



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

Report No.: 50-400/88-22

Licensee: Carolina Power and Light Company
 P. O. Box 1551
 Raleigh, NC 27602

Docket No.: 50-400

License No.: NPF-63

Facility Name: Harris

Inspection Conducted: August 1-6, 1988

Inspectors: P. A. Taylor 8-28-88
 P. A. Taylor Date Signed

P. A. Taylor 8-28-88
 for S. E. Sparks Date Signed

Approved by: Frank Jape 8/29/88
 F. Jape, Chief Date Signed
 Test Programs Section
 Engineering Branch
 Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection was conducted in the areas of Diesel Generator 18 months operability tests, diesel generator maintenance and reliability test and review of previous enforcement matters.

Results: The inspectors witnessed the operability testing of Train "A" diesel generator and its associated Engineered Safety Features (ESF). The test preparations, performance of procedure steps and data acquisition by operation personnel was noted to be thorough and well executed.

The licensee was receptive to NRC initiatives regarding improving test methods for determining total KW auto-connected loads on the diesel generators during loss of offsite power with and without safety injection actuation. Test and calculate what accident flow KW values would be for those ESF pumps that are in mini flow or recirculation mode during the test were incorporated into the test procedures (Paragraph 3).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *R. T. Biggerstaff, Principal Engineer, Onsite Nuclear Safety Unit
- *J. M. Collins, Operating Manager
- *C. S. Hinnant, Plant General Manager
 - V. McGraew, Shift Technical Advisor
 - R. Rhodes, Shift Technical Advisor
- *W. T. Shenton, Project Engineer, Maintenance
- *J. H. Smith, Operations Support Supervisor
- *F. E. Strekle, Project Specialist Quality Assurance
 - D. L. Tibbits, Director Regulatory Compliance
- *M. G. Wallace, Senior Specialist, Regulatory Compliance

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

NRC Resident Inspectors

W. Bradford
M. C. Shannon

*Attended exit interview

2. Diesel Generator Maintenance and Reliability (61701)(72701)

The inspectors reviewed the monthly surveillance testing procedure for Emergency Diesel Generator (EDG) testing, OST-1073, 1B-SB Emergency Diesel Generator Operability Test, Monthly Interval, Rev. 1. The procedure was found to contain the necessary test prerequisites, precautions and limitations, and acceptance criteria per Technical Specifications (TS) 4.8.1.1.2.a. OST-1073 is used in conjunction with OP-155, Diesel Generator Emergency Power System, Rev. 4, which is the controlling procedure for EDG operation. The inspectors also reviewed OPT-1510, Emergency Diesel Generators Daily Inspections/Checks, Rev. 0, which the licensee performs as recommended by the Transamerica Delaval Owners Group. This procedure is performed to verify emergency diesel generator main control board positions, tank levels, pump and valve status, and lube oil and jacket water temperatures. The licensee also performs TMM-400, Test Results Evaluation, Rev. 3, in which the engine operating parameters are trended. A review of the logs of EDG testing (after pre-op testing) completed through June 30, 1988, revealed that EDG 1A has had no failures in the last 43 valid tests, and EDG 1B has had one failure in the last 32 valid tests. Therefore, the testing frequency per TS remains every 31 days.

The inspectors performed a walkdown of the diesel fuel oil transfer system using Drawing Nos. CPL-2165-S-633S03, Rev. 3, and CPL-2165-S-0563, Rev. 5. The general condition of the system was found to be free of corrosion and deleterious materials, and was consistent with system drawings.

The inspector also reviewed the licensee's response to a recent 10 CFR 21 submittal from the diesel generator vendor, Transamerica Delaval Incorporated (TDI). The submittal involved a design flaw in the tolerance stackup for some pressure and temperature sensors of a specific model number. The sensors are used for the non-emergency mode lube oil pressure trip control, turbocharger lube oil pressure indication, and other diesel engine operating parameter indications. The licensee had evaluated the Part 21, and had removed from stock (a total of five) the sensors which may be affected and returned them to the manufacturer. The licensee did not remove any of the sensors already in service (four per diesel) as they have had no operational problems.

