UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos: 50-269/89-11, 50-270/89-11, 50-287/89-11

Licensee: Duke Power Company
422 South Church Street
Charlotte, N.C. 28242

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

Facility Name: Oconee Nuclear Station

Inspection Conducted: March 18 - April 14, 1989

Inspectors: P. H. Skinner, Senior Resident Inspector — Date Signed 4/20/89

L. D. Wert, Resident Inspector — Date Signed 4/20/89

Approved by: M. B. Shymlock, Section Chief, Division of Reactor Projects — Date Signed 4/20/89

SUMMARY

Scope: This routine, announced inspection involved resident inspection on-site in the areas of operations, surveillance testing, maintenance activities, safeguards and radiation protection, and inspection of open items.

Results: During this period the inspectors noted a significant increase in the level of overall cleanliness throughout the plant. Housekeeping efforts appeared particularly vigorous and improved cleanliness conditions in many locations noted previously as needing more attention.

Several minor weaknesses were noted during observation of functional testing of the Safe Shutdown Facility Diesel Generator, paragraph 2.c.

A Licensee Identified Violation concerning inoperability of the Emergency Condenser Circulating Water system due to a mispositioned valve is documented in paragraph 2.d.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

M. Tuckman, Station Manager
C. Boyd, Site Design Engineer Representative
J. Brackett, Senior QA Manager
*J. Davis, Technical Services Superintendent
*D. Detherage, Operations Support Manager
*W. Foster, Maintenance Superintendent
T. Glenn, Instrument and Electrical Support Engineer
*D. Havice, Instrument & Electrical Engineer
C. Harlin, Compliance Engineer
D. Hubbard, Performance Engineer
*E. Legette, Assistant Engineer Compliance
H. Lowery, Chairman, Oconee Safety Review Group
J. McIntosh, Administrative Services Superintendent
G. Rothenberger, Integrated Scheduling Superintendent
R. Sweigart, Operations Superintendent

Other licensee employees contacted included technicians, operators, mechanics, security force members, and staff engineers.

NRC Resident Inspectors:

*P.H. Skinner
*L.D. Wert

*Attended exit interview.

2. Plant Operations (71707)

a. The inspectors reviewed plant operations throughout the reporting period to verify conformance with regulatory requirements, technical specifications (TS), and administrative controls. Control room logs, shift turnover records, and equipment removal and restoration records were reviewed routinely. Discussions were conducted with plant operations, maintenance, chemistry, health physics, instrument & electrical (I&E), and performance personnel.

Activities within the control rooms were monitored on an almost daily basis. Inspections were conducted on day and on night shifts, during weekdays and on weekends. During one such backshift inspection an approach to criticality was observed. Some

inspections were made during shift change in order to evaluate shift turnover performance. Actions observed were conducted as required by the Licensees Administrative Procedures. The complement of licensed personnel on each shift inspected met or exceeded the requirements of TS. Operators were responsive to plant annunciator alarms and were cognizant of plant conditions.

Plant tours were taken throughout the reporting period on a routine basis. The areas toured included the following:

Turbine Building
Auxiliary Building
Units 1, 2 and 3 Electrical Equipment Rooms
Units 1, 2 and 3 Cable Spreading Rooms
Units 1, 2 and 3 Penetration Rooms
Station Yard Zone within the Protected Area
Standby Shutdown Facility
Units 1/2 Spent Fuel Pool Room
Keowee Hydro Station

During the plant tours, ongoing activities, housekeeping, security, equipment status, and radiation control practices were observed.

Unit 1 - Operated at 100 percent power for this entire reporting period.

Unit 2 - Began this report period at 100 percent power and remained at that power level until April 3, 1989 when a reactor trip occurred. The trip was caused by a loss of main feedwater pumps due to a loss of condensate booster pumps (paragraph 2.b.). The unit was returned to full power operation on April 4. Unit 2 was taken off line on April 6 to repair a ground in the generator exciter field. After repairs were completed the unit was returned to 100 percent full power on April 9 and operated at that level for the remainder of the reporting period.

Unit 3 - Operated at 100 percent power for this entire reporting period.

b. Unit 2 Reactor Trip

At approximately 10:05 a.m. on April 3, 1989, Oconee Unit 2 tripped from 100% power. The trip was caused by the loss of both main feedwater pumps which had resulted from a loss of the condensate booster pumps. The condensate booster pumps had tripped due to an erroneous low suction pressure signal. This signal was caused by a piece of threaded rod (2 inch diameter and about 3 inches long)

falling about twenty feet (through a hole in the floor above) and striking the condensate booster pump suction pressure transmitter. Markings on the transmitter and the nearby concrete floor fully support this explanation. The licensee's investigation into what caused the piece to fall through the hole has not disclosed any additional details.

