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

Report Nos.: 50-269/93-13, 50-270/93-13 and 50-287/93-13

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242-0001

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: March 28 - May 1, 1993

Inspectors: R Lesser for — 5/20/93
P. E. Harmon, Senior Resident Inspector — Date Signed

R Lesser for — 5/20/93
B. B. Desai, Resident Inspector — Date Signed

R Lesser for — 5/20/93
W. K. Poertner, Resident Inspector — Date Signed

Approved by: R Lesser — 5/20/93
M. S. Lesser, Chief — Date Signed
Projects Section 3A
Division of Reactor Projects

SUMMARY

Scope: This routine, resident inspection was conducted in the areas of plant operations, surveillance testing, maintenance activities, Keowee issues, and emergency condenser circulating water system.

Results: A strength was identified in the reduction of the backlog of work requests older than 90 days. (Paragraph 4.b)

A weakness was identified in the licensee's Design Basis Documentation of the Condenser Circulating Water (CCW) System. (Paragraph 6)

Three instances occurred where a Keowee unit failed to start. In the first instance, a blown fuse prevented the operation of the Keowee Unit 2 field flashing circuit. A second instance occurred when the field flashing breaker's closing coil failed on a subsequent start of Keowee Unit 2. A non-cited violation involving an inadequate Keowee test procedure was identified involving a failure of the Keowee Unit 1 voltage regulator.

During this attempted start, Oconee operators did not recognize the voltage regulator failure. (Paragraph 5.c)

One Violation was identified concerning a transient and subsequent startup of the Emergency feedwater system during a scheduled Unit 2 shutdown. The transient was determined to be caused by a temporary scaffold which interfered with operation of a feed regulating valve. (Paragraph 2.d)

Numerous concerns were identified during a detailed walkdown of the Emergency Condenser Circulating Water (ECCW) system. During a conference call with NRC, the licensee was allowed to reverse a previous commitment to maintain the ECCW system cross-connect valves shut. The previous commitment was implemented to reduce flooding concerns, but due to a potential single failure identified by the NRC, the valves were reopened to ensure adequate suction supply to the LPSW pumps. Two Unresolved Items involving the apparent inability of the ECCW to withstand single failures, and to track the long-term resolution of corrective actions to restore the system to the requirements of the design basis were identified. (Paragraph 6)

Operators manually tripped Unit 2 during a scheduled refueling shutdown due to a partial loss of Integrated Control System (ICS) power. The reactor was subcritical and rods were being manually inserted when the ICS power failure occurred. (Paragraph 2.e)

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*H. Barron, Station Manager
S. Benesole, Safety Review Manager
*D. Coyle, Systems Engineering
*J. Davis, Safety Assurance Manager
T. Coutu, Operations Support Manager
W. Foster, Superintendent, Mechanical Maintenance
*J. Hampton, Vice President, Oconee Site
C. Little, Superintendent, Instrument and Electrical (I&E)
*M. Patrick, Regulatory Compliance Manager
*B. Peele, Engineering Manager
*S. Perry, Regulatory Compliance
*G. Rothenberger, Operations Superintendent
R. Sweigert, Work Control Superintendent

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

NRC Resident Inspectors

*P. Harmon
*W. Poertner
*B. Desai

Other NRC employees

*J. Johnson, Region II
*R. Chou, Region II

*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 Equipment Rooms
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
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.

b. Plant Status

Unit 1 operated at power for the entire report period.

Unit 2 operated at power until April 29, 1993, when the Unit was shutdown for a scheduled refueling outage. The turbine generator was taken offline at 12:44 a.m.

Unit 3 operated at power for the entire report period.

c. Refueling Outage Power Supplies

During the reporting period, the inspectors discussed the licensee's plans for supplying power to Unit 2 during the refueling outage that began on April 29. The inspectors informed the licensee that their plans to use the offsite Central Switchyard to supply Transformer CT-5, and from CT-5 to the onsite Standby buses was not a condition allowed by the plant's TS. The Standby busses feed the shutdown Unit's Main Feeder busses, supplying power to safety-related equipment. At present, TS 3.7 for Oconee allows the CT-5 transformer to be powered from a dedicated gas turbine at the Lee Steam Station. This provision is specifically provided for periods when the on-site emergency power supply, Keowee Hydro station, is out of service for extended maintenance affecting both Keowee Units.

