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

Report Nos.: 50-269/92-11, 50-270/92-11 and 50-287/92-11

Licensee: Duke Power Company
P. O. Box 1007
Charlotte, NC 28201-1007

Docket Nos.: 50-269, 50-270, 50-287, 72-4

License Nos.: DPR-38, DPR-47, DPR-55, SNM-2503

Facility Name: Oconee Nuclear Station

Inspection Conducted: April 26 - May 23, 1992

Inspector: ______________________ 6-11-92
P. E. Harmon, Senior Resident Inspector — Date Signed

______________________ 6-11-92
B. B. Desai, Resident Inspector — Date Signed

______________________ 6-11-92
W. K. Poertner, Resident Inspector — Date Signed

Approved by: ______________________ 6/11/92
G. A. Belisle, Section Chief — Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine, resident inspection was conducted in the areas of operations, surveillance testing, maintenance activities and followup on previous inspection findings.

Results: One violation involving the failure to use the proper Reactivity Balance Procedure/Curves was identified (paragraph 2.d).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*H. Barron, Station Manager
*S. Benesole, Safety Review
*D. Coyle, Systems Engineering
J. Davis, Safety Assurance Manager
D. Deatherage, Operations Support Manager
B. Dolan, Manager, Mechanical/Nuclear Engineering (Design)
W. Foster, Superintendent, Mechanical Maintenance
*J. Hampton, Vice President, Oconee Site
*O. Kohler, Regulatory Compliance
C. Little, Superintendent, Instrument and Electrical (I&E)
*M. Patrick, Performance Engineer
B. Peele, Engineering Manager
*S. Perry, Regulatory Compliance
*G. Rothenberger, Work Control Superintendent
*P. Stovall, Superintendent, Operator Training
*R. Sweigart, Operations Superintendent

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

NRC Resident Inspectors:

*P. Harmon
*W. Poertner
B. Desai

* Attended exit interview.

2. Plant Operations (71707)

a. General

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, temporary modification log 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. Some inspections were made during shift change in order to evaluate shift turnover performance. Actions observed were conducted as required by the licensee's 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
CCW Intake Structure
Independent Spent Fuel Storage Facility
Units 1, 2 and 3 Electrical Equipment Rooms
Units 1, 2 and 3 Cable Spreading Rooms
Units 1, 2 and 3 Penetration Rooms
Units 1, 2 and 3 Spent Fuel Pool Rooms
Unit 2 Containment
Station Yard Zone within the Protected Area
Standby Shutdown Facility
Keowee Hydro Station

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

Within the areas reviewed, licensee activities were satisfactory.

b. Plant Status

<u>Unit 1</u>

Unit 1 operated at full power until May 7 when a reactor trip occurred from 100 percent power. A loose pin connection in the exciter circuit caused a generator lockout which caused an anticipatory turbine to reactor trip. The unit was taken critical later that evening. At 3:42 a.m., on May 8, the unit tripped from 14 percent due to anticipatory Loss of Feedwater Pump reactor trip. A leak in the feedwater pump suction instrument line was found after the trip. The unit was cooled down to the low pressure injection (LPI) switchover mode to isolate and repair the leak. The unit was returned to power on May 11. On May 22 the unit was shut down due to leakage associated with reactor coolant pump (RCP) number 1 and 2 seals. The unit was cooled down and remained shutdown for the remainder of the report period. The seal repair outage is expected to last 11 days.

Unit 2

Unit 2 operated at full power until May 15 when it was shut down due to temperature on Main Transformer Y-Phase connection exceeding 360 degrees F. Following repairs, the unit was taken critical and returned to power operations on May 17. On May 21, a 2A1 RCP oil pot level low alarm was received. Power was reduced to 30 percent and upon entry in the reactor building, the licensee discovered that the lower oil pot vent line was broken. Fixing the line would have required a unit shutdown. However, a decision was made to delay the shutdown due to power demand. Power was increased back up to 70 percent and the unit operated with three RCPs. The unit was shut down on May 22 and following repairs to the vent line the unit was brought back up on May 23. The unit operated at power for the remainder of the report period.

