



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

DEC 28 1992

Report No: 50-261/92-32

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

Docket No.: 50-261

License No.: DPR-23

Facility Name: H.B. Robinson

Inspection Conducted: December 7-11, 1992

Inspectors: M. N. Miller
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12/21/92
 Date Signed

L. R. Moore
 L. R. Moore

12/22/92
 Date Signed

Accompanying Personnel: N. Salgado

Approved by: Milton B. Shymlock for
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 Plant Systems Section
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12/28/92
 Date Signed

SUMMARY

Scope:

This special announced inspection was conducted to assess the adequacy of the licensee's corrective actions for safety significant NRC findings and other concerns identified during the Electrical Distribution System Functional Inspection (EDSFI) (NRC Report No. 50-261/91-21).

Results:

In the areas inspected, violations or deviations were not identified. Although corrective actions for all findings were not completed, the licensee's response to the EDSFI findings and other concerns was fully satisfactory. Of the nine findings identified during the EDSFI two remain open, 91-21-03 and 91-21-09. The licensee has made adequate progress towards resolving both of these findings.

Strengths:

The licensee's electrical systems engineers in the on-site Technical Support Group and the electrical design engineers in the corporate Nuclear Engineering Department were very knowledgeable and exhibited their concerns for resolving the EDSFI findings and enhancing the electrical systems in the plant.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *G. Attarian, Manager - Electrical, Nuclear Engineering Department
- *D. Baur, Senior Specialist, Regulatory Compliance
- *S. Billing, Technical Aide, Regulatory Compliance
- *P. Binuya, Senior Engineer - Electrical, Technical Support
- *R. Chambers, Plant General Manager
- *G. Clark, Manager, Maintenance
- *C. Coffman, Senior Engineer - Electrical, Technical Support
- *W. Hammond, Engineer, Quality Assurance
- *B. Hynds, Project Engineer, Nuclear Engineering Department
- *G. Kirven, Senior Engineer, Technical Support
- *A. McCauley, Manager - Electrical, Technical Support
- *R. Parsons, Manager, Nuclear Performance Analysis

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

Other NRC employee:

- *C. Ogle, Resident Inspector

*Attended Exit Interview

Acronyms and initialisms used throughout this report are listed in paragraph 4.

2. Electrical Distribution System Follow-up Inspection (2515/111)

This inspection assessed the adequacy of the licensee's corrective actions for both safety significant findings and other team concerns identified during the EDSFI conducted September 23 - October 25, 1991.

Initially, the licensee responded to the EDSFI findings (NRC Report 50-261/91-21) by letter dated March 9, 1992. The licensee also responded to one finding that was identified as a deviation by letter dated January 31, 1992. In the March 9, 1992 letter, the licensee addressed the findings, stated their position, determined the safety significance, specified the actions to be taken, and the date the actions would be completed. The items addressed in both letters were reviewed by the inspectors to verify implementation of the licensee's corrective actions.

Overall, the licensee's response to the EDSFI findings and teams concerns was fully satisfactory although several items were not completed. The licensee indicated that several of these items could only be implemented during the refueling outages. One of the findings not closed is under review by the NRC staff. The inspectors determined that the licensee was implementing appropriate corrective action in a reasonable and timely manner.

The following paragraphs a. through i. address the EDSFI concerns discussed in the report and paragraphs j. through r. address the EDSFI findings. The first part of each paragraph addresses the EDSFI concern or finding. The second part of each paragraph discusses the results of this inspection.

a. Degraded Grid Voltage Protection

The degraded grid voltage was discussed in paragraph 2.2.2 of the EDSFI report. The EDSFI team was concerned with the protection relay setpoints. At that time the licensee was performing an analysis to determine an appropriate setpoint upon which a Technical Specification (TS) Change Request would be submitted to the NRC. The EDSFI team concluded this issue was adequately addressed.

The inspector verified that engineering had completed, Engineering Evaluation Of Proposed Degraded Grid Voltage Relay Drop Out and Reset Setpoints Analysis, I.D. EE107-CS-46 dated November 3, 1992. The modification package and TS Change Request to implement the setpoint changes were being reviewed for management approval. In addition, a new AC loop calculation was in progress for determining AC loop voltage requirements to comply with current Nuclear Engineering Department (NED) Design Guide requirements. Pending the results of this calculation a decision will be made for the appropriate setpoints. The licensee indicated the setpoint changes will be implemented during refueling outage RFO No. 15 or RFO No. 16. The inspectors considered this proposal appropriate. This item was closed.

b. Fast Bus Transfer

The fast bus transfer was discussed in paragraph 2.3.3 of the EDSFI report. The EDSFI team determined the fast bus transfer scheme was adequate. However, there was a concern that the scheme had not been analyzed for excessive voltages between the auxiliary load bus and the incoming power source. The licensee authorized EBASCO to perform a bus transfer dynamic simulation study.

