UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-269/94-20, 50-270/94-20 and 50-287/94-20

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

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

Facility Name: Oconee Nuclear Station Units 1, 2 and 3

Inspection Conducted: June 27 - July 1, 1994

Inspector: Rich C. Chou 7/26/94
R. Chou Date Signed

Approved by: 7/26/94
J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of Inservice Inspection, modifications, and previous open items involving safety-related piping systems.

Results:

In the areas inspected, violations or deviations were not identified.

Two unresolved items and one inspector followup item were closed. The licensee had weaknesses in documentation and quality control. One support drawing was not reverified to check its validity with the controlled document within 14 days of installation. Two rewelds re-entered by the welder in the weld log form on a later date were not reverified and resigned by the craft supervisor and the welding inspector.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

***M. E. Bailey, Regulatory Compliance Engineer
*S. W. Baldwin, System Engineer
*D. W. Dalton, Mechanical Engineer
*J. M. Dave, Engineering Manager
**B. Dolan, Safety Assurance Manager
*J. W. Hampton, Vice President on Site
*R. Harris, System Engineer
***D. Kelly, Mechanical/Civil Engineer Supervisor
*F. Linsley, Mechanical Engineer
***B. L. Peele, Station Manager

Other licensee employees contacted during this inspection included craftsmen, engineer, operators, mechanics, technicians, and administrative personnel.

NRC Resident Inspectors

*P. Harmon, Senior Resident Inspector
G. Humphrey, Resident Inspector
L. Keller, Resident Inspector

*Attended preliminary exit Interview on June 30, 1994

**Attended final exit Interview on July 1, 1994
***Attended both exit Interviews

2. Document Review on Inservice Inspection on Units 1 and 3 (73755)

At the time of this inspection, Oconee Unit 1 just restarted from a refueling outage. During Inservice Inspection (ISI) this outage, the licensee only had two inspection findings which required engineering disposition.

Support No. 1-03A-1-0-439A-H23 was originally inaccessible for inspection of items 1, 5, 6, 7, 8, 9, 10, 11 & 12 of the Bill of Materials. Later, the licensee engineers and inspector reached the support through an air duct. (Part of the support which could not be inspected originally is inside of the air duct.) They still could not inspect the support completely. Since a complete VT-3, Visual Inspections could not be performed on this support, the piping system was analyzed for the worse case scenario, which is, that this support carries no load. This analysis demonstrated that the piping stresses remained within design allowables, but loads on eight supports increased. These eight supports were evaluated for the load increases and all were found to remain within their design allowables. Based on this evaluation, this support is acceptable for continued service without additional inspection.

Support No. 1-53B-0-435B-DE067 was found to have a discrepancy as documented in NRC Inspection Report 50-269, 270, 287/92-29. The deficiency was that this support had a strut which was skewed beyond the 5-degree tolerance. The licensee issued Work Request 92054351 to repair the strut during the previous outage and also requested a reinspection to make sure that the problem is not reoccurring during this outage. This support was reinspected by ISI examiner and was found it to be acceptable.

The inspector also reviewed the engineering dispositions on Item Nos. F1.01.140 & F1.01.141 for the Unit 3 ISI inspection during the last refueling outage around February 1994. Both items are in 3B Steam Generator support skirt. The bolting material and gusset plate welds were found to have a "heavy accumulation of boron, rust, and debris." The bolting material inspected is the anchor bolts for the support skirt, which are partially embedded in concrete. There are 48, two-inch diameter bolts around the skirt; the material specification for the bolts is ASTM A-490. The licensee's engineers determined that the skirt welds were acceptable and the corrosion on the bolts did not reduce the material below the minimum thickness requirements due to the size and quantity of the bolts. Work Request 94003674 was written to clean and inspect the bolt during the next refueling outage.

No violation or deviations were identified in this area.

3. Document Review on Modification on Unit 1 (73755)

The inspector reviewed two modification packages which were completed during this outage; the two packages were NSM# 12921 and 12971.

a. NSM # ON-12921, Rev. 0

This modification was classified as an Urgent Modification.The purpose of this modification was to replace the existing carbon steel piping and valves to the Turbine Driven Emergency Feedwater Pump (TD-EFWP) Bearing Cooler Jacket with stainless steel materials because the piping was seriously degraded. The modification consisted of replacing the piping downstream of 1LPSW-136 to the TD-EFWP Bearing Cooler Jacket; replacing the piping used for backup cooling water downstream of 1HPSW-248 to the TD-EFWP Oil Cooler; replacing the carbon steel piping from the High Pressure Service Water (HPSW) backup to the pump jacket; and tie into a second, new connection on the 16" HPSW header. Low Pressure Service Water (LPSW) will no longer service the cooler. An orifice and flow measurement instrumentation were also added downstream of 1LPSW-137 for bearing cooling flow measurement. This modification included replacement of about 150 feet of corroded 2" carbon steel piping and nine valves.

