



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

Report Nos.: 50-413/88-20 and 50-414/88-20

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

Docket Nos.: 50-413 and 50-414

License Nos.: NPF-35 and NPF-52

Facility Name: Catawba 1 and 2

Inspection Conducted: May 16-20, 1988

Inspector: S. E. Sparks 6/3/88
 S. E. Sparks | Date Signed

for S. E. Sparks 6/3/88
 P. A. Taylor | Date Signed

Approved by: Frank Jape 6/3/88
 Frank Jape, Section Chief | Date Signed
 Test Programs Section
 Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection was in the areas of emergency diesel generator operations and surveillance testing, maintenance, and corrective actions.

Results: The licensee has identified problem areas with diesel generator reliability, and has implemented ongoing activities and corrective actions in the form of increased preventative maintenance frequencies and design modifications aimed at improving reliability, Paragraph 2.

In the areas inspected, no violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *H. B. Barron, Superintendent, Operations
- W. Beaver, Performance Engineer
- L. Blankenship, Operations Engineer
- *M. Cote', Compliance Specialist
- W. Green, I&E Engineer
- R. McElwee, Supervisor, Mechanical Maintenance
- *T. Owen, Station Manager
- *R. F. Wardell, Superintendent, Technical Services

Other licensee employees contacted during this inspection included engineers, mechanics, technicians, and administrative personnel.

NRC Resident Inspectors

- *K. VanDoorn - Senior Resident Inspector
- *M. Lesser - Resident Inspector

*Attended exit interview

2. Complex Surveillance, Diesel Generator Reliability - Units 1 & 2 (61701)

The objective of this inspection was to review the licensee's diesel generator testing program, with emphasis placed on identifying corrective actions, if any, taken as a result of recent diesel generator failures. The inspection effort was divided into the following areas, each of which is addressed in separate report details:

- Review of Diesel Generator Testing Records
- Operations and Surveillance Testing
- Diesel Generator Maintenance and Corrective Actions
- Diesel Generator Inspection Requirements per License Amendment

a. Review of Diesel Generator Testing Records

The inspector reviewed portions of the testing logbooks for diesel generators (DG's) 1A, 1B, 2A, and 2B. The logs described all start attempts in sufficient detail to determine statistical validity. The purpose of each start attempt, i.e. operability performance test, trouble shooting test, or air roll test, was adequately identified. The testing logbooks reviewed appeared to be complete and up to date,

with one exception. The inspector questioned the classification of DG 1A Test #627 as an invalid failure. During this test, the licensee had begun the test to determine DG operability, in which performance test procedure PT/1/A/4350/02A, Diesel Generator "1A" Operability Test, was used. After DG 1A had been loaded for 14 minutes, it tripped on overcurrent, which is an emergency mode trip. Discussions with the licensee led to the reclassification of DG 1A Test #627 as a valid failure. The reclassification is consistent with Regulatory Guide 1.108, Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants. The licensee has revised the acceptance criteria of Operations Management Procedure OMP 2-28, Diesel Generator Logbook, which is used to classify DG start attempts. OMP 2-28 was revised such that once the operability performance test has begun (PT/1/A/4350/02A), the test is subject to normal success/failure criteria as identified in OMP 2-28.

Results of DG testing completed through May 19, 1988, revealed the following number of failures and therefore testing frequency per Technical Specification (TS) Table 4.8-1:

	Failures in last 100 tests	Failures in last 20 tests	Testing Frequency
DG 1A	8	5	*7 days
DG 1B	5	0	7 days
DG 2A	3	2	7 days
DG 2B	4	2	7 days

*At the time of the inspection, the licensee was voluntarily testing DG 1A once every 3 days, although TS Table 4.8-1 requires testing every seven days.

b. Operational and Surveillance Testing

The inspector witnessed DG 1A Start Attempt #700 and DG 1B Start Attempt #797. The controlling procedure for DG testing is PT/A/4350/02A, Diesel Generation "1A" Operability Test. The inspector verified that this procedure was in use at the time of the test for both DG 1A and 1B. Each DG started and accelerated to at least 441 RPM in ≤ 11 seconds, and voltage and frequency were at least 4150 ± 420 volts and 60 ± 1.2 Hz within eleven seconds after the start signal. Both DG's were started using a manual start signal. The inspector observed that the licensee delayed loading of the DG's approximately five minutes after the start signal to obtain equilibrium conditions. The licensee explained that this delay minimized induced stresses during startup. After this delay, the DG's were loaded to >5600 KW but < 5750 KW in ≤ 60 seconds after being synchronized, and operated for at least 60 minutes. The two DG

tests witnessed were correctly classified as valid successes. The operators observed during the tests seemed knowledgeable of acceptance criteria, limits and precautions, and recorded DG operating parameters per PT/1/A/4350/02A. The inspector performed a walkdown of the exterior portions of the starting air system, fuel system, lube oil system, as well as the diesel engine before and during the tests, and found the general appearance to be free of noticeable corrosion or wear.