The inspectors reviewed the licensee's evaluation to I.E. Notice 86-73 regarding emergency diesel generator problems. The Notice identified a logic deficiency in Morrison-Knudson diesels which could prevent the EDGs from developing a voltage output when required in an emergency. The normal shutdown cycle of the Morrison-Knudson diesels includes a ten minute cooldown run of about 450 rpm. The logic is such that after output voltage has built up, the field flash circuitry is automatically disabled. Engine speed must decrease below 200 rpm to re-enable the field flash circuitry, thus no field flash would occur if an emergency start signal is received during the cooldown period due to the logic in the speed dependence of the field flash reset. The licensee's On-Site Nuclear Safety Unit (ONSU) evaluated the Notice, and concluded that their EDGs (TDI diesels) do not experience a reduced speed cooldown during the normal shutdown, and that the field flash circuit is designed such that field flash is available whenever needed for emergency operation. As such, no action was required. However, approximately nine months subsequent to the licensee's evaluation of I.E. Notice 86-73, TDI (the licensee's EDG vendor) issued a Part 21 regarding the above speed dependence of the field flash reset. This Part 21 was applicable to the licensee's EDGs. The licensee thus issued Plant Change Request PCR-1446 to reset the field flash based on an emergency start signal instead of the previous speed dependence. This PCR is planned to be completed during the current refueling outage.

The inspectors discussed the inadequacy of the ONSU's initial evaluation of I.E. Notice 86-73 with licensee management. Management concurred with the inspector in that their initial evaluation did not address the underlying concern, which was a potential failure for the EDGs to develop a voltage output. Management expressed a heightened awareness toward the importance of properly evaluating operational feedback information, including I.E. Notices, for applicability to their plant.



The inspectors also reviewed Plant Change Request PCR-2869, which involves a modification to be made later during the refueling outage of the existing 1B-SB EDG right bank intercooler adapter. The purpose of the modification is to provide a flexible connector at the point the adapter connects to the turbocharger. The existing adapter had developed a crack at the connecting weld which was developed during EDG operation. The licensee had learned through a TDI Owners Information Bulletin that this problem had been encountered previously with other licensees, and discussions with other plants has lead to the above design change. The inspector also reviewed the licensee's nuclear safety evaluation for design changes, and had no comments.

Within the areas inspected no violations or deviations were identified.

3. Eighteen Month Diesel Generator Operability Tests (61701)

a. Operational Surveillance Test (OST) Review

The inspectors reviewed the following OSTs:

- OST 1823, Rev. 2, 1ASA Emergency Diesel Generator Operability Test, Mode 5 and 6
- OST 1824, Rev. 2, 1ASB Emergency Diesel Generator Operability Test, Mode 5 and 6.

The above surveillance procedures were reviewed to verify that:

- The Technical Specification 4.8.1.1.2f 1-4, and 6-12 which identifies several operability tests have been incorporated into the surveillance procedures.
- The provided acceptance criteria is in accordance with the above Technical Specifications and prescribed a qualitative or quantitative results for determining the results of the test.
- The surveillance procedures had received appropriate levels of management review and approval.
- Appropriate plant conditions, prerequisites, precautions and test equipment are provided to support the detailed sections of the test.

Technical Specification 4.8.1.1.2.f.8 requires verifying that the auto-connected loads to each Diesel Generator (D/G) do not exceed the continuous rating of 6500KW. This technical specification is verified in OST 1823, 1824, Section 7.2, "Simulated Loss of Off-site power tests and again in Section 7.6 "Simulated Loss of Off-Site Power Inconjunction with a Safety Injection Signal Test. During these tests ESF auto-connected loads are sequenced on to the diesel



generator through the load sequencer in prescribed load groups. The KW loads on the diesel generator are read on the KW meter in the control room as well as on the brush recorder installed at the diesel generator panel.

During the above test the following pumps are in miniflow or recirculation alignment. This alignment provides reduced pump flowrates and less KW output from the pump motor than would normally be seen when these pumps are at accident flow conditions.

- Motor driven auxiliary feedwater pump
- Residual Heat Removal pump
- Changing/Safety Injection pumps

The licensee issued a temporary change to OST 1823, and OST 1824 which requires that the above pump motor amperage be measured during the tests and then be used to determine motor KW output. FSAR Table 8.3.1-2 which lists the KW value for ESF equipment under LOCA and safe shutdown conditions can then be used to determine, the KW change that needs to be added to the recorded diesel generator KW load. This action provides a more accurate account when verifying the continuous rating to be less than 6500KW. In addition, auto-connected loads which may not be available prior to the start of the test or which inadvertently do not sequence on to the diesel generator during the test will have to be accounted for with regards to verifying total KW loads on the diesel generators.

b. Surveillance Test Witnessing (61701)

The inspectors witnessed from the control room and from the Diesel Generator 1A-SA control panel the conduct of the following test from OST 1823, Rev. 2. 1A-SA Emergency Diesel Generator 18 Month Operability Test Modes 5 and 6.