The construction and QC inspection record package was reviewed by the inspector. The review included signatures and dates by workers, craft supervisors, QC inspectors and managers for

materials and tools checked out, hold points, weld inspections, installation completions, procedure approvals, etc. There were no problems identified by the inspector.

b. NSM #ON-12971, Rev. 0

This modification was to correct problems which the licensee had identified in the Low Pressure Service Water (LPSW) piping on the discharge side of each of the three High Pressure Injection (HPI) pump motor bearing coolers. Four Problem Investigation Process (PIP) reports had been generated and one additional problem was found concerning this line. The following lists a brief description of the problems which were to be corrected by this modification:

(1) PIP #93-0801 - Piping downstream of coolers is non-seismic.

The LPSW piping immediately downstream of the HPI pump motor bearing coolers is Duke Class G (non-seismic) and has a normal back pressure of 35 psig. During a seismic event, one train could be broken and cause the other two trains to be inoperable. The disposition of this PIP will upgrade the piping to Duke Class F (seismic) to a common discharge header.

(2) PIP #93-0868 - Piping design temperature is too low.

The design temperature of the LPSW piping immediately downstream of the HPI pump motor bearing coolers is 160°F. OSC-6015, "Operability Evaluation for PIP 0-093-0660," indicated that this temperature could reach approximately 200°F during accident conditions. This PIP requires this line to be upgraded to at least 200°F.

(3) PIP #93-0694 - Low LPSW flow through the HPI motor coolers.

This PIP was written for blockage concerns in the LPSW piping. The modification will resolve the problem.

(4) Existing Rotameters are unreliable and are easily clogged.

The existing Rotameter flow switches (1LPSFS 0009, 1LPSFS0010, 1LPSFS0011) are unreliable. As a result, Operations has to perform a quarterly "bucket" test. The modifications will install reliable flow switches.

(5) PIP #93-0695 - Piping upstream of 1LPSW-771 is non-seismic.

The piping upstream of valve 1LPSW-771 providing backup cooling water to the HPI pump motor bearing coolers is Duke Class G (non-seismic). A seismically induced break in this

portion of the line would prevent the coolers from receiving the required cooling water flow. The modification will install a check valve on the class F side of 1LPSW-771 to eliminate this problem. The modification included:

(1) Replacing/upgrading the piping and associated pipe supports

(2) Eliminating the unused flow control valves and thermometers

(3) Replacing three existing rotameters

(4) Adding new flow switches with a flow orifice and a QA-1 check valve (1LPSW-931)

The inspector reviewed the installation and QC inspection package. A problem was identified on page 1 of 1, MP/0/A/1810/014, Enclosure 13.3- Weld Log and Piping Surface Inspection Form. This form initially contained two welds which had been completed and signed off by the welders on April 24 & 26, 1994, and accepted by a QC inspector. On the bottom of the form, required craft supervisor and welding inspector were signed and dated April 26, 1994. On May 21 and 22, 1994, two rewelds were completed and entered by the welders and accepted by the QC inspector. The signatures and dates of craft supervisor and welding inspector on the bottom portion of the form were not re-entered. This is considered a weakness in the area of documentation and quality control.

c. Support Calculations Review

Six pipe support calculations from the above two modification packages were randomly selected for review. The design calculations were partially reviewed and evaluated for thoroughness, clarity, consistency, and accuracy. The review included formulas, theories, assumptions, displacements, member sizes, stress checks, weld sizes and symbols, bolt sizes, and standard component capacity. In general, the design calculations were of good quality. The calculations reviewed are listed below.

Support No.	Calculation No.	Rev. No.	NSM No.
1-14B-403A-H4191	OSC-1237-00-0033	0	12921
1-14B-403A-H4195	OSC-1237-00-0037	0	12921
1-14B-403A-H4199	OSC-1237-00-0037	0	12921
1-14B-435K-H5641	OSC-0967-14-0004	0	12971
1-GH-RS-7273-04	OSC-1619-01-1005	4	12971
1-14B-5100-NS-2004	OSC-1239-10-1015	3	12971

d. Results and Conclusions

The modification packages and calculations inspected were acceptable except for the weakness on documentation and quality control as stated above.