At the time the trip occurred, the licensee was conducting an emergency drill which simulated a casualty on Unit 1. The drill was immediately secured. The unit was quickly stabilized on emergency feedwater (EFW) and all major systems performed as expected. The main steam relief valves all fully reseated without operator action. In initial reports it was speculated that a noise which had been heard in the control room after the trip had been caused by water hammer in a secondary system. The licensee has walked down all concerned piping and found no indications that a water hammer occurred. It is believed that the noise (rumble) was caused by relatively cold (150-160 degrees F) EFW flowing into the Main Feedwater lines. The licensee is also investigating why several small electric loads apparently were slow to shift power or momentarily lost power during the shift to the auxiliary power source. These loads did not effect the recovery and further analysis may require refueling outage conditions.

The inspector was in the control room during the trip and observed the recovery actions. The condensate booster pump pressure transmitter was recalibrated and the unit was returned to power operation on the evening of April 3. The inspectors will continue to follow the licensees actions regarding prevention of future occurrences. Consideration is being given to construction of shielding around such potential reactor trip hazards and providing labels which identify such hazards.

c. Safe Shutdown Facility (SSF) Diesel Generator Testing

The inspector observed a post maintenance functional test of the SSF diesel generator. Just prior to witnessing the test, the inspector walked down the diesel fuel oil system to obtain information for TI 2515/100: Emergency Diesel Generator Fuel Oil Issues. The inspector questioned the operators preparing to run the diesel generator about the alignment of the valves controlling fuel oil flow to the duplex fuel strainers. On both diesel engines, the fuel oil strainer inlet/outlet combination valve was in the middle position (labeled as 'off') rather than positioned to admit flow to one strainer or the other as required by OP/0/A/1600/03: SSF Fuel Oil Lineup For Normal Operation. The operators recognized that this alignment was improper and indicated that their understanding was that this position secured fuel oil flow to the diesel. Subsequent review of drawings of the valve internals and discussions with the

vendor by the licensee indicate that in the mid position flow is admitted to both the strainers simultaneously. The diesel was run unloaded with the valves in the mid position. It is not clear whether this valve is intended to be placed in the mid position for normal diesel operation or simply constructed this way to allow shifting of strainers while the diesel is running. Subsequently the licensee obtained information which indicated that sufficient fuel flow would be available to support full load operation with the valve in the mid position.

Several other discrepancies were noted by the inspectors;

- While the fuel oil strainer valves (SSF-FO-74 and 75) were labeled for the 'A' diesel engine, the strainer valves on the 'B' engine (SSF-FO-85 and 86) were not labeled. The inspector found the labels for FO-85 and FO-86 on the engine 'B' differential pressure instrument root valves for the fuel oil filter.

- OP/0/A/1600/03 (Enclosure 3.1) had been changed in December 1988 requiring the fuel filter inlet switch to be positioned to 'both' to place both filters in service. On December 16, 1988, the Encl. 3.1 lineup was completed and apparently the above labeling problem and a lack of knowledge regarding fuel oil strainers and fuel oil filters caused the strainer valve to be improperly positioned. The terms 'filters' and 'strainers' apparently are used interchangeably in the procedures and on labels, leading to some confusion.

- The Alarm Response Procedures for the diesel generator annunciator panel state that on a high fuel oil filter differential pressure the operator will shift to the nonoperating fuel oil filter. Since both filters are required to be in service, this procedure is no longer valid. The actions promulgated in the Alarm Response Procedures are critical to sustaining diesel generator operation if abnormalities occur.

The licensee took prompt action to correct the labeling discrepancies and is also reviewing the alarm response procedures to ensure they are current and correct. The inspectors questioned the decision to run the diesel with both fuel oil filters simultaneously online. Although a filter differential pressure indication is available and spare filters are on site, this configuration allows the possibility of both filters becoming blocked and could result in a loss of the diesel. The licensee is reviewing this decision. All indications are that the diesel was not rendered inoperable by the improper lineup of the strainers. No violation or deviation was

noted. IFI 269,270,287/89-11-01: SSF Diesel Generator Fuel Oil System Issues, will be utilized to follow the licensees actions.