- 7.2 This test simulates a loss of off-site power and verifies that the emergency buses de-energize, loads shed, diesel generator auto-starts and auto connected loads sequence on to the diesel generator with steady state voltage and frequency being maintained within prescribed tolerances.
- 7.3 Load reject tests at greater than 1878KW and between 6200-6400KW are conducted without tripping the diesel generator, or auto-connected loads and verify that voltage and frequency is capable of being maintained within prescribed tolerances.
- 7.4 24 hour diesel generator load test and shutdown
- 7.6 This test simulates a loss of off-site power inconjunction with a safety injection signal and a verification that parameter and condition are as noted in Section 7.2. above.



The inspectors also selected several prerequisite, initial conditions, and test equipment calibration to verify that they had been established and that test equipment was within required calibration frequency. Shift briefings on the test procedure was observed to be thorough and the data takers and operators duties and responsibilities during the test were discussed in detail.

The inspectors noted during the pre-test preparations that non-emergency mode trip annunciators for low lube oil pressure, and jacket water temperature had been tagged out. These areas were decided to be visually monitored during the test locally at the diesel generator panel by operating personnel.

Test observation of the above test indicated satisfactory results; however, final evaluation will depend on a detail analysis of brush recorder charts which monitored the diesel generator parameters.

OST 1823 and 1824 requires a incremental unloading of the diesel generator following the completion of the 24 hours test (Tech. Spec. 4.8.1.1.2.f.7). The load is decreased from 6200 - 6400KW to 500KW in approximately 20 minutes, and at 500 KW the diesel generator output breaker is open and the engine is shutdown. As required by Technical Specification 4.8.1.1.2.f.7 a loss of offsite power with a safety injection actuation (Loop/SI) was then initiated. The time interval between opening the diesel generator output breaker and initiating the Loop/SI test was approximately 2-3 minutes. The licensee requested an interpretation of the intent of Technical Specification 4.8.1.1.2.f.7 which states that; within five minutes after completing this 24 hour test perform the LOOP/SI test.

On August 11, 1988, a conference call between P. Taylor of Region II and J. Knight of NRR was held to discuss the above test method. The shutdown of the diesel generator is considered a part of completing the 24 hour test. The licensee was provided this information.

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

4. Action On Previous Inspection Findings (92701)

(Closed) 400/86-88-01, Inadequate Preoperational Testing of ESF Components. The following ESF components were determine not to have been adequately tested during preoperational testing: SN and SM relay circuitry which is designed to trip open Diesel Generator output breaker upon receiving and S.I. signal when closed and connected to offsite power; the PX blocking relays on 1A-SA, and 1B-SB sequencer panel; and the 27UV blocking relay for 6.9KV and 480V emergency buses.

The licensee identified and corrected wiring errors associated with the SM Relay. OST 1823 and OST 1824 test results were received by the inspectors to verify that the SM relay functions to trip the diesel generator breaker open when it is tied to the grid and an SI signal is initiated.



EPT-033, Attachment 8.4 test results was reviewed and verified that 270V blocking relay for the 6.9KV and 480V emergency buses functioned satisfactorily following correction of wiring errors.

The PX blocking relays for the 1A-SA and 1B-SB sequencer incorporated a design change to eliminate relay racing. The inspectors reviewed the test results of EPT-033, EPT-029T and EPT-030T and PX blocking relays functioned to prevent ESF components from actuating during testing at the sequencer test panels.

5. Exit Interview

The inspection scope and results were summarized on August 6, 1988, with those persons indicated in Paragraph 1. The inspectors 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.

The licensee committed to issuing permanent revisions to OST-1823 and OST-1824 which will require to test and calculate KW value for motor driven pumps in mini flow or recirculation alignment during the test and determine the KW change that needs to be added to the recorded diesel generator KW load. The revision should also account for auto-connected loads which may not be available prior to the test, which may not sequence on or trip during the test in order to obtain a total KW profile for the diesel generator.