The inspector reviewed the completed EBASCO BUS TRANSFER STUDY dated July 1992 and found it to be acceptable. The study specifically indicated that motors were not subjected to excessive inrush currents and transient torques; the motors could re-accelerate to normal operating speed following a fast bus transfer; and the transformers were not subjected to excessive inrush current following a fast bus transfer. This item was closed.

c. Static And Dynamic Loading

The loading of the 208 VAC buses was discussed in paragraph 2.4.1 of the EDSFI report. The EDSFI team identified that the 208 VAC buses dropped below acceptance criteria during the emergency diesel generator (EDG) loading sequence. The licensee stated that this was a transient dip and therefore motors on the buses would not stop operating; however, engineering was planning to install new transformers with taps to rectify this condition.

The licensee stated Calculation RNP-E-8.016 indicated that the transient voltage dip for motor control centers MCC 9 and MCC 10 was exceeded only when a large "fictitious" margin load was modeled for each EDG. Calculation EE-107-CS-39 demonstrated that with the "fictitious" load reduced, the criteria was not exceeded. The licensee indicated that there were several parallel projects investigating methods for improving emergency power systems voltage regulation. The licensee indicated that either voltage regulators off the 4160 V buses would be added or new transformers with taps for the 208 VAC buses and MCCs 9 and 10 would be added or both if needed. The inspector reviewed the calculations and discussed these concerns with the engineering staff. Although there was no safety concern at the present time, the inspector agreed with the licensee's staff that voltage regulation would be needed to improved and provide additional loading margin for future load growth. This item was closed.

d. Class 1E Low Voltage AC System

The Class 1E 120 VAC system was discussed in paragraph 2.5 of the EDSFI report. The EDSFI team identified minor deficiencies such as the method for establishing channel loading. The licensee relied on measuring loads instead of using manufacturer's data. Secondly, the minimum voltages for devices had not been determined. The licensee stated that an instrument bus upgrade project was underway which would address these deficiencies and the overall configuration of the system.

The inspector discussed these minor concerns and reviewed the licensee's plans and analysis for upgrading the 120 VAC systems. Analysis I. D. RNP-E-1.003, Revision 2, dated August 4, 1992 Instrument Bus Channel Loading, that contained the calculation for loading was reviewed by the inspector. The inspector determined the revised calculation indicated existing loading was not a problem and there was no safety concern at the present time. However, the inspectors agreed with the licensee that upgrading the 120 VAC system would an enhancement to improve and provide additional loading margin for future load growth. This item was closed.

e. Containment Electrical Penetrations

Containment electrical penetrations were discussed in paragraph 2.7 of the EDSFI report. The EDSFI team noted that the licensee's DBR project included a study that would assess all electrical penetrations. The

team reviewed a preliminary first copy of the scope of the work document for assessing the need to upgrade the penetrations.

The inspectors reviewed the licensee's finalized plans to assess the need for upgrading containment electrical penetrations. This included reviewing new calculation RNP-E-5.030, Revision 0, dated July 1, 1992, Crouse-Hinds Electrical Penetration Ampacity, Short Circuit, And Heat Generation Calculation for safety related equipment. The licensee stated that all penetrations for safety related equipment had been completed. Non-safety related equipment would be identified during the first quarter of 1993 and placed on the upcoming refueling outage plan. During RFO No. 15 this non-safety equipment would be walked down to obtain nameplate data such as full load current and the power rating. An analysis would be performed using the data obtained from the walkdown. The electrical penetration upgrades would be completed by the end of 1994. The inspectors considered this approach for upgrading the penetrations for non-safety related equipment appropriate. This item was closed.

f. Grounding of AC Systems

The grounding of the AC electrical systems was discussed in paragraph 2.8 of the EDSFI report. The licensee informed the EDSFI team that the Class 1E AC systems would be analyzed as an element of the DBR project. This analysis would determine if the original design was adequate.

The inspectors reviewed the preliminary analysis performed under system EH Calculation Type 5145, Analysis For Electrical Distribution System Neutral Grounding Resistor/Transformer Sizing. This analysis had not been approved, however, it appeared to be complete. Since the preliminary analysis indicated further evaluations were needed, this item will remain open.

g. Electrical Drawings

Electrical drawings were discussed in paragraphs 4.1 and 4.2 of the EDSFI report. The licensee did not have one-line drawings at the time of the EDSFI. The electrical drawings used by the EDSFI team for walkdowns had several minor errors and were difficult to use. The licensee agreed that the electrical drawings needed to be upgraded and stated that one-line drawings were being developed.