In addition, the inspectors reviewed the completed test results for the 18 month diesel generator testing required by TS 4.8.1.2.g. This series of tests includes Engineering Safety Features (ESF) actuation with and without a loss of offsite power and a loss of offsite power only. Unit 1 testing was conducted in October 1987 and Unit 2 in December 1987, in accordance with PT-4200/09. Unit 2 testing did not document any diesel generator test failures. Unit 1 experienced four failures identified as pneumatic air control system pressure sensor - shuttle valve malfunctions associated with diesel generator low lube oil trip. Modification to these components were accomplished and the 18 month tests completed satisfactorily. The inspectors reviewed Unit 1 diesel generator load sequencer test results (PT 1/A/4350/04A) and inspected the sequencer panel. No discrepancies were identified.

c. DG Maintenance and Corrective Actions

Based on the inspectors review of DG Special Reports and discussions with licensee personnel, the licensee has experienced several recent DG failures which can be attributed to the starting air system. The starting air system also supplies instrument air for the pneumatic control system, which has also been a contributor to recent DG failures. The licensee had implemented several corrective actions aimed at improving the quality of the air in the starting air system, many which involve increasing maintenance activities. The inspectors verified the following corrective actions have been implemented:

- Increased blowdown frequency of the starting air system compressor aftercoolers from once to twice per shift. This is intended to reduce the amount of carryover moisture entering the air dryers.
- Increased preventative maintenance inspection and servicing of the starting air dryer, including the prefilter and afterfilter, from semi-annually to quarterly. In addition, the frequency of servicing the starting air dryer desiccant has been increased from annually to semi-annually.
- Increased frequency of testing dew point of air in the starting air receivers from semi-annually to weekly (however, the licensee's dew point instrument is currently being repaired and calibrated). In addition, oil and particulate monitoring of the air system is being performed weekly.

- The licensee is preparing a separate procedure for inspection of pneumatic trip valve internals on six month intervals.
- The licensee has installed per Nuclear Station Modification CN-11151/00 a nitrogen control air system for DG 1A due to the number of pneumatic air problems DG 1A has experienced. This modification consists of six nitrogen cylinders, pressure regulating valve, a filter, and associated piping and tubing. The cylinders supply nitrogen at 2500 psi which is controlled by the pressure regulating valve to provide 70 psi of control pressure. The nitrogen system is connected to a shuttle valve inside the control panel such that if the nitrogen system malfunctions, the shuttle valve automatically switches to a backup control air system, which is the normal air starting system. The nitrogen supply system is seismically qualified.

In addition, the licensee is currently evaluating alternative electrical DG trip systems for Emergency Mode trips (low-low lube oil pressure trip and engine overspeed trip), and for non-emergency mode trips.

The inspector also reviewed a 10 CFR Part 21 submittal from IMO Delaval Inc. regarding a potential problem with certain engine control devices in the air start, lube oil, jacket water, and crankcase systems. The components were manufactured by California Controls (Calcon), and include three air start valves, a low pressure lube oil trip sensor, a high temperature jacket water trip sensor, and high crankcase pressure trip sensor. IMO Delaval Inc. identified a failure in the implementation of their Quality Assurance program with regard to product testing in that there was no objective evidence that product testing was performed. The licensee has experienced DG trips on low-low lube oil pressure (an Emergency Mode trip), which were suspected of being caused by the Calcon pressure sensor. On May 7, 1988, a Calcon representative visited the licensee to investigate the pressure sensor problems. It was confirmed that a design flaw consisting of an improper tolerance stackup existed with certain pressure sensors. The flawed pressure sensors include (as indicated on pneumatic schematics CNM 1301.00-0031 and CNM 1301.00-0032) three low-low lube oil pressure sensors, one low-low lube oil trip switch, one low lube oil pressure sensor, one low turbocharger oil pressure sensor, and one turbocharger oil pressure sensor. These pressure sensors were subsequently replaced by the licensee with ones that did not contain the design flaw.

d. Diesel Generator Inspection Requirements per License Amendment

The inspector reviewed activities related to Amendment #18 of the Unit 2 Operating Licensee (NPF-52). This amendment contains additional requirements related to Transamerica Delaval Inc. (TDI) diesel engines in the inspection, maintenance, and surveillance area. The following activities were verified by the inspectors:

- Turbocharger rotor axial clearances were measured during the most recent Unit 2 refueling outage, and found to be in compliance with TDI/Elliott specifications under Work Requests 4352MNT (DG 2A) and 4359MNT (DG 2B).
- Spectrographic and ferrographic engine oil analysis are being performed monthly for all DG's (1A, 1B, 2A, 2B) to provide early evidence of bearing degradation. High copper levels could signify turbocharger thrust bearing degradation. However, no unusual copper levels have been found to date.
- Main Bearing No. 7 of DG 2B was disassembled and visually inspected during the last outage under Work Request 3799MNT. In addition, liquid penetrant testing was also performed per Work Request 5738MNT. No indications of bearing distress were found.

Within the areas inspected, no violations or deviations were found.

3. Exit Interview

The inspection scope and results were summarized on May 20, 1988, with those persons indicated in Paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.