d. Emergency Condenser Cooling Water (ECCW) Steam Air Ejector Inoperability

The Condenser Circulating Water (CCW) System for the three Oconee units is supplied water from Lake Keowee through an intake structure with 12 CCW pumps whose suctions extend below the maximum draindown level of the lake. The CCW system also supplies water to the Low Pressure Service Water (LPSW) system which provides various safety related cooling functions. The CCW system discharge is normally returned to Lake Keowee. The CCW system is designed such that on a loss of power situation (loss of CCW pumps), gravity flow and a siphon effect will cause continued flow through the piping. A siphon is initiated at system startup by vacuum pumps and maintained by continuous vacuum priming pumps during operation. In the event of a loss of all power, an emergency discharge path (a 48 inch discharge line to the Keowee Dam tailrace) will automatically open and flow will continue through the CCW system, providing condenser flow for decay heat removal and LPSW supply for cooling requirements. During such operation the vacuum to sustain siphon flow from the intake structure is maintained by steam air ejectors.

On February 22, 1989, during a periodic test the licensee discovered that 1MS-45, the main steam supply valve to the emergency steam air ejector was closed. Technical Specification 3.4.5a requires that whenever the reactor is above 250 degrees F, the ECCW system shall be operable. LER 269/89-05 states that the steam supplied air ejector must function to remove noncondensible gases to ensure the siphon will function. The primary reason that the valve was incorrectly shut was that the Unit 1 CCW system valve checklist did not include this valve. Consequently, during CCW system startup after an outage in which valve 1MS-45 was replaced, the valve was not opened. During unit startup the control room operators were required only to verify that the valve checklist had been completed and that the main steam system was in service.

Immediately upon being discovered shut, 1MS-45 was opened. The valve has subsequently been added to OP/1/A/1104/12 (Enclosure 4.19): Valve Checklist for CCW System. Additionally the CCW system startup procedures; OP/1,2,3/A/1104/12 (Encl. 4.1) were revised to provide clear directions on verification of steam to the emergency air ejectors. Statements in the FSAR and LER 269/89-05 indicate that the continuous vacuum priming system or its backup, the steam emergency air ejector must function correctly to maintain siphon and gravity flow of CCW through the condensers. Each refueling outage the ECCW system flow is tested for 4 hours, during which neither the continuous vacuum primary system nor the air ejector is

utilized. During these tests, the siphon flow from the intake to the LPSW supply has been maintained successfully.

In addition to steam relief through the turbine bypass valves to the condenser there are other ways to remove decay heat from the steam generators after a loss of power. Steam relief via the Main Steam Relief Valves or the atmospheric dump valves could provide decay heat removal following a station blackout without the use of the ECCW system. Additionally, during a station blackout situation the Safe Shutdown Facility could be used. The licensees Design Engineering group is analyzing this situation in order to resolve if steam air ejector operation is required to ensure ECCW operability. A factor that must be considered is that although the periodic test verifies ECCW flow for 4 hours without the ejector, the test is done under cold plant conditions. If the ECCW system was removing decay heat by condensing steam it would be heated up possibly releasing entrained gases and affecting siphon flow.

Since available information indicates the air ejector is required for ECCW operability, 1MS-45 being shut violated TS 3.4.5a. This violation meets the criteria specified in Section V of the NRC Enforcement Policy for not issuing a Notice of Violation and is not cited. This is documented as Licensee Identified Violation 50-269/89-11-02: ECCW Steam Air Ejector Inoperability. Based on the actions completed by the licensee, this item is closed.

One Licensee Identified Violation was identified.

3. Surveillance Testing (61726)

Surveillance tests were reviewed by the inspectors to verify procedural and performance adequacy. The completed tests reviewed were examined for necessary test prerequisites, instructions, acceptance criteria, technical content, authorization to begin work, data collection, independent verification where required, handling of deficiencies noted, and review of completed work. The tests witnessed, in whole or in part, were inspected to determine that approved procedures were available, test equipment was calibrated, prerequisites were met, tests were conducted according to procedure, test results were acceptable and systems restoration was completed.

Surveillances reviewed and witnessed in whole or in part:

PT/1/A/600/13	Motor Driven Emergency Feedwater Pump Performance Test
PT/0/A/0250/25	Annual Fire Protection Performance Test
PT/0/A/0150/22K	Emergency Condenser Circulating Water Valves Quarterly Function Test
OPO/A/1600/10	Operation Of The Safe Shutdown Facility (SSF) Diesel Generator (Normal Start)

While no deviations or violations were identified, several weaknesses were noted during observation of the SSF diesel generator testing, see paragraph 2.c.

4. Maintenance Activities (62703)

Maintenance activities were observed and/or reviewed during the reporting period to verify that work was performed by qualified personnel and that approved procedures in use adequately described work that was not within the skill of the trade. Activities, procedures and work requests were examined to verify proper authorization to begin work, provisions for fire, cleanliness, and exposure control, proper return of equipment to service, and that limiting conditions for operation were met.