The licensee has stated a position that the TS do not specifically prohibit use of the Central Switchyard to supply CT-5, and ultimately a shutdown Unit's emergency bus. Therefore, as long as appropriate safety features and interlocks are incorporated into the CT-5 protective circuitry, any off-site source may be tied in to the safety bus.

The inspector informed the licensee that the proposed use of Central Switchyard to feed a shutdown unit's Main Feeder bus is not addressed in TS, and is therefore outside of the license and TS. The inspectors reviewed the Safety Evaluation to support Amendment 50 to the Facility License. The evaluation considered acceptable the licensee's proposed use of the Lee gas turbine and the dedicated 100 kv transmission circuit as a temporary substitute power source for use primarily during a period when the onsite Keowee hydro units are not available. The evaluation does not address the use of Central Switchyard.

The inspectors consulted with NRR and do not consider the Central switchyard supply to the CT-5 transformer as an acceptable substitute for the Lee gas turbine and its dedicated transmission circuit specifically approved in the Safety Evaluation. Since the licensee's proposed use of the Central switchyard has not been reviewed or evaluated, any such use could be considered as outside the TS and the station's licensed condition. This position was presented to station management during the inspection period. The licensee agreed not to use the subject lineup until further evaluation and discussion.

d. Unit 2 Emergency Feedwater (EFW) Actuation

On April 29, 1993, at approximately 12:25 a.m. with Unit 2 at approximately 20 percent power and decreasing to take the generator offline for a scheduled refueling outage, an emergency feedwater actuation occurred due to low steam generator level on the 2A steam generator. The cause of the low level in the steam generator was that valve 2FDW-32, the main feedwater regulating valve, stuck closed during a feedwater swing which caused a decrease in feedwater flow to the 2A steam generator. The 2A steam generator startup control valve, 2FDW-35, opened but power level was above the flow capacity of the startup control valve and steam generator level continued to decrease. The operators took manual control of the main feedwater regulating valve and attempted to open the valve manually from the control room. The valve remained closed with a 40 percent demand signal input to the controller. When steam generator level dropped below 21 inches for greater than 30 seconds, both motor driven emergency feedwater pumps automatically started and supplied feedwater to the steam generator. Subsequent to the EFW actuation, 2FDW-32 opened and the operators shut the EFW control valves and maintained steam generator level by manually cycling 2FDW-32.

The turbine generator was taken offline at 12:44 a.m. and power was reduced to 15 percent. The motor driven emergency feedwater pumps were secured at 12:55 a.m. The licensee determined that the EFW actuation was caused by the installation of scaffolding next to the controller arm for 2FDW-32. The scaffolding blocked the movement of the positioner feedback arm on the valve controller and resulted in an error signal that caused the valve to close. Oconee Scaffolding Manual, Section 3.C, requires that scaffolds not interfere with plant operations including manual or automatic operation of valves. Contrary to the above, scaffolding which prevented operation of valve 2FDW-32 was built and verified to be acceptable by maintenance personnel. The failure to meet the requirements of the scaffolding manual is identified as Violation 270/93-13-01: Failure to Follow Scaffolding Manual Requirements.

e. Unit 2 Manual Reactor Trip

At approximately 5:56 a.m. on April 29, Unit 2 reactor was manually tripped. The reactor was already subcritical with Reactor Coolant System (RCS) temperature at approximately 536 degrees F and rod groups 3,4,5,6 and 7 fully inserted. Decay heat was being removed by the steam generators with the 2A main feedwater pump removing decay heat.

A loss of AC power supply to the 2KI bus, which supplies power to the Integrated Control System, ICS, resulted in a false high steam generator level signal being fed to the main feedwater control circuitry. The high level signal caused the running main feedwater pump to trip. The operators responded by manually tripping the reactor. EFW actuated as a result of loss of both main feedwater pumps. The 2A turbine bypass valve, which was closed prior to the transient, failed open due to the loss of power to the 2KI bus. This caused a slight cooldown to approximately 520 degrees F. The loss of feedwater Abnormal Procedure (AP), the loss of KI AP, and the Emergency Operating Procedure were entered.