The inspectors reviewed the new one-line drawings G-190626, Sheet 1, Main & 4160 Volt One Line Diagram; Sheet 2, 480 & 120/208 Volt One-Line Diagram; Sheet 3, 125V DC & 120V Vital AC One Line Diagram. The drawings were considered to be satisfactory. This item was closed.

h. Maintenance Procedure check Lists

The maintenance check lists were discussed in paragraph 4.3.2 of the EDSFI report. The EDSFI team identified that brief check lists were still being used in the maintenance procedures to specify required work.

The Maintenance Team also identified this same concern as a weakness in NRC Inspection Report 50-261/90-10 dated August 9, 1990.

The licensee stated the "check lists" are being removed in the new procedures that are being developed in the Procedure Upgrade Program. The inspectors reviewed three new upgraded procedures to verify that the "check lists" are no longer being used. The procedures reviewed were PM-408, Bridging And Meggering Pressurizer Heaters; PIC-806, Westinghouse Type KF Underfrequency Relay; and MST-201, 4KV Undervoltage Test-Auto Start Of Steam Driven Auxiliary Feedwater System. The inspectors considered this corrective action appropriate. This item was closed.

i. Fuse Control Program

The fuse control program was discussed in paragraph 4.3.2 of the EDSFI report. During the EDSFI the licensee was in the process of developing a fuse control program. The licensee stated the fuse control program would be completed for the next RFO scheduled in the Spring of 1992.

The inspectors reviewed the completed fuse control program developed by the Nuclear Engineering Department. The inspectors considered the fuse control program to be very good. It not only included the normal requirements of listing the fuses, sizes, manufacturer, location, Q rating, and substitutes; it also contain engineering information, and referenced the design calculations. The fuse program included a) NED Design Guide, b) Fuse Control Program Procedure, c) Master Fuse List, and d) NED Calculcations. This item was closed.

j. Finding 91-21-01: Inadequate Coordination Between Safety and Non-Safety Circuit Breakers on the 120 VAC Vital Bus System (para. 2.5)

Inadequate coordination was discussed in paragraph 2.5 of the EDSFI report. The EDSFI team noted that the supplies to instrument buses IB7 and IB9, from instrument buses IB2 and IB4 respectively, were through 30A circuit breakers. The non-safety loads connected to IB7 and IB9 were also through 30A circuit breakers. The EDSFI team postulated that in the event of an earthquake both non-safety loads could fail short circuit. Because of lack of coordination, the feeder breakers could trip resulting in the de-energization of both IB7 and IB9.

The inspectors reviewed new calculation RNP-E-1.025, 120 VAC Instrumentation Bus Coordination, dated June 25, 1992, to determine if the licensee had resolved the coordination problem. In addition, the inspectors conducted a walkdown inspection to verify that the 30A circuit breakers in Circuit 11 of Bus IB2 and Circuit 12 of Bus IB4 were replaced with 50A breakers as specified in RNP-E-1.025 and plant modification M-1119. The inpectors considered the licensee's corrective action appropriate and timely. This finding was closed.

- k. (Closed) URI 92-21-02: Marginal Service Water Flow Rate to Diesels for 110% Power (para. 3.4)

This unresolved item (and finding) addressed an apparent deficiency in service water cooling flow to the EDGs during a LOCA when the EDGs operate for a short period in the range of 100 to 110 percent of rated power. The manufacturer recommended service water flows of 700 gpm at 110 percent power and 600 gpm at 100 percent rated power. Previous plant testing determined a flow of 550 gpm would be available. The licensee had accomplished an analysis which concluded that this flow was adequate for all EDG operating conditions, although the jacket water system would be operating in the alarm range at 110 percent of rated power. The EDSFI team challenged an assumption in the analysis which would compromise the conclusion that 550 gpm service water flow was adequate. The assumption, that EDG heat exchangers experienced ideal performance characteristics, was not validated and did not account for equipment degradation since 1969. The team's concern was that the operating margin available due to operation in the alarm range would be eroded by inadequacies in this assumption of ideal heat exchanger performance.

The licensee's response to the EDSFI, dated March 9, 1992, stated the ideal heat exchanger assumption would be further evaluated. Additionally, an analysis of EDG operation at elevated service water temperatures would be accomplished. The inspector concluded that the heat exchanger evaluation did not adequately validate this assumption. However, the calculation for elevated service water temperatures determined that the operational margin was larger than the margin previously analyzed. This increased margin would more adequately compensate for inaccuracies in the ideal heat exchanger performance assumption.

