have subsequently been corrected at the Jocassee switchyard. NRC inspectors also learned that the same or similar problems existed at the Oconee plant switchyard, and that circuit modifications had been initiated to ensure proper operation of the breaker failure scheme.

The sequence of events recorder at the Oconee plant indicated that the loss-of-field relays for Units 1 and 2 operated and gave a generator trip signal. Since the loss-of-field relay should not normally respond to faults on the transmission system, the question arose as to whether the relay operation was spurious or legitimate. To answer this question, the licensee reviewed the relay set point calculation, checked the calibration, and compared wiring to drawings. These activities led to the discovery that the current transformer inputs to the relay were different than shown in the relay manufacturer's instruction book. Current transformers from two generator phases input to the relay; however, they were found to be reversed with respect to the connections shown in the instruction book. Further analysis confirmed that the current transformer wiring error would in fact explain why the relay operated for this "slow clearing" fault on the transmission line, and at the same time would not operate for "fast clearing" faults which occurred from time to time over the years of operation. The wiring error was corrected for the Unit 1 generator loss-of-field relay. However, since Units 2 and 3 were operating at full power by the time this problem was discovered, the licensee elected to wait for the next outage to make the correction on those units. With the wiring error, the Zone 1 loss-of-field relay would not provide any protection for an actual loss-of-field event; but, the Zone 2 relay would provide a good backup measure of protection, as it was wired correctly.

The failure of the Unit 1 non-safety-related condensate/feedwater auxiliary equipment to fast transfer was attributed to circuit breaker auxiliary contacts being out of adjustment. Control logic provides for either a fast-dead-bus-transfer or a slow transfer. The fast transfer is a sequential type transfer utilizing "early b" auxiliary contacts. Also, the transfer is supervised by a timer relay which will block the fast transfer if the generator breaker has been open for 60 milliseconds or more (this is to help ensure that the "from" and "to" sources are in synchronism at the moment the transfer is initiated). Having the breaker auxiliary contact out of adjustment meant that the circuit breaker close signal

was given later than 60 milliseconds and the fast-dead-bus-transfer had been blocked. The slow transfer occurred in 1.6 seconds as designed. Circuit breakers for the non-safety-related condensate/feedwater auxiliary equipment receive a trip signal upon loss of voltage, but circuit breakers for the safety-related equipment do not. Since the system would see a momentary loss of voltage during a slow transfer, the non-safety-related condensate/feedwater auxiliary equipment received a trip signal, but the safety-related equipment was re-energized upon completion of the transfer.

The Oconee electrical distribution system has a double bus arrangement, which means that two circuit breakers had to exhibit the out of adjustment auxiliary contact problem in order to fail the fast-dead-bus-transfer. Also, NRC inspectors learned that one of the two Unit 2 circuit breakers experienced a slow transfer. As such, the dual unit trip event revealed that at least three auxiliary contacts employed in the fast-dead-bus-transfer schemes were out of adjustment. This fact raised issues about the maintenance of the circuit breakers. The fast-dead-bus-transfer is more desirable than the slow transfer from a plant operation viewpoint because it maintains the non-safety-related condensate/feedwater auxiliary equipment in operation, making for a smoother shut down evolution.

The NRC inspector's conclusion drawn from the above described inspection activity was that the licensee had developed a valid explanation for the events of February 15, 2007, and had implemented appropriate short-term corrective actions. The need for long-term corrective actions should be addressed within the licensee's Significant Event Investigation Team report which will cover all issues except the fast transfer. PIP 07-1097 described longer term corrective actions for the fast transfer issue as follows:

- Work orders were created to replace the "early b" auxiliary contacts used in the transfer scheme of Units 2 and 3.
- Adjustment of "early b" contacts for the 7 kV fast transfer will be checked.
- An action item was created to identify and implement an appropriate periodic preventive maintenance test for the fast transfers, as well as provide guidance on proper adjustment of the "early b" contacts.

No findings of significance were identified.