The loss of KI invertor was attributed to a blown fuse in the static transfer switch. The cause of the blown fuse is not known at this time. The inspectors will review the post trip review and will follow up on the circumstances surrounding this event.

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.

Surveillances reviewed and witnessed in whole or in part:

TT/0/A/0620/03, Keowee Hydro Load Rejection Test
PT/1/A/0251/01, LPSW Pump Performance Test
PT/0/A/620/09, Keowee Hydro Operation
OP/0/A/1106/19, Keowee Hydro at Oconee

No violations or deviations were identified.

4. Maintenance Activities (62703)

a. General

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 5979C, Re-mount Unit 1 Field Flashing BKR Relay
WR 92037314, I/R B LPSW Pump Motor Hi Stator Temp. WR 59799, Replace High Burden Coil on Keowee
WR 59797, Troubleshoot Keowee Unit 2 Field Flashing Breaker

b. Maintenance Backlog

The inspectors reviewed the backlog for work requests older than 90 days. The goal established for Oconee is less than 300. The present level at Oconee is 180, down from 508 in January 1992. The reduction is the result of an aggressive attitude by maintenance managers to lower the numbers to a manageable level. The inspectors reviewed maintenance histories in specific categories and verified that the reduction was not just the result of bookkeeping or classification changes. This effort is considered a strength in the maintenance organization.

c. LPSW Pump Bearing Replacement

On March 30, 1993, at 6:00 p.m., the Unit 1 and 2 "B" LPSW pump was removed from service to replace the pump bearing. The removal of the "B" LPSW pump placed Units 1 and 2 in a 24 hour Limiting Condition of Operation per the requirements of a technical

specification interpretation written by the licensee to ensure that the Unit 1 and 2 LPSW system could meet single failure requirements. The pump bearing problem was identified by the licensee's oil analysis program and high vibration data obtained during the pump performance test. The vibration data obtained during the pump performance test was high but still in the acceptable range, but the oil analysis showed that the bearing was deteriorating and would probably fail prior to the next scheduled test. The bearing was replaced and the pump was tested and returned to service on March 31, 1993, at 2:55 p.m. The inspectors monitored the work activities to replace the pump bearing and return the pump to service. There were no concerns identified regarding the bearing replacement activities.

d. LPSW Pump Motor Replacement

On April 29, 1993 at 12:14 p.m. the Unit 1 and 2 "B" LPSW pump was removed from service to replace the pump motor due to high stator temperatures. The motor had exhibited high stator temperatures for an extended period of time and the stator temperatures had been steadily increasing over time. The stator temperature did not exceed the maximum allowable stator temperature allowed for operability but the licensee determined that the maximum allowable stator temperature could have been exceeded as the ambient temperature increased in the turbine building due to increased outside temperatures as the summer months progressed. The pump motor was replaced and the pump returned to service on April 30, 1993 at 9:04 a.m. The inspectors monitored the work activities to replace the pump motor and return the pump to service. No concerns were identified.

No violations or deviations were identified.

5. Keowee Issues

During this inspection period there were three instances where a Keowee unit failed to start.

a. Blown Fuse Associated With Keowee Unit 2 Field Flashing Breaker.

On April 5, at approximately 7:05 a.m., Keowee Unit 2 tripped during a normal start while operators were attempting to tie the unit to the 230 kV grid. The cause of the trip was determined to be a blown fuse in the generator field flashing circuit. The fuse was replaced and the unit was successfully started. The unit was returned to service at 10:29 a.m. The failure would have prevented the Keowee unit from providing emergency power during an emergency start situation. The licensee is performing a failure analysis on the fuse. The age of the fuse may have been a contributor to the failure. The inspectors questioned the licensee whether they had considered inspecting other fuses on both the Keowee units. The licensee responded that checking the

other fuses was not necessary. A Problem Investigation Report was initiated associated with this event.

b. Field Flashing Breaker Coil Replacement

On April 12, at approximately 7:39 p.m., during a normal startup of Keowee Unit 2 to generate to the grid, the field flashing breaker did not close as required. A work request was written to troubleshoot and repair the problem. The investigation found that the closing coil associated with the field flashing breaker had burned up. The solenoid was also found to have some visual indications of wear. Additionally, the fuse in the control circuitry had also blown, possibly due to binding of the coil. This was the same fuse which blew on April 5. The unit was declared inoperable as of 7:39 p.m. and a 72 hour LCO pursuant to TS 3.7.2 a.1 was entered. It appears that the closing coil problem was the cause of the April 5 failure.