Calculation RNP-M/MECH-1189, CP&L Robinson Plant Emergency Diesel Evaluation with Elevated SW, Revision 1, concluded, that at service water inlet temperature of 95 degrees F and 505 gpm, the EDG would operate at 110 percent rated power with jacket water temperature in the alarm range. The licensee provided documentation which verified that the EDG vender, Coltec Industries Inc., concurred that this operating condition was acceptable. The 505 gpm SW flow used in this calculation provided additional operational margin with respect to the measured 550 gpm flow measured in the plant. The inspectors concluded this concern had been adequately resolved.

- l. (Open) URI 91-21-03: E1/E2 Equipment Room Ambient Conditions Not Evaluated (para 3.5)

This unresolved item (and finding) addressed the effect of potential high ambient temperatures in a space which contains safety related electrical equipment. The licensee's 480 VAC safety related buses, E1 and E2, were located in a single equipment space. Equipment in this

room included safety related buses, breakers, transformers, and inverters for vital control power, and reactor protection and safeguards logic cabinets. Ventilation for this room was not a safety related load and therefore would be lost during a loss of offsite power. The licensee had not analyzed the potential ambient temperatures in this room on loss of ventilation and the related impact on safety related electrical equipment.

During the EDSFI the licensee provided two evaluations using separate input data for the equipment heat loads which yielded a wide variation in resulting conclusions. The input heat load values based on industry standard references resulted in higher ambient temperatures in a shorter time period than values from informal testing in 1985. The licensee indicated they would accomplish heat load testing for the space in a more controlled manner to resolve the differences in heat loading values. Additionally, the room equipment would be evaluated for impact due to the calculated ambient temperatures resulting from the tested values.

The testing was completed on October 30, 1992. The information was used to estimate the ambient temperatures in the space following a LOCA with a LOOP. The analysis indicated the ambient temperatures would approach 122 degrees F in 7 hours. During this inspection the licensee was in the process of completing an impact evaluation on electrical equipment in this space at 125 degrees F (50 C). With approximately 70 percent of the equipment evaluated, the impact on equipment operation was minor, i.e. slight derating of equipment which commonly was used in applications far below rated capacities.

This unresolved item remains open pending completion of impact evaluations due to ambient temperatures above rated values for equipment in this space. Additionally, the licensee indicated they would evaluate actions to notify operators of the need to monitor E1/E2 ambient temperatures during a LOCA with a LOOP.

m. Finding 91-21-04: Corrosion Protection of Underground Fuel Oil Piping (para. 3.6.2)

The licensee's system to protect underground fuel oil piping from galvanic corrosion had operated with indeterminate effectiveness over the past 7 years. They had initiated actions to upgrade the cathodic protection system and plant technical knowledge of the system. However, no action had been initiated to determine if the piping had degraded during the time period when the piping may not have been protected from galvanic corrosion.

The licensee accomplished a sample inspection of the EDG fuel oil underground piping on March 27 and May 20, 1992. The piping examination demonstrated the piping coating was intact with no detectable piping degradation. The licensee concluded from this sample that the underground fuel oil piping had not degraded by galvanic corrosion. The licensee completed a hardware upgrade of the system and was establishing

base line operating parameters during this inspection. In discussions with the inspectors, the technical staff demonstrated a good knowledge level of the system operation and design. The inspectors concluded the licensee had accomplished appropriate actions to verify the integrity of the underground fuel oil piping and had upgraded the cathodic protection system to an operable status. This item was closed.

n. (Closed) Deviation 91-21-05: Fuel Oil Sampling Methodology
(para.3.6.2)

The licensee's method for obtaining a sample of fuel oil from the storage tank was not in accordance with the methodology of the applicable industry standard to which the licensee was committed. No evaluation was documented to justify this deviation from the specified methodology. It was not apparent that the method used by the licensee obtained a representative sample of the tank.

The licensee's response to the deviation, dated January 31, 1992, stated that samples would be obtained using both the plant practice and the methodology recommended by the industry standard. Chemical analysis of these samples would demonstrate if the sample methodologies were equivalent. The licensee accomplished 5 dual samples during the first quarter of 1992. Chemical analysis yielded virtually identical results for tested properties, indicating the methodologies were equivalent. This testing provided justification for the licensee to obtain fuel oil storage tank samples by their existing methodology.

o. Finding 91-21-06: Poor Maintenance Practices (para. 4.2)

Two examples of poor maintenance practices were identified by the EDSFI team. First, a number of spare electrical cables, leads, wires, and conductors' ends were not securely taped to last for the life of the plant. In several instances, the tape appeared to be loose and ready to fall off exposing bare conductors. These potential bare conductors could short to other circuits causing more damage. The second poor practice was that the labels in the plant did not always agree with the drawings or plant procedures. The licensee recognized these conditions at the time of the EDSFI and started to initiate corrective action.