No violations or deviations were identified.

4. Special Event Review (92700)

PIP Serial No. 1-094-0866 was reviewed. This PIP described an instance when the LPSW, a safety-related system, was overpressurized and caused 24 gauges to be over-ranged. The licensee suspected that the gauge damage might be caused by the overpressure or by a water hammer.

After the licensee modified the portion of LPSW and removed a check valve, the LPSW system was hydro-tested on May 22, 1994, before it was returned to service. The LPSW system was pressurized by High Pressure Service Water (HPSW) to a maximum pressure of approximately 115 psig (HPSW pressure). Some of the 100 psig pressure gauges (the gauges are capable of sustaining 125 psig) were broken. After disassembly of a broken gauge, the cause of failure was determined to be the result of failure of mechanical linkages due to system vibration.

The licensee's Instrumentation and Electrical (I&E) department tested one of the gauges and determined that the deformation of the mechanical linkages would require approximately 500 psig, which was well above the 115 psig applied. The licensee concluded that the LPSW hydro-test did not result in over-pressurization of the LPSW system.

On May 31, 1994, a flow test of the LPSW was performed with a flow of about 2000 gpm through the Reactor building Cooling Units (RBCU) and three Rosemount flow transmitters were damaged. Per the manufacturer's catalog, the maximum range of the Rosemount flow transmitters is 750 inches of H_2O (about 4000 gpm) which is well above the test flow rate of 2000 gpm. It appears that the damage to the Rosemount flow transmitters did not result from the LPSW system flow test.

On June 11, 1994, the 1B1 Reactor Building auxiliary cooler supply header was found to be leaking and a 3" header end cap was separated from the supply header after a loud noise was heard. All of the pressure gauges on the 1B1 auxiliary cooler were also found to be broken at this time. Meantime, operations was performing PT/0/A/0160/03, "Component Test of ES Channels 5 & 6." It was suspected that the performance of PT/0/A/0160/03 resulted in a water hammer in the auxiliary coolers because the pressure in 1B1 auxiliary cooler, due to the higher elevation of the cooler, might be below the system vapor pressure resulting in a water hammer due to vapor cavities.

On June 13, 1994, two of the Rosemount flow transmitters could not be recalibrated and were replaced. A third Rosemount flow transmitter was recalibrated; all of the Bailey flow transmitters could be recalibrated. At the same time, the pressure gauges on the 1A, 1C, and 1D Reactor Building auxiliary coolers were also found to be damaged and were replaced. The licensee concluded, at that time, that a pressure transient had not occurred in the LPSW system.

On June 15, 1994, insufficient LPSW flow on the "1A" decay heat removal train was discovered. The key connecting the manual operator to the valve stem was found to be sheared on 1LPSW-254. The failed key was determined to be due to excessive stress. Therefore, the insufficient LPSW flow shown above could have been the result of a water hammer.

On June 18 and 21, 1994, Reactor Cooling Pump (RCP) 1A2 and 1B1 cooling coils were found to be leaking. The licensee concluded that the RCP cooling coil leaks did not result from a water hammer in the LPSW system because the valves were not in service during that period.

Based on the above events, the licensee suspected that PT/0/A/0160/03 might result in a water hammer. To determine if PT/0/A/0160/03 resulted in a water hammer in the LPSW system, TT/1/A/0251/48, "ES channels 5&6 LPSW Functional Test" was performed to simulate the valve manipulations of PT/0/A/0160/03. Upon performing TT/1/A/0251/48, there were no indications of a water hammer.

Therefore, the licensee concluded that the damage to pressure gauges was due to vibration and would bring vibration experts to investigate the problem. The root cause of the damaged Rosemount transmitters and the leaking 1B1 auxiliary supply header is still unknown. A possible explanation is that the damaged components may have been subjected to an air pocket. The licensee will continue to observe the system during operation.

The inspector agreed with the licensee's decision to continue to observe the system operation. No violations or deviations were identified in this area.

