



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

Report Nos.: 50-269/87-17, 50-270/87-17, and 50-287/87-17

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 1, 2, and 3

Inspection Conducted: April 27 - May 1, 1987

Inspectors: McKenzie Thomas 6/2/87  
M. Thomas Date Signed

Johnny L. Mathis 6/2/87  
J. L. Mathis Date Signed

Approved by: Frank Jape 6/13/87  
F. Jape, Chief, Test Program Section  
Engineering Branch  
Division of Reactor Safety Date Signed

SUMMARY

Scope: This routine, unannounced inspection was conducted in the areas of review of licensee's corrective actions for recent low pressure injection (LPI) and reactor building cooling units (RBCUs) fouling problems; and the licensee's program addressing overall service water system fouling.

Results: No violations or deviations were identified.

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## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*M. S. Tuckman, Station Manager
- \*J. M. Davis, Technical Services Superintendent
- \*T. B. Owen, Maintenance Superintendent
- \*R. T. Bond, Performance Engineer
- \*K. Chea, Test Engineer
- \*F. E. Owens, Assistant Engineer, Compliance
- \*L. Benge, Chemistry Section
- B. Green, Chemistry Section
- L. Schreier, Mechanical Maintenance Section
- L. Hawthorne, Performance Section

Other licensee employees contacted included test coordinators, engineers, technicians, operators, mechanics, security force members, and office personnel.

#### NRC Resident Inspectors

- \*J. C. Bryant, Senior Resident Inspector, Operations
- \*L. D. Wert, Resident Inspector

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings were summarized on May 1, 1987, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

### 3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

### 4. Unresolved Items

Unresolved items were not identified during this inspection.

## 5. Followup of Recent Fouling Problems

The inspectors reviewed licensee actions related to the recent low pressure injection (LPI) and reactor building cooling unit (RBCU) cooler fouling problems which were reported to the NRC. The licensee implemented additional testing and analysis of the LPI and RBCU coolers in order to determine their heat transfer capability. The testing, which is in addition to that required by Technical Specifications (TSs), was implemented because of concerns regarding decay heat removal capabilities at the McGuire Nuclear Station. The inspectors held discussions with site personnel, reviewed test data, maintenance records, and operator logs. In addition, the inspectors also reviewed a chronology of events concerning the LPI and RBCU cooler fouling problems.

While reviewing the Unit 1 LPI and the Unit 2 LPI and RBCU test data (recorded during testing performed in August 1986), the inspectors observed that the low pressure service water (LPSW) temperatures recorded during the test were greater than the maximum design LPSW temperature stated in the FSAR and used in the accident analysis. The maximum design temperature for LPSW is 75 degrees F, but LPSW temperatures recorded during testing were as high as 85 degrees F. The inspectors raised the question as to whether the higher LPSW temperatures had been evaluated to determine the effect on the accident analysis. The inspectors will pursue this question during an inspection at the licensee's corporate design engineering offices where the design calculation and analyses of the LPI and RBCU test data will be reviewed.

The degraded capabilities of the LPI and RBCU coolers due to fouling on Units 1, 2 and 3 are discussed in detail in Licensee Event Report (LER) 269/87-04.

No violations or deviations were identified.

## 6. Low Pressure Service Water (LPSW) System

Inspection of the LPSW system involved reviews of system design requirements, Technical Specification requirements, plant operating procedures, and programs for chemistry control, preventive maintenance, and sampling for Asiatic clams. The reviews in each of these areas are discussed below along with determinations made by the inspectors.

### a. Review of System Design

The inspectors reviewed the LPSW system design as described in Subsection 9.2.2 of the Oconee Final Safety Analysis Report (FSAR), the LPSW system description, and applicable drawings. The intent was to identify the safety-related components cooled by LPSW and subsequently determine whether Duke Power Company's (DPC) plans and procedures for detecting and controlling fouling address these components. The inspectors also identified design flow requirements for the safety-related components as part of this review.

The LPSW system provides cooling for components in the turbine building, auxiliary building, and reactor building under normal and emergency conditions. The LPSW pumps take suction from the crossover line between the inlet headers of the condenser circulating water (CCW) system. The CCW system also serves as the ultimate heat sink for decay heat removal during cooldown of the plant. The high pressure service water (HPSW) system is connected to the LPSW at the LPSW pump discharge to provide emergency back-up. Safety-related components served by the LPSW system are: (1) RBCUs; (2) LPI coolers; (3) high pressure injection (HPI) pump motor coolers; (4) emergency feedwater pump turbine coolers; and (5) motor driven emergency feedwater pump motor air cooler.

b. Review of Technical Specification Requirements

The inspectors reviewed Technical Specification requirements to determine the extent to which related surveillance testing could be used to detect system or component fouling. Section 4.5.1.1.2.a.(2) requires verification each refueling outage of the engineered safety features (ESF) function of the LPSW system which supplies cooling water to the LPI coolers to verify that all components respond properly to the actuation signal shall be made to demonstrate operability of the coolers.

Sections 4.5.2.1.2.a.(2) and 4.5.2.1.2.b require verification each refueling outage of the ESF function of the LPSW system which supplies cooling to the RBCUs shall be made to verify that all components respond properly to the actuation signal to demonstrate operability of the coolers, with the LPSW flow through each cooler exceeding 1400 gpm.