Unit 3

Unit 3 operated at full power until April 30 when the 3A1 RCP upper oil pot level low alarm came in. Power was reduced and approximately 15 gallons of oil was added. On May 6 power was reduced again to secure the 3D1 Heater Drain Pump (HDP) and isolate the 3D1 HDP recirculation line. The unit operated at full power for the remainder of the report period.

c. Unit 1 Reactor Trips

On May 7, 1992, at approximately 1:55 p.m., Unit 1 experienced an automatic reactor trip from 100 percent power due to turbine trip on Main Generator Lockout. The Main Generator Lockout was apparently caused when a loose pin connection caused a relay to actuate spuriously, resulting in indication that the Generator Field Breaker was open. All systems performed normally following the trip.

At the time of the reactor trip, there were some housekeeping (sanding/painting) activities in progress in the vicinity of the Generator and it was initially speculated that the Generator Lockout was related to the ongoing work. However, the licensee later concluded that this did not contribute to the trip.

The licensee performed an investigation and found a loose pin connection on pin 6 of the EHC (EHC-6) terminal which is mounted inside the generator exciter housing cabinet. The licensee concluded that vibration caused the generator protective circuitry to be interrupted causing the 41MXa relay to actuate when the pin connection became loose. Relay 41MXa falsely sensed that the Main Generator field breaker was open and caused the Main Generator to lockout causing turbine trip and an anticipatory reactor trip.

The licensee implemented an exempt change which installed a hard wire bypassing the pin connection prior to startup. Similar trips on Unit 1 had occurred in October 1991 and December 1984. These two trips were attributed to EHC-6 coming loose at the connector and not the terminal, though both have the same control logic flowpath. The exciter housing in both instances had recently been removed for maintenance during refueling outages. This required manipulating the connectors. Following the trip in October 1991, the licensee inspected and tightened all loose terminal plug connections and connectors. However, the licensee apparently did not suspect the pin connection within the terminal plug to be loose. As a permanent solution to this problem, the licensee was evaluating the failure logic of relay 41MXa to determine if alternative logic schemes are needed.

The unit was taken critical at 1:42 a.m. on May 8. At approximately 3:42 a.m., the unit experienced another reactor trip from 14 percent power. Just prior to the trip, the operators had received a High Hotwell Level alarm and the hotwell level was found to be fluctuating between 72 inches and 79 inches. The normal level is between 63 inches and 69 inches. There was no guidance available to the operators with regard to responding to the alarm and the perceived abnormality. The operators were concerned about losing condenser vacuum if the Condensate Steam Jet Air Ejector suction lines were to flood from the Condenser due to High Hotwell Level.

Based on this concern, the operators decided to use condensate recirculation and move some water from the hotwell to the Upper Storage Tank (UST). Operations personnel considered the evolution to be within "skill-of-the-craft", and did not feel that a written procedure was required.

After verifying that condensate recirculation control valve 1C-128 was closed, operators began opening block valve 1C-124. Opening of valve 1C-124 initially acts to fill a partially vacated Condensate Recirculation pipe. The volume between 1C-124 and 1C-128 is large.

It is believed that a significant volume of the Condensate Recirculation pipe had been emptied by evaporation of the water to the UST via leakage through 1C-128. Upon opening 1C-124, a feedwater swing developed and low suction pressure at the Condensate Booster Pump and a low discharge pressure at 1B Main Feedwater Pump (FWP) condition was created. The FWP/anticipatory reactor trip RPS setpoint of 802 psig was reached on the 1B FWP discharge. This caused the reactor to trip. Trip response was normal with control systems functioning as required to bring the unit to Hot Shutdown.

The licensee concluded that the oscillations were caused during the power increase from 0 to 15 percent. During this period, the steam generator level is held constant, and the steam bypass system dumps steam to the hotwell as reactor power is raised to approximately 15 percent. The impingement of steam from the bypass system onto the hotwell water level causes turbulence and false level increases at the level detectors. This was verified during the startup on May 11. The inspectors determined later that some operators were aware of this phenomenon. The operating crew on shift at the time of the trip did not realize that false level indications were routine during steam bypass system operations. The inspectors discussed this event with the licensee and the licensee agreed to review this event to determine if additional training is required. In addition, the licensee revised the alarm response procedure for Emergency High Hotwell level to reference a new enclosure to the Condensate and Feedwater procedure, OP/1,2,3/A/1106/02. This new enclosure provides guidance on how to reduce Hotwell level.