5. Previous Open Items (92701)

a. (Closed) Unresolved Item (UNR) 50-269,270,287/91-05-01, Improper Gap Between Washer and Snubber Rod Bearing

Excessive gaps were found between washers and rod bearings for snubbers and sway struts during a previous inspection. A ⅝" gap on Support No. 3-07A-6-0-2400A-H72 was found. The licensee did not inspect the gaps and did not have a procedure to inspect them. Conceivably, with an excessive gap, the snubber or sway strut movements, or impact due to the pipe movement, could cause damage to the rods or pins. Per the manufacturers catalog the construction tolerance for the gap should be 1/16-inch.

The inspector discussed the gap problem with the licensee engineers and reviewed the information provided. The licensee sent a letter on March 8, 1993, to Grinnnell Corporation, 1341 Elmwood Ave. Cranston, RI 02910 and requested guidelines or an acceptable gap tolerance for inspection. The Grinnell Corporation provided the following reply to the licensee in a letter FB/V/3163D, dated April 16, 1993:

- The gap between pipe clamp halves is a concern when evaluating potential damage to the rods or pins in the area of the spherical bearing and washer.

- The functions of the gap between pipe clamp halves is to accommodate the spherical bearing and to permit the rod eye to rotate in a 10° cone of action. If the gap is too large the bending stress in the stud becomes unacceptable. Additionally, there is a concern that in the unlikely event of bearing dislodgement, a large gap would permit unacceptable movement of the bearing.

- It is the opinion of Grinnell Corporation that once our clamps are properly installed with all nuts locked (particularly the load stud nuts), normal operating conditions will not affect the gap ("S" dimension) of the clamp. Any overloading condition would warrant a reinspection of the clamp.

- The concern that an excessive gap between the spacer washer and spherical bearing could cause damage to the rods or pins is not shared by Grinnell.

From the above reply to the licensee, the Grinnell Corporation implied that excessive gaps could result in damage to the support due to failure of the stud or through bearing dislodgement; but they failed to specify what gap size could be tolerated.

Per discussion with the licensee engineers, the inspector learned that the licensee will not establish inspection tolerances for the gap, since the manufacturer will not provide a definitive inspection tolerance. The inspector will close this item and refer the question to NRR.

b. UNR 50-269, 270, 287/91-23-01, Maintenance Corrective Action Program

An investigation process for the failure of the internal threads on one of the anchor heads during the concrete tendon surveillance was not initiated and the failure was not considered to be an item reportable to the NRC. The licensee did not initiate a root cause investigation based on the non-conformance program to investigate the failure of the internal threads. Later, the licensee engineers indicated that this problem would be written in Station

Directive (SD) 4.5.5, Problem Investigation Process, which is a lower tier program. The more significant non-conformances were handled by a Problem Investigation Report (PIR). The inspector also found that this event would not be a reportable item to NRC since the tendon was evaluated to be acceptable and operable.

The inspector discussed the problems with the licensee engineers and reviewed the information provided. The licensee rewrote the Problem Investigation Report (PIR) to combine all other procedures into it and to include all non-conformances. The new PIR is divided into four categories from the least significant non-conformance to the most significant non-conformance and were classified and evaluated by the same people in each displine. Based on the actions taken by the licensee, this item is considered closed.

c. Inspector Followup Item (IFI) 50-270/93-16-01, Pipe Support Related Defects Found During Inservice Inspection

This matter identified three problems to be followed and the corrective actions reviewed. The problems were a bent rod, standing water in the Quench Tank, and a base plate gap between the base plate and concrete.

The inspector discussed the problems with licensee engineers and reviewed the information provided. The bent rod was replaced. The standing water disappeared toward the end of outage during the licensee reinspection. A shim was installed between the base plate and concrete per Work Request 93027412 and Work Order 94024506-01.

The inspector reviewed the construction and QC inspection package for the above work request and work order. A minor deficiency was found in that the support drawing attached to the package for construction was not validated within 14 days of the construction. The drawing was initiated, obtained, and verified from the document controlled area on March 9, 1994; the work was completed between April 12 and 14, 1994. The support drawing was not reverified and revalidated within 14 days of April 12, 1994. The inspector considered this problem to be a minor weakness in document control, therefore, this IFI is considered closed.

6. Exit Interview

The inspection scope and results were summarized on June 30 and July 1, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Closed) Unresolved Item 50-269, 270, 287/91-05-01, Improper Gap Between Washer and Snubber Rod Bearing (paragraph 5a).

(Closed) Unresolved Item 50-269, 270, 287/91-23-01, Maintenance Corrective Action Program (paragraph 5b).

(Closed) Inspector Followup Item 50-270/93-16-01, Pipe Support Related Defects Found During Inservice Inspection (paragraph 5c).