Maintenance reviewed and witnessed in whole or in part:

WR 55486 B Perform Electrical PM's on 2LP21 and 2LP5
WR 050610 Repairs to 2A Low Pressure Injection Pump Circuitry

No violations or deviations were identified

5. Safeguards and Radiological Controls Activities (71707)

In the course of the monthly activities, the Resident Inspectors included review of portions of the licensee's physical security activities. The performance of various shifts of the security force was observed in the conduct of daily activities which included; protected and vital areas access controls, searching of personnel, packages and vehicles, badge issuance and retrieval, escorting of visitors, patrols and compensatory posts. The inspectors observed protected area lighting and protected and vital areas barrier integrity, and verified interfaces between the security organization and operations or maintenance.

No violations or deviations were identified.

6. Inspection of Open Items (92700)

Two of the following open items are being closed based on review of licensee reports, inspection, record review, and discussions with licensee personnel, as appropriate:

a. (Open) LER 287/88-03: Potential Degraded Performance of Reactor Building Cooling Units (RBCUs) Due to Service Induced Fouling. The inspectors continued to follow the licensees ongoing actions to resolve this matter. Inspection Report 269,270,287/89-05 discussed the formation of a RBCU task force, the latest testing results and progress made on resolution of this issue. On April 7, 1989, the licensee completed testing of the '2A' and '2C' RBCUs. Results indicated that the coolers had not fouled at all since their January

16, 1989 test. On April 10, 1989, testing was completed on the Unit 3 'A' and 'C' RBCUs which indicated that the coolers had lost only 2% combined capacity due to fouling since their March 22, 1989 test. While the Unit 3 coolers are still fouling and their combined capacity (about 113 percent) is lower than the Unit 1 and Unit 2 coolers (about 140 percent), it appears that the fouling rate has slowed and the cleaning efforts are achieving capacities which are closer to the other units capacities than prior efforts. After cleaning in February the test indicated a 133 percent capacity, the highest post cleaning capacity to date. The latest testing trends along with notably lower Unit 3 reactor building temperatures have enabled the licensee to begin formulating an explanation for the Unit 3 RBCU fouling. Although the explanation is still not fully conclusive, it appears that a primary system leak in 1985 may have deposited significant amounts of boron throughout the ductwork and cooler surfaces of the RBCUs. The repeated and improved cleaning efforts are gradually removing the boron deposits from these surfaces, resulting in better thermal performance after each successive cleaning and a reduced fouling rate. At this time indications are that air side fouling is the principal contributor to the reduction of cooler performance. The inspectors will continue to follow the licensees actions on this matter.

b. (Closed) LER 269/88-12: Incorrect Routing of SSF Incore Thermocouple Cables Due to a Design Deficiency. This LER was submitted on a voluntary basis on March 21, 1989. The actions described in this report have been reviewed by the inspector and based on this review, this item is closed.

c. (Closed) LER 269/87-11, Revision 1: Cable Room Sprinkler Systems Inoperable Due To Design Deficiency of Pressure And Flow Rates. The original LER was initially submitted in correspondence dated January 4, 1988 and was revised by Revision 1 dated April 19, 1988. The original LER identified a design deficiency associated with a portion of the fire protection system associated with Unit 3 cable room. The revision identified an additional problem with the inoperability of the Keowee Hydro Station Main Lube Oil Storage Room water spray system. The corrective actions for these problems were reviewed by the inspectors. Modifications have been completed for both sprinkler systems. Based on this action, this item is closed.

7. Exit Interview (30703)

The inspection scope and findings were summarized on April 14, 1988, with those persons indicated in paragraph 1 above. The following items were discussed in detail:

Item Number	Status	Description/Reference Paragraph
LER 287/88-03	Open	Potential Degraded Performance of RBCUs Due to Service Induced Fouling
LER 269/88-12	Closed	Incorrect Routing of SSF Incore Thermocouple Cables Due to a Design Deficiency
LER 269/87-11(Rev.1)	Closed	Cable Room Sprinkler Systems Inoperable Due to Design Deficiency of Pressure and Flow Rates
IFI 269,270,287/89-11-01	Open	SSF Diesel Generator Fuel Oil System Issues
LIV 269,270,287/89-11-02	Closed	ECCW Steam Air Ejector Inoperability

The licensee representatives present offered no dissenting comments, nor did they identify as proprietary any of the information reviewed by the inspectors during the course of their inspection.