Per the work request, a replacement coil was obtained from the warehouse. There were two types of closing coils available for the subject breaker; a high burden and a standard coil. The high burden coil was selected as replacement.

The closing coil is housed in a "laminated" mechanism/plunger assembly. To replace the closing coil, this mechanism has to be disassembled, and it is easier to change out the entire mechanism along with the closing coil. Based on this, a spare DB-25 breaker was also obtained from the warehouse with the intention of using its mechanism along with its high burden closing coil. The mechanism along with the closing coil as well as the fuses were replaced. The unit was returned to service at 2:41 a.m. on April 13.

The next morning, with both Keowee units in a scheduled outage as discussed in paragraph d. of this section, the technician involved in the coil replacement discussed the option of using either the standard or the high burden coil with another senior technician. The senior technician recalled that the subject breakers had been modified in 1979, which replaced the high burden coil with the standard coil to increase reliability of the breakers. Consequently, the high burden closing coil was then replaced with a standard burden closing coil removed from another spare breaker. Of two standard burden coils in the warehouse, one was damaged and the other did not have the appropriate documents. Therefore the coil in the spare breaker was utilized. The unit's field flashing breaker was returned to service before the end of the LCO associated with the dual unit outage.

Several concerns were identified during the replacement of the coil. These include, an apparent failure to incorporate changes in the procurement/replacement material control process following the modification several years ago, unavailability of replacement

parts associated with the DB-25 breaker, and arbitrary selection of one part over the other. The inspectors requested that the licensee analyze and adequately resolve the situation with regard to this and other potential similar situations. A Problem Investigation Report (PIR) was initiated to review this issue.

c. Failed Voltage Regulator

On April 16, during operability verification of the Keowee units as required by TS 4.6.1, the voltage regulator for Keowee Unit 1 did not function as expected. This made Keowee Unit 1, which was aligned to the overhead path, inoperable. Periodic Test, PT/0/A/620/09, Keowee Hydro Operation, in conjunction with Operating Procedure, OP/0/A/1106/19, Keowee Hydro at Oconee, is used monthly to verify operability of the Keowee units. Both Keowee units are automatically started from the Oconee control room and their capability to energize CT-4 and the overhead path is verified. For this operability verification, it is not necessary to load the Keowee units.

During the performance of this test on April 16, with Keowee unit 1 aligned to the overhead path, Unit 1 was automatically started from the Oconee control room. Following the start, Oconee control room was notified by the Keowee operator that the voltage regulator had not come on as required. The Keowee operator observed that the indicating light had stayed green (as opposed to red) after the start of the Keowee unit. The unit was shutdown. The Oconee operator performing the PT had not observed the voltage regulator indicating light on the Keowee panel.

Had the Keowee operator not caught the abnormality, the surveillance would have been completed with the voltage regulator problem going unnoticed. The Keowee Units are designed such that after a period of five minutes following a start, if the voltage regulator has not come on, the unit would automatically shutdown. The inspector questioned the adequacy of the test procedure. PT/0/A/620/09 as well as OP/0/A/1106/19 do not specifically require the Oconee operator to observe the status of the voltage regulator during the test nor does the test procedure require that the Keowee units be run for five minutes such that the voltage regulator interlock would be challenged.

Oconee TS 6.4.1 requires that the station shall be operated and maintained in accordance with approved procedures, including nuclear safety-related periodic test procedures. Contrary to the above, OP/0/A/1106/19 was inadequate in that it did not require verification of the voltage regulator status during operability verification of the Keowee units. The subject OP was revised to include verification by the Oconee operator to ensure that the status of the Generator Field Breaker, Generator Supply Breaker, the Generator Field Flashing Breaker and the Generator Voltage

Regulator. The revised procedure was reviewed by the inspectors. This violation will not be subject to enforcement action because the licensee's efforts in identifying and correcting the violation meet the criteria specified in Section VII.B of the enforcement policy a Non-cited Violation NCV 269,270,287-93-13-02.