The licensee made the appropriate notifications to the NRC. In addition, Licensee Event Reports (LERs) describing these events will be issued by the licensee. The inspectors will follow the licensee's long term resolution of the circumstances that caused these two reactor trips through the LERs.

d. Reactivity Management Problems During Unit 1 Startup

On May 12, during a review of completed procedures, the licensee identified that during the Unit 1 startup on May 11, the Estimated Critical Boron Concentration (ECB), Estimated Critical Rod Configuration (ECP), and the Subcritical Multiplication (1/M) measurements were performed by the Unit 1 Supervisor (SRO) using the Unit 2 Reactivity Balance Calculation Procedure/Curves. A second, redundant calculation performed by the Shift Manager (STA) also used the wrong procedure/curves. Unit 1 was started up and taken critical using data derived from Unit 2 procedures/curves. The differences in the core characteristics between Unit 1 and 2 were insignificant.

To account for changes in Xenon concentration, RCS temperature, and boron concentration, the ECB as well as the ECP are deemed valid only if performed within one hour of criticality. Initial intent was to go critical at 1:00 p.m. The Reactivity Balance Calculation Procedures for Unit 1 and Unit 2, PT/1 or 2/A/1103/15, are located on the common bookshelf of the Unit 1 and 2 Control Room. The Unit 1 Supervisor inadvertently pulled the Unit 2 procedure/curves and performed the ECB and ECP calculations. The STA then used the same procedures to independently verify the calculations. Startup was postponed several times and consequently the ECB and ECP had to be performed three times. Each time the Unit 2 procedure/curves were used. Independent verification by another licensed SRO was also performed using Unit 2 procedure/curves. ECP based on the Unit 2 Reactivity Balance Procedure was determined to be 65 percent on Rod Group 6.

Unit 1 was taken critical at 3:17 p.m., on Rod Group 6 at 89 percent. This was within the acceptable band of plus/minus 1 percent delta k/k of the total inserted rod worth. The 1/M calculations used to predict premature criticality were also based on Unit 2 procedures. At that time there was no reason to doubt the ECP. The next morning at approximately 6:00 a.m., the Unit 1 Supervisor for the night shift identified the error during his review of completed procedures. Appropriate personnel were notified and available shutdown margin was verified to be within acceptable limits. Additionally, the ECP was recalculated using the appropriate unit procedure and was determined to be 57 percent on Rod Group 6. The critical data was within the acceptable band based on the revised calculations. Consequently, the error made in calculating the ECP did not significantly affect startup.

The consequences of this event were insignificant due to the similarity in the Unit 1 and Unit 2 cores. However, this event illustrates continued problems in the area of attention to detail and the failure of the independent verification process to prevent such occurrences. Further attention is warranted in the area of reactivity management. As an interim corrective action, the licensee color coded the unit specific Reactivity Balance Procedures. The licensee has also initiated an upper tier Problem Investigation. Failure to use the proper Reactivity Balance Procedure/Curves is identified as violation 50-269/92-11-01. The inspectors will continue to monitor the licensee's performance in the area of reactivity management.

e. Operator Logs

The inspectors reviewed the operators' logs associated with the reactor trips and noted that only three entries consisting of a total of five lines were entered. The inspectors have discussed the lack of detail in operator logs in general terms with station management on other occasions. The information being logged is not consistent with the management guidance provided in this area. Operations management had agreed to address this issue, but instances of inadequate logging persist. The inspector will continue to monitor licensee actions pertaining to this concern.

Within this area, one 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.

Surveillance reviewed and witnessed in whole or in part:

PT/0/A/251/13 Component Cooling Check Valve Functional Test.

PT/0/A/600/01 Periodic Instrument Surveillance

No violations or deviations were identified.

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 92015377 Repair 2B LPI Pump Vent Line Leak.