The inspectors verified the licensee had implemented appropriate corrective action by conducting walkdown inspections of the electrical panels, motor control centers, and switchgear. In addition, the licensee has implemented a Label Upgrade Program to identify and correct labels in the plant for all equipment, not just electrical. The inspectors considered the licensee's corrective action satisfactory. This finding was closed.

- p. Finding 91-21-07: The Motor Starters For Motor Operated RHR Valves 744A And 744B Are Undersized.
(para. 4.2)

The EDSFI team identified that the motor starters for RHR Valve 744A in MCC 5, Compartment 1J and RHR Valve 744B in MCC 6, Compartment 12J were size 1 and appeared to be undersized for their load. The licensee verified that the size 1 motor starters were undersized and agreed to replace them with size 2 starters.

The inspectors conducted a walkdown inspection of MCC 5 Compartment 1J and MCC 6 Compartment 12J verifying that the size 2 motor starters were installed. This finding was closed.

- q. Finding 91-21-08: Undetectable Failure Mechanism on MOVs
(para. 4.2)

The EDSFI team identified that there is no indication provided to plant operators to detect a tripped overload relay in a motor starter circuit. The licensee agreed. The licensee was requested to address this concern by the EDSFI team. The licensee initiated an adverse condition report (ACR) to investigate this concern. The licensee stated the MOV circuits were original plant design and did not represent an operability concern.

The licensee discussed this concern with the inspectors and stated that the existing MOV design was acceptable. No general design criteria or standard could be identified which specifies the exact wiring configuration of the thermal overload contact. However, the licensee stated that operators and maintenance personnel will be trained to be aware of the "undetectable failure" mode. The inspectors informed the licensee that this finding will be closed.

- r. (Open) URI 91-21-09: EDGs Not Tested at Name Plate Rating as Required by TS 4.6.1.1 (para. 4.3.3)

This unresolved item (and finding) addressed the licensee's surveillance testing of the EDGs. The EDSFI team identified that the EDGs had not been tested at nameplate rating as stated in TS 4.6.1.1. The existing EDG surveillance testing procedures OST 401 and OST 409 specified that the EDG be loaded to 2500KW, but did not require this loading at 80 percent power factor and 3125 kVA as specified on the nameplate. On December 9, 1991 the licensee attempted to perform a revised OST 401 test at 3125 kVA, and had to terminate the test because it caused very high terminal voltages on equipment due to light loading on the emergency E-1 bus. It was not the NRC intentions to cause the licensee to push test conditions to the point of causing equipment damage. Therefore the correct intention of the TS surveillance requirement needed further review by both the NRC staff and the licensee.

The inspectors held discussions with the licensee's engineering staff to determine what efforts and progress had been accomplished. The licensee had implemented plant improvement request PCN-025/00, Develop An EDG kVA Test Procedure, to develop a new testing procedure for the EDGs. The new surveillance procedure is to be developed in January 1993. The testing will then be conducted during the next refueling outage RFO No. 15. The licensee also was planning to apply for a TS amendment to clarify the existing requirements. The inspectors informed the licensee that the NRC staff review for determining the TS requirements had not been completed. This unresolved item (finding) will remain open for further review.

3. Exit Interview

The inspection scope and results were summarized on December 11, 1992, 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.

4. ACRONYMS AND ABBREVIATIONS

A	Amperes
ACR	Adverse Condition Report
C	Celsius
DBR	Design Base Reconstitution
EBASCO	Licensee Architect-Engineer
EDG	Emergency Diesel Generator
EDSFI	Electrical Distribution System Functional Inspection
F	Fahrenheit
GPM	Gallons Per Minute
KW	Kilowatts
kV	Kilovolts
kVA	Kilovolt-amperes
LOCA	Loss of Coolant Accident
LOOP	Loss of Off-site Power
MCC	Motor Control Center
MOV	Motor Operated Valve
NED	Nuclear Engineering Department
NRC	Nuclear Regulatory Commission
RFO	Refueling Outage
RHR	Residual Heat Removal
RNP	Robinson Nuclear Plant
SW	Service Water
TS	Technical Specifications
URI	Unresolved Item
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current