Troubleshooting was performed on components associated with the voltage regulator and no abnormalities were identified. The Keowee unit was started several times and the problem with the regulator did not recur. The unit was declared operable at 3:14 p.m. Similar problems had occurred on the Keowee Unit 2 voltage regulator several years ago. No root cause(s) were identified although components were replaced. Pending continued review of licensee actions, this is IFI 93-13-05, Failure of Keowee Voltage Regulator. The licensee will continue to monitor the capabilities of the voltage regulator.

d. Dual Keowee Unit Outage

On April 13, 1993, at 5:36 a.m., both Keowee hydro units were removed from service for a dual unit outage as permitted by Technical Specification 3.7.6. Prior to removing the Keowee units from service the Oconee standby busses were energized by a Lee Station gas turbine through a dedicated transmission line as required by the Technical Specification. The Technical Specification allows both Keowee units to be out of service for 72 hours for planned tests or maintenance.

The licensee dewatered the common Keowee penstock to allow inspection of the penstock and the Keowee units' waterwheels. The licensee also conducted inspections and performed tests on the Keowee generators. The licensee did not identify any significant problems during the inspections conducted. The Keowee units were rewatered, tested, and returned to service at 1:10 a.m. on April 15, 1993.

One non cited violation was identified.

6. Emergency Condenser Circulating Water (ECCW) System (71710)

The inspectors conducted a system walkdown of the Unit 3 ECCW system. The ECCW system is required to be operable whenever the reactor coolant system is heated above 250 degrees. The ECCW system is required to provide both a suction source to the Low Pressure Service Water (LPSW) pumps and cooling water through the main condenser for decay heat removal if the Condenser Circulating Water (CCW) pumps are unavailable. The Unit 3 ECCW system is actuated following a loss of all four Unit 3 CCW pumps. When all 4 CCW pumps are lost or secured the condenser outlet valves receive a close signal and the condenser emergency discharge valves, 3CCW-93 and CCW-8, receive open signals. ECCW flow is provided by a siphon from the CCW intake through the main condenser and discharges through 3CCW-93 and CCW-8 which is directed to the Keowee

tailrace. The ECCW discharge flowpath downstream of 3CCW-93 is common to all three Oconee Units.

The highest point in the ECCW system is approximately elevation 801 and is located at the discharge of the main condenser. Full pond for Lake Keowee is 800 feet. The midpoint of the CCW pump discharge piping is elevation 800.5 and the pipe has an inside diameter of 8 feet. The Technical Specifications permit lake levels as low as 775 feet. The condenser cooling portion of the ECCW system requires that a siphon through the CCW system be achieved if all four CCW pumps are lost. The LPSW system requires that siphon flow be established if lake level drops below approximately 796.5 feet. The ECCW system is arranged such that if siphon flow is achieved through the main condenser, CCW flow to the LPSW system is assured and if lake level is above approximately 796.5, CCW flow to the LPSW system is assured even if siphon flow through the main condenser is lost, as long as one CCW pump discharge valve remains open.

The CCW pumps are powered from 4160 volt safety related power supplies TC, TD, TE but are not considered safety related and are load shed on a loss of power. The high pressure service water (HPSW) system supplies cooling water to the pump motors and pump seal injection. The HPSW Pumps are also load shed but the HPSW system contains an Elevated Water Storage Tank (EWST) with a 100,000 gallon capacity to supply HPSW loads following a loss of the HPSW pumps.

The CCW system consists of four pumps per Unit. The suctions of the pumps extend below the maximum drawdown of the lake. Each pump discharges into an eight foot diameter pipe. The discharge from two pumps are combined into an eleven foot diameter conduit and the two eleven foot diameter conduits are combined into a common condenser intake header under the turbine building floor. Each pump discharge header contains an isolation valve. The pump discharge valves automatically open when the associated CCW pump is started and close when the associated CCW pump is secured. The control logic for the discharge valves contains a circuit that allows the discharge valve of the last CCW pump secured to remain open. The control logic allows the discharge valves of all running CCW pumps to remain open if all CCW pumps are lost simultaneously. The purpose of this control logic is to ensure that the ECCW system will actuate properly via siphon following a loss of the CCW pumps.

