



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30303

Report Nos. 50-259/83-55, 50-260/83-55 and 50-296/83-55

Licensee: Tennessee Valley Authority  
500A Chestnut Street  
Chattanooga, Tennessee 37401

Facility Name: Browns Ferry Nuclear Plant

Docket Nos. DPR-33, DPR-52 and DPR-68

Inspection at Browns Ferry site near Athens, Alabama

Inspectors: *Ross Butcher for* 7/19/84  
G. L. Paulk Date Signed

*Ross Butcher* 7/19/84  
R. C. Butcher Date Signed

Approved by: *F. S. Cantrell* 7/19/84  
F. S. Cantrell Date Signed  
Division of Project and Resident Programs

SUMMARY

Inspection on October 25-28, 1983

Areas Inspected

This special inspection involved 50 inspector-hours in the area of diesel generator/emergency equipment cooling water heat exchanger.

Results

Of the one area inspected, two violations were identified.

## DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*T. Campbell, Nuclear Production Manager
- \*H. Abercrombie, Assistant to the Manager, Nuclear Production
- \*G. T. Jones, Power Plant Superintendent
- J. E. Swindell, Assistant Power Plant Superintendent
- J. R. Pittman, Assistant Power Plant Superintendent
- T. L. Chinn, Plant Compliance Supervisor

Other licensee employees contacted included technicians, and engineering personnel.

#### NRC Personnel

- \*R. C. Lewis, Director, Division of Project and Resident Programs (DPRP)
- \*R. C. Butcher, Project Engineer, DPRP
- \*T. Gibbons, Reactor Engineer, Division of Engineering and Operational Programs (DEOP)
- G. Paulk, Senior Resident Inspector
- \*T. Peebles, Technical Assistant, DEOP

\*Involved in November 9, 1983 telephone conference

### 2. Management Interviews

A management interview was conducted on October 28, 1983, with the Power Plant Superintendent and other members of his staff. The licensee was informed of two violations identified during this report period. The licensee had no comment on the violations cited. Subsequently, on November 9, 1983, a telephone conference was held with the noted personnel regarding the qualification of the diesel generator/emergency equipment cooling water heat exchangers.

### 3. Licensee Action on Previous Inspection Findings

Not inspected during this report.

### 4. Unresolved Items

There were no new unresolved items during this inspection.

### 5. Inspection Findings

The Browns Ferry Emergency Equipment Cooling Water (EECW) system has experienced flow blockage problems due to pipe corrosion buildup and biofouling. During the licensee's investigation it was revealed that the

Diesel Generator (DG)/EECW heat exchangers have a design pressure of 75 psig., and the EECW system design pressure is 185 psig. This design deficiency was documented in Division of Engineering Design Nonconformance Report BFN MEB 8301 dated March 9, 1983. On April 11, 1983, an EECW heat exchanger head was found to be cracked and was reported on Licensee Event Report (LER) 50-296/83-26 dated May 9, 1983. Neither the original LER or Revision 1 (dated June 16, 1983), reported the design deficiency identified in nonconformance report BFN MEB 8301. The cracked head was attributed to an apparent manufacturing defect which became apparent due to in-service stresses.

Normal operating pressure of the EECW system is approximately 120 psig. during standby service (two pump EECW operation) and is approximately 135 psig. during four pump operation (emergency operation). Failure of the DG/EECW heat exchangers could prevent the DGs from performing their emergency functions. During this inspection the licensee was requested to justify why continued operation was acceptable. The licensee presented the results of the ASME Section XI hydrostatic tests on the north and south headers of the EECW system which was conducted in 1978 and 1980. This hydrostatic testing subjected the EECW system to pressures ranging from 142 psig to 168 psig. The licensee also committed to submit a complete safety analysis report by November 28, 1983.

During a telephone conference on November 9, 1983, the licensee stated that a technical analysis had been performed which satisfied immediate concerns for continued operation and this data was being assembled for the November 28, 1983 submittal. The technical analysis shows that the heat exchanger design, excluding the cast iron heads, was qualified for normal and emergency operating pressures. The cast iron heads, which cannot be analyzed except by complex analysis due to their configuration, have been hydrostatically tested to pressures greater than that experienced during normal or emergency operation.

Revision 3 to LER 50-296/83-26 dated November 21, 1983, submitted in response to the November 9, 1983 phone conference, stated that calculations of the rated pressures of the diesel generator cooler heat exchanger shell flanges, tube sheet and tubes was 180, 190, and 1200 psig. respectively, and that these pressures are greater than the maximum actual pressure experienced during an accident (135 psig., two EECW pumps starting on each header).

LER 50-296/83-26, Revision 4, dated November 25, 1983, which submitted the safety analysis to justify continued operation calculated that the heat exchanger head assembly bonnet flanges were rated 130 psig. which is below the 135 psig. experienced during accident conditions. To ensure satisfactory long term operation of the heat exchangers, throttle valves will be installed in the inlet piping of each set of heat exchangers (two heat exchangers arranged in series in each diesel generator engine cooler). These throttle valves will be used to set the EECW pressure to each heat exchanger at levels below the manufacturers design pressure of 75 psig. The schedule for completion of the modification is to have all eight diesel

generator engine coolers completed by August 1984. The diesel generators are being visually checked each day and documented in operating instructions until the modification is complete.

The licensee had not reported this design deficiency prior to this inspection although they were aware of the question of the adequacy of the DG/EECW heat exchanger design. Technical Specification 6.7.2.a(9) requires prompt notification upon discovery during plant life of conditions not specifically considered in the safety analysis report or Technical Specifications that require remedial action or corrective measures to prevent the existence or development of an unsafe condition. The licensee was informed that the failure to report, as required by Technical Specification 6.7.2.a(9), was a violation (50-259, 260, 296/83-55-01).

This design deficiency originated during the original design of the EECW system. 10 CFR 50, Appendix B, Criterion III, requires that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods or by the performance of a suitable testing program. The licensee was informed that the failure to provide adequate design control measures for verifying or checking the design was a violation (50-259, 260, 296/83-55-02).