4OA3 Event Followup

a. Inspection Scope

The inspectors responded to a simultaneous reactor trip of Unit 1 and 2 that occurred on February 15, 2007. The inspectors observed operator actions in the control room and observed equipment operation. The inspectors discussed the trip with operations, engineering, and licensee management personnel, as well as reviewed the licensee's trip report to assess operator actions and safety-related equipment operation. The inspectors reviewed operator actions taken in accordance with licensee procedures and reviewed unit and system indications to verify that actions and system responses were as expected. The Unit 2 trip was a normal reactor trip with all secondary equipment available for post trip decay heat removal. The Unit 1 trip was complicated by the fact that unit auxiliary equipment did not transfer to the alternate power source (i.e., startup

transformer) as expected, which resulted in loss of condensate/feedwater systems and use of the emergency feedwater system. The operators initially were able to utilize turbine bypass valves to remove decay heat, but eventually, due to rising hotwell levels and loss of condenser vacuum, had to utilize the atmospheric dump valves to cooldown the plant. The inspectors discussed the trips with the licensee's cause analysis team, independently reviewed the post trip reports, and assessed the team's actions to gather, review, and assess information leading up to and following the trips.

The Unit 1 and 2 reactor trips were determined to be a result of a breaker fault at the Jocassee Hydroelectric Station switchyard. The breaker fault disturbed grid voltage sufficiently to cause actuation of incorrectly wired generator field protection relays for each unit, locking out the generator which automatically trips the reactor. A detailed discussion of equipment issues and the associated inspection results are found in Section 4OA2.2b.(2) of this report.

b. Findings

No findings of significance were identified.

4OA5 Other Activities

Institute of Nuclear Power Operations (INPO) Plant Assessment Report Review

a. Inspection Scope

The inspectors reviewed the final report for the INPO plant assessment of Oconee Nuclear Station conducted in August 2006. The inspectors reviewed the report to ensure that issues identified were consistent with the NRC perspectives of licensee performance and to determine if any significant safety issues were identified that required further NRC follow-up.

b. Findings

No findings of significance were identified.

4OA6 Management Meetings (Including Exit Meeting)

.1 Exit Meeting Summary

The inspectors presented the inspection results to Mr. Bruce Hamilton, Site Vice President, and other members of licensee management at the conclusion of the inspection on April 10, 2007. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Annual Assessment Meeting Summary

On April 12, the NRC's Deputy Regional Administrator, Chief of Reactor Projects Branch 1, and the Resident Inspectors assigned to the Oconee Nuclear Station (ONS) met with

Duke to discuss the NRC's Reactor Oversight Process (ROP) and the NRC's annual assessment of ONS safety performance for the period of January 1, 2006 - December 31, 2006. The major topics addressed were: the NRC's assessment program and the results of the ONS assessment. The first part of the meeting, which discussed security performance, was closed to the public because it included Safeguards Information. The remainder of the meeting was open to the public. A listing of meeting attendees and information presented during the open portion of the meeting are available from the NRC's document system (ADAMS) as accession number ML071140188. ADAMS is accessible from the NRC Web site at *www.nrc.gov/reading-rm/adams.html*.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
L. Azzarello, Modification Engineering Manager
S. Batson, Superintendent of Operations
D. Baxter, Station Manager
R. Brown, Emergency Preparedness Manager
J. Burchfield, Reactor and Electrical Systems Manager
S. Capps, Mechanical/Civil Engineering Manager
N. Constance, Operations Training Manager
C. Curry, Maintenance Manager
G. Davenport, Compliance Manager
C. Eflin, Requalification Supervisor
M. Glover, Engineering Manager
T. Grant, Engineering Supervisor, Reactor & Electrical Systems
B. Hamilton, Site Vice President
D. Hubbard, Training Manager
T. King, Security Manager
L. Nicholson, Safety Assurance Manager
J. Smith, Regulatory Affairs
J. Steeley, Training Supervisor
P. Stovall, SRG Manager
J. Twiggs, Radiation Protection Manager
J. Weast, Regulatory Compliance