During startup of the CCW system after an outage, the CCW system piping is filled by starting CCW pumps and venting the system through 6 inch vent valves located at the high points and mid-points of the CCW system. Once the CCW system is filled, any air coming out of solution is removed via a continuous vacuum priming system that consists of vacuum pumps, an emergency air ejector, and float valves.

During the walkdown of the ECCW system, the inspectors identified numerous apparent discrepancies with respect to the design of the system. The ECCW system with respect to the condenser cooling mode of

operation does not meet single failure criteria: the failure of the normally closed ECCW discharge valve at the outlet of the condenser to open or the failure of the normally closed discharge valve at the Keowee tailrace will prevent siphon flow from being established through the main condenser; the condenser discharge valves fail as is on a loss of instrument air or power; the turbine bypass valves fail closed on a loss of instrument air; and the power supply to the turbine bypass valves is not considered safety related. The licensee indicated that the ECCW system does not have to meet single failure criteria with respect to the condenser cooling mode of operation and that the original licensing basis did not require that the system meet single failure criteria. The licensee stated that sufficient water inventory exists in the upper surge tanks and condenser hotwell to relieve steam to atmosphere through the main steam relief valves or manual atmospheric dump valves until a CCW pump could be restarted. The inspectors requested the calculations and documentation supporting the licensee position. This item is still under review by the NRC and is identified as Unresolved Item 269,270,287/93-13-03: ECCW System Design and Testing.

The inspectors identified that all four CCW pump discharge valves could go closed on a loss of the CCW pumps if one of several single failures occurred in the CCW system control logic. The inspectors identified this item to the licensee on April 5, 1993, and questioned the effect on the operability of the ECCW system and LPSW system. On April 8, 1993, the licensee determined that the Oconee LPSW systems were unable to withstand a design basis accident and a single failure with respect to the ability of ECCW to support LPSW and entered a 24 hour LCO at 5:30 p.m. and made a 4 hour non-emergency report to the NRC.

On April 9, 1993, a conference call was held between NRC and the licensee to discuss the operability of the LPSW systems and proposed actions to return the LPSW systems to operability. The licensee proposed that the LPSW suction cross connect valves between units be opened to supply a common suction to the LPSW pumps from all three Units' CCW systems. These valves were originally required to be open during system operation but had been closed in 1982 as a result of turbine building flood concerns to minimize the flow available to feed a line break in the turbine building. The licensee performed a safety evaluation that determined that operation with the suction cross connect valves open for a 30 day period until a long term corrective action could be implemented was acceptable based on present plant conditions. The licensee agreed to provide the NRC with the safety evaluation performed and determine appropriate corrective actions within 30 days. Based on these actions the cross connect valves were opened and the LPSW systems declared operable at 5:37 p.m. on April 9, 1993. This item was still under review by the licensee and the NRC at the conclusion of the inspection period. This item is identified as Unresolved item 269,270,287/93-13-04: LPSW/ECCW Operability.

The inspectors identified that portions of the CCW/ECCW system and its support systems were not seismically qualified. In particular, the inspectors identified that the HPSW system, the continuous vacuum

priming system, the CCW surge lines, and numerous systems attached to the CCW system were not seismically qualified. The licensee stated that design study ONDS 327 had been initiated to resolve the seismic concerns and that the study had been completed in December 1992. The inspectors reviewed Design Study ONDS 327 and determined that the seismic concerns had been identified by the licensee in 1987 as the result of a self initiated technical audit (SITA) and that the concerns had not been resolved. The Design Study recommended that the isolation valves supplying cooling water to the radwaste facility be administratively controlled whenever lake level dropped below 787 feet. The Design Study qualified portions of the continuous vacuum priming system up to the first manual isolation valve on the CCW intake piping at the high and mid-point and recommended that the valves be shut during normal operation. The Design Study recommended that a station modification be implemented to provide cooling water and seal injection to the HPSW pumps from a source other than the HPSW system. None of the Design Study recommendations had been implemented as of the end of the inspection period. The lack of seismic qualification of portions of the CCW/ECCW and support systems is identified as another example of Unresolved Item 269,270,287/93-13-03.