The inspectors also reviewed the following procedures that are used to satisfy the surveillance requirements:

PT/O/A/160/02, Reactor Building Cooling System Performance Test

PT/O/A/160/03, Reactor Building Cooling System ES Test

PT/1,3/A/251/01, Low Pressure Service Water Pump Performance Test

PT/1,2,3/A/600/12, Turbine Driven Emergency Feedwater Pump Performance Test

PT/1,2,3/A/600/13, Motor Driven Emergency Feedwater Pump Performance Test

PT/O/A/230/15, High Pressure Injection Motor Cooler Flow Test

The inspectors concluded that, of the surveillance requirements related to LPSW operability, some of the surveillance tests will be useful for detecting fouling which causes LPSW flow blockage to the applicable components. However, the recent LPI and RBCU fouling problems have demonstrated that none of the surveillance tests were useful for detecting fouling which could result in a degraded heat transfer capability. The licensee has developed test procedures (which are in addition to the TS required surveillance tests) to determine the heat transfer capability of the LPI and RBCU coolers. These procedures are PT/O/A/160/06, Reactor Building Cooling Units Heat Exchanger Performance; and PT/O/A/251/18, Decay Heat Cooler Test. In addition to the inspectors' review of the above surveillance procedures, the resident inspectors also reviewed selected surveillance procedures related to LPSW system operability. The results of the review performed by the resident inspectors are discussed in NRC Inspection Report No. 50-269, 270, 287/86-20.

c. Review of Plant Operating Procedures

The inspectors reviewed the following abnormal operating procedure (AP):

- AP/1,2,3/A/1700/13, Loss of Condenser Circulating Water Intake Canal/Dam Failure

The review revealed that this procedure focuses on actions necessary to maintain the plant in a safe condition following a loss of CCW intake canal or a dam failure without a loss of the CCW intake canal. One of the subsequent actions performed by the operators following either of these failures is to trip all LPSW pumps. Licensee personnel stated that there is not a procedure which addresses loss of the LPSW system but an AP is currently being developed.

d. Review of Chemistry Control Program

The inspectors reviewed the licensee's chemistry control program to determine what measures have been established to control LPSW system fouling. This review revealed that because there has not been a problem with biofouling, the open raw water systems are not chemically treated (chlorinated). The only systems that are being chemically treated are closed systems such as component cooling and recirculated cooling water. These systems are being treated with chromates and phosphates for corrosion inhibitors. The inspectors reviewed the following procedures:

CP/O/B/2002/09, Chemical Addition to the Component Cooling System

CP/O/B/2004/04A, Determination of Chromates by the Direct Colorimetric Method

CP/O/B/2004/10A, Determination of Phosphates in High Purity Water by Colorimetric Method

CP/O/B/2004/19, Chemistry Procedure for the Determination of Corrosion Inhibitors (Calgon CS) in Closed Water Systems

CP/O/B/4002/12, Monitoring Program for Asiatic Clams

Chemistry Section Procedure 3.10, Primary Lab Sampling Frequencies and Specifications

e. Review of Preventive Maintenance Program

The inspectors reviewed the licensee Preventive Maintenance (PM) Program for components which receive Low Pressure Service Water (LPSW). The safety-related components served by LPSW are reactor building cooling units, low pressure injection coolers, high pressure injection pump motor coolers and emergency feedwater pump turbine coolers.

The emergency feedwater pump turbine oil coolers, at the time of this inspection, were the only safety-related components serviced by LPSW on a PM program. The program consisted of opening the system for cleaning and inspecting each refueling outage. The high pressure injection pumps motor coolers were removed from the PM program in September 1985. The licensee justification for this was the coolers are made of copper tubing. The elbows on the inlet and outlet are welded and a partial motor disassembly would be required to remove the cooling coils. Furthermore, the licensee added that a flow test is performed per PT/O/A/230/15 weekly. The piping supplying high pressure injection pump motor coolers were changed out from carbon steel to stainless steel to aid in reduction of corrosion build-up.

There were no PM programs in place at the time of this inspection for RBCUs and LPI coolers. The licensee discussed plans to perform PM on the RBCUs and LPI (Decay Heat Removal) cooler during the next refueling outage and each refueling thereafter.

The inspectors discussed fouling problems with the licensee staff. Biofouling problems are discussed in the resident inspector's report number 86-20. The prominent fouling problem at Oconee is corrosion build-up. LPSW and CCW are systems where corrosion build-up has

caused the licensee to change out small bore carbon steel piping to stainless steel. The detection of small amounts of clams was found in the Amertap system. Whenever any work is done involving opening of the lake water portion of components, valves or piping, the interior is visually inspected by environmental personnel for clams. Also, maintenance is required to notify environmental personnel if any clams are observed. The licensee performs a visual examination of condenser water boxes for clams on unit shutdowns.

No violations or deviations were identified.

f. Conclusions of Low Pressure Service Water Review

Based on the existing potential for fouling, the inspectors concluded that, with the implementation of the additional testing and PM for the LPI and RBCU coolers, DPC's plans and procedures for detecting and controlling fouling appear to be adequate. Silt/mud and corrosion appear to be the major contributors to fouling. The potential for Asiatic clams infestation appears to be low. The licensee's program for replacing the small bore carbon steel piping with stainless steel (on an as needed basis) has reduced the effects of fouling due to corrosion. The additional testing and analyses to determine the heat transfer capability of the LPI and RBCU coolers combined with implementation of a cleaning program for these coolers, should reduce the effect of the silt/mud fouling causing degraded heat transfer capability of the coolers.

The ongoing Asiatic clam inspection program provides means for detecting the presence of clams in the LPSW system in the event that Asiatic clam intrusion occurs in the future.

No violations or deviations were identified in the areas inspected.