NRC

J. Moorman, III, Chief, Reactor Projects Branch 1
L. Olshan, Project Manager, NRR

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Opened and Closed

05000269/2007002-01	NCV	Failure to Follow the Installation Procedure for the MDEFW Pump 1A Thrust End Bearing (Section 1R12)

Closed

None

Items Discussed

None

DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

partial walkdown
Drawing OFD-121D-2.1, Unit 2 Flow Diagram of Emergency Feedwater System
Drawing OFD-121B-2.3, Unit 2 Flow Diagram of Feedwater System (Final Feedwater)
Drawing OFD-121D-3.1, Unit 3 Flow Diagram of Emergency Feedwater System
Drawing OFD-121B-3.3, Unit 3 Flow Diagram of Feedwater System (Final Feedwater)
Drawing OFD-137B-1.1, Unit 1,2,3 Flow Diagram of Instrument Air System

complete walkdown
UFSAR Section 6.1, Engineered Safeguards
UFSAR Section 6.3, Emergency Core Cooling System
OSS-0254.00-00-1028, Design Basis Specification for Low Pressure Injection and Core Flood System
Drawing OFD-102A-2.1 and 2.2, Unit 2 Flow Diagram of Low Pressure Injection System

Section 1R05: Fire Protection

fire area walkdowns
UFSAR Section 9.5.1, Fire Protection System
Design Basis Specification OSS-0254.00-00-4008, Fire Protection

Section 1R12: Maintenance Effectiveness

OSS-0254.00-00-1034, Design Basis Specification for Reactor Building Spray System
OM 1201.-1121 001, Ingersoll-Rand HPI, LPI, Reactor Building Spray and Component Cooling Pump Instruction Book
PIPs O-07-0964, O-01-1402
MP/1/A/1300/027, Pump - Bingham - Motor Driven Emergency Feedwater - Unit 1 - Disassembly, Repair and Assembly

Section 1R17: Permanent Plant Modifications

OSS-0254.00-00-1005, Design Basis Specification for the Standby Shutdown Facility Auxiliary Service Water System
OSS-0254.00-00-1008, Design Basis Specification for the Standby Shutdown Facility Diesel Support Systems
OSS-0254.00-00-1004, Design Basis Specification for the Standby Shutdown Facility Reactor Coolant Makeup System OD 500844, Install SSF PDW Isolation Valves
UFSAR Section 9.6, Standby Shutdown Facility

WO 01676942, Install SSF PDW Isolation Valves
OD 500907, Install SSF Sewage System Valve
WO 01679564, Install SSF Sewage System Valve

Section 1R19: Post-Maintenance Testing

Drawing OFD-121D-3.1, Unit 3 Flow Diagram of Emergency Feedwater System
Drawing OFD-121B-3.3, Unit 3 Flow Diagram of Feedwater System (Final Feedwater)
OP/3/A/1106/006, Emergency Feedwater System
OP/0/A/1106/019, Keowee Hydro at Oconee
OP/0/A/2000/041, Keowee Hydroelectric Station - Modes of Operation

Section 1R22: Surveillance Testing

Drawing OFD-121D-1.1, Unit 1 Flow Diagram of Emergency Feedwater System
Drawing OFD-121B-1.3, Unit 1 Flow Diagram of Feedwater System (Final Feedwater)
OP/1/A/1106/006, Emergency Feedwater System
Drawing OFD-121D-2.1, Unit 2 Flow Diagram of Emergency Feedwater System
Drawing OFD-121B-2.3, Unit 2 Flow Diagram of Feedwater System (Final Feedwater)
OP/1/A/1106/006, Emergency Feedwater System
OP/2/A/1106/006, Emergency Feedwater System
Drawing OFD-121D-1.2, Unit 1,2,3 Flow Diagram of Emergency Feedwater System (Auxiliary Service Water)
OP/0/A/1107/003, 100KV Power Supply
OP/0/A/1600/009, SSF Auxiliary Service Water System