The inspectors reviewed the testing conducted on the ECCW system. The Unit 3 ECCW system is tested every refueling outage by the performance of PT/3/A/0261/07, Emergency CCW System Flow Test. The test initiates flow through all four CCW lines by starting all four CCW pumps and tagging open the power supplies to the pump discharge valves. The CCW pumps are then secured and the ECCW system is initiated by the loss of all four CCW pumps. The test procedure isolates the condensate coolers and the continuous vacuum priming system just prior to securing the CCW pumps. The test acceptance criteria requires that a minimum ECCW flow be maintained at the Keowee tailrace for a four hour period and that water level in the CCW pump discharge piping be greater than a certain value based on lake level at the end of the four hour period. The flow acceptance criteria decreases as a function of time and is based on decay heat removal requirements and the pipe level requirement is based on prevention of a loss of siphon. The inspectors determined that the purpose of the test was to verify that ECCW flow could be maintained for a minimum of four hours with the continuous vacuum priming system secured and not that ECCW flow could be maintained indefinitely.

The inspectors questioned the duration requirements for ECCW flow under accident conditions. The licensee stated that ECCW siphon flow is only required to be maintained for four hours. The licensee stated that credit was taken for the restart of a CCW pump for accident mitigation under worst case design basis conditions. The licensee procedures direct the operators to restart a CCW pump within one hour following a load shed of the nonsafety related loads from the safety related 4160 volt switchgear. The inspectors expressed concern that the licensee was taking credit for nonsafety related and non-technical specification required equipment to mitigate the consequences of a design basis accident event. The inspectors were still reviewing this item at the end of the inspection period. The acceptability of restarting a CCW

pump for accident mitigation is identified as another example of Unresolved item 269,270,287/93-13-03.

The inspectors questioned the adequacy of the ECCW system flow test presently conducted. The test procedure does not require that a predetermined LPSW flow be maintained throughout the four hour test duration. The Unit 3 test procedure requires that the Unit 3 LPSW system be aligned to the Unit 3 CCW system but does not require that LPSW flow be maintained. The Unit 1 and Unit 2 test procedures require that the LPSW pumps be aligned to the opposite Unit prior to performing the ECCW flow test. The inspectors determined that ECCW system flow tests conducted in 1986 had required that significant LPSW flow rates be maintained throughout the tests. The tests conducted in 1986 were a result of a loss of siphon flow event on Unit 2 during a load shed test conducted during a refueling outage. The loss of siphon was the result of air inleakage through the CCW pump flanges. This event resulted in the shutdown of all three Oconee Units to modify the pump flanges to prevent air inleakage.

The inspectors also questioned the testing with regards to the continuous vacuum priming system. The ECCW system flow test does not verify proper operation of the continuous vacuum priming system. While this is conservative with respect to air removal the system would not be isolated from ECCW during an accident. A single failure of certain components in the vacuum priming system could adversely affect the syphon. The licensee is reviewing the testing conducted on the ECCW system as a result of the inspector's concerns. The adequacy of the testing performed on the ECCW system is identified as another example of Unresolved Item 269,270,287/93-13-03.

The licensee completed a Design Basis Document (DBD) on the CCW/ECCW system in 1990. As a result of the items identified by the inspectors, the licensee is reviewing and revising the DBD to determine the design basis of the system. The inspectors consider that the DBD effort conducted on the CCW/ECCW system was weak and that the document produced does not sufficiently define the design basis of the system. The inspectors expressed concern that the DBD process did not identify any discrepancies in the design of the system.

No violations or deviations were identified.

7. Exit Interview (30703)

The inspection scope and findings were summarized on May 6, 1993, 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.

Item Number	Description/Reference Paragraph
VIO 50-270/93-13-01	Failure to Follow Scaffolding Manual Requirements (Paragraph 2.d).
NCV 50-269,270,287/93-13-02	Inadequate Keowee Test Procedure (Paragraph 5.c).
URI 50-269,270,287/93-13-03	ECCW System Design and Testing (Paragraph 6).
URI 50-269,270,287/93-13-04	LPSW/ECCW Operability (Paragraph 6).
IFI 50-269,270,287/93-13-05	Failure of Keowee Voltage Regulator (Paragraph 5.c.)