The inspectors observed portions of the work activities associated with WR 92015377 to repair minor leaks on the 2B low pressure injection pump casing vent line connection and the pump suction line connection. The work activity involved disconnecting the lines and cleaning the connections then reassembling the lines. The inspectors observed that work activities did not commence on the pump until at least five hours after the pump had been isolated by operations for maintenance even though the removal of the 2B LPI pump placed the unit in a twenty four hour limiting condition for operation.

The post maintenance test for this activity consisted of filling and venting the pump and performing a visual inspection of the pipe connections. The pressure head of the borated water storage tank, approximately 20 psig, supplied the pressure source. However, the pump casing vent would experience a pressure approaching the pump discharge pressure, approximately 170 psig. The inspectors questioned the adequacy of the post maintenance test and were told by the operations staff that the test performed was adequate and that running the pump was not required.

The work activities associated with the LPI pump (WR 92015377) are considered to be an example of poor scheduling. The operations group's acceptance of the post maintenance testing of the LPI pump is considered to be an example of poor post maintenance testing.

No violations or deviations were identified.

5. Inspection of Open Items (92700)(92701)(92702)

The following open item was reviewed using licensee reports, inspection, record review, and discussions with licensee personnel, as appropriate:

(Open) Vio 50-287/91-35-01, Example b

This violation involved the inadvertent dilution of the Concentrated Boric Acid Storage Tank (CBAST) on Unit 3. The violation specified that procedures were not followed in that a valve had been mispositioned which caused an unmonitored dilution of the CBAST. The event occurred December 17, 1991. The licensee's investigation and assessment of the event were completed during this inspection period. The investigation and report was performed by the site Safety Review Organization. The report was comprehensive and accurate regarding the root cause and contributing causes of this event. Several poor work practices were identified along with recommendations for correction.

The report as written contains elements of an effective investigation and corrective action program. The resident staff will review licensee management's response to the report for inclusion in the closure of the violation.

6. Low Pressure Service Water Pump Deadheading Issues

NRC Inspection Report Nos. 50-269, 270, 287/92-09 described a February 9, 1992, event involving an instance of a deadheaded Low Pressure Service Water (LPSW) pump. The pump is shared between Unit 1 and Unit 2. With Unit 1 shut down at the time, decreased cooling demands and maintenance activities required the isolation of LPSW to several components. As a result, total system flow decreased to the point where the two running pumps interacted with each other and the weaker pump experienced deadheading or intermittent zero flow. Operators realized a pump was deadheading based on the intermittent surging sounds of the LPSW piping directly above the control room. This was confirmed by the B LPSW pump discharge pressure and pump current instruments in the control room. After checking the pumps locally and verifying that the B LPSW pump's discharge check valve was closed, the operators stopped the B pump and the surging noise stopped.

Following this incident, the inspectors questioned if the LPSW pump had been damaged. The licensee performed ASME Section XI testing on the pump and concluded that it was operable. The inspectors expressed concern to the licensee that the ASME Section XI testing did not appear adequate to identify damage that could be caused by deadheading. The licensee, based on information from the pump vendor, reiterated that the testing performed was acceptable and that additional testing was not required.

Because of the LPSW incident described, the inspectors questioned the licensee's response to NRC Bulletin 88-04, Safety-Related Pump Loss. The licensee stated that the response, dated January 15, 1990, was adequate. That response stated that the LPSW system design does not preclude pump interaction that could lead to deadheading, but the system configuration would be maintained with adequate flow paths and total system flows above the minimum required for deadheading. The Bulletin also requires that if the system design does not preclude the possibility of pump-to-pump interaction that could result in deadheading, the system must be evaluated for flow division including actual line and component resistances for the as-built configuration. The evaluation should include development of head versus flow characteristic curves of the installed pumps, and actual test data for the "strong" versus "weak" pump flows. This evaluation was not performed, and a basis for minimum flow requirements has not been established. The licensee has not determined the minimum flow above which they stipulated the system would be operated.

The licensee's response to Bulletin 88-04 will be discussed with the NRC Office of Nuclear Reactor Regulation.

7. Exit Interview (30703)

The inspection scope and findings were summarized on May 28, 1992, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

<u>Item Number</u>	<u>Description/Reference Paragraph</u>
Vio 50-269-92-11-01	Unit 2 ECP Procedures Used to Start Up Unit 1 (paragraph 2.d).