Section 4OA2: Identification and Resolution of Problems

<u>focused review - LPSW</u>
PIP O-97-0240, GL-96-06
PIP O-97-0310, GL-96-06
PIP O-97-0311, GL-96-06
PIP O-06-4428, Pin-hole leak
LPSW System Health Report, Period 2006T3
Duke Pwr Letter to NRC dated Aug 1, 1997 re: GL 96-06
Duke Pwr Letter to NRC dated February 14, 2007 re: GL 96-06

<u>focused review - 230 kV Line Fault and 4kV Fast Transfer Failure</u>
OEE-117-27A, Sheet 1, Elementary Diagram 4160 Volt Switchgear No. B2T Start-up Breaker Unit No. 13., Rev. 9
OEE-117-27A, Sheet 2, Elementary Diagram 4160 Volt Switchgear No. B2T Start-up Breaker Unit No. 13., Rev. 14
OEE-117-25A, Elementary Diagram 4160 Volt Switchgear No. B2T Normal Breaker Unit No.11, Rev. 15
OEE-117-58, Elementary Diagram 4160 Volt Switchgear 1TD Unit 5 Cond Booster Pump Motor No. 1B, Rev. 19

OEE-117-63, Elementary Diagram 4160 Volt Switchgear 1TD Unit 10 L.P. Injection Pump Motor No. 1B, Rev. 11
General Electric Co. Instruction Book, GEK-27887H, Loss of Excitation Relay Type CEH51A
Data Sheet for performance of Calibration Procedure IP/0/A/4980/040 B, General Electric CEH51A Single Phase Relay, performed on 2/16/07 per WO# 00917076 (Unit 1)
Data Sheet for performance of Calibration Procedure IP/0/A/4980/040 B, General Electric CEH51A Single Phase Relay, performed on 2/16/07 per WO# 00917077 (Unit 2)
IP/0/A/4980/040 B, General Electric CEH51A Single Phase Relay, Rev. 2 [Reviewed to confirm that the set point of relay has not changed]

LIST OF ACRONYMS

ADAMS	-	Agency Wide Documents Access and Management System
AHU	-	Air Handling Unit
AP	-	Abnormal Procedure
ASW	-	Auxiliary Service Water
BWST	-	Borated Water Storage Tank
CCW	-	Condenser Circulating Water
CFR	-	Code of Federal Regulations
DEC	-	Duke Energy Corporation
ECCS	-	Emergency Core Cooling System
EFW	-	Emergency Feedwater
EOP	-	Emergency Operating Procedure
ES	-	Engineered Safeguards
FDW	-	Feedwater
HPI	-	High Pressure Injection
IA	-	Instrument Air
IP	-	Inspection Procedure
IR	-	Inspection Report
IST	-	Inservice Testing
KHU	-	Keowee Hydroelectric Unit
kV	-	Kilo Volt
LPI	-	Low Pressure Injection
LPSW	-	Low Pressure Service Water
MDEFW	-	Motor Driven Emergency Feedwater
MS	-	Main Steam
MT	-	Magnetic Particle
NCV	-	Non-Cited Violation
NR	-	Narrow Range
NRC	-	Nuclear Regulatory Commission
NRR	-	Nuclear Reactor Regulation
ONS	-	Oconee Nuclear Station
OOS	-	Out-of-Service
ORAM	-	Operational Risk Assessment Monitor
PARS	-	Publicly Available Records
PI	-	Performance Indicator

PIP	-	Problem Investigation Process report
PMT	-	Post-Maintenance Testing
PT	-	Performance Test
RII	-	Region II
RB	-	Reactor Building
RP	-	Radiation Protection
RTP	-	Rated Thermal Power
SCBA	-	Self-Contained Breathing Apparatus
SDP	-	Significance Determination Process
SSC	-	Structure, System and Component
SSF	-	Standby Shutdown Facility
TDEFW	-	Turbine Driven Emergency Feedwater
TS	-	Technical Specification
UFSAR	-	Updated Final Safety Analysis Report
URI	-	Unresolved Item
WO	-	Work Order