



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

Report No.: 50-261/91-12

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: March 25 through March 29, 1991

Inspector: Fanny S. Mellen 4/18/91  
L. Mellen Date Signed

NRC Team Members:

R. Rapp  
L. Trocine

Approved by: B. Breslau 4/18/91  
B. Breslau, Chief Date Signed  
Operational Programs Section  
Division of Reactor Safety

SUMMARY

Scope: This was a routine announced follow-up inspection. Its purpose was to verify that corrective actions for previous findings were adequate.

Results: The inspectors found that the licensee had adequately addressed the previous inspection findings for the items closed. The licensee's resolution of previous inspection findings was technically adequate.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*R. Barnett, Manager Outages and Modifications
- \*S. Barrett, Nuclear Assessment
- \*C. Baucom, Regulatory Compliance
  - S. Billings, Regulatory Compliance
- \*R. Chamber, Unit 2 Operations Manager
- \*R. Crook, Senior Specialist - Regulatory Compliance
  - L. Dutton, Administration
- \*B. Harward, Technical Support
  - J. Klusterman, Manager - Regulatory Compliance
  - T. Lewis, Senior Engineer
- \*A. Padgett, Manager E&RC
  - E. Paine, Plant Support
  - H. Phillips, Senior Engineer
- \*W. Powell, Nuclear Engineering Design - Onsite
- \*J. Sheppard, General Manager
- \*E. Shoemaker, Project Engineer
- \*R. Smith, Manager Maintenance
- \*R. Steele, Manager - Maintenance Support

Other licensee employees contacted included operators, trainers, and office personnel.

#### NRC Resident Inspectors

- \*L. Garner, Senior Resident Inspector
- K. Jury, Resident Inspector

\*Attended exit interview on March 28, 1991.

### 2. Follow up On Previously Identified Items (92701)

- a. (Open) Violation 50-261/89-11-01, Auxiliary Feedwater System Inoperable Due to Inadequate Net Positive Suction Head.

The licensee revised several administrative programs to prevent recurrence of unaddressed safety concerns. The licensee's technical analysis of this violation was previously reviewed by the Resident Inspector. The inspectors reviewed two new procedures, OMM-39, Operability Determination, Revision 1, and PLP-10, Nuclear Plant Prioritization Program, Revision 2. These procedures were implemented as part of the corrective actions to this violation. The inspector's review of the effectiveness of these procedures was

inconclusive due to the fact that the programs had only recently been implemented.

Procedure OMM-39 provided the operations staff with detailed procedural guidance on how to determine if a specific component or system meets operability requirements. The review indicated several weaknesses. The procedure allowed equipment with suspect operability to remain as operable until proven inoperable. This is significant because an operability determination could take as long as six days if an engineering evaluation was necessary. An engineering evaluation was required if inoperability could not be determined immediately. This evaluation was to be completed within 72 hours but could be extended by an additional 72 hours if the evaluation could not be completed within that time.

Procedure PLP-10 provided direction on how to determine the significance of an issue based on plant safety. The initiator would answer a series of questions and, based on those answers, a priority of one to 51 would be assigned. A priority of one required immediate attention while a priority of 51 required no action at all. After reviewing this procedure, the inspectors found the methodology was overly complicated and tended to decrease the significance of an identified concern. The system allowed all plant personnel to initiate an item for the plant prioritization system, however there was no formal training on how to prioritize an item or how to conduct a review. Additionally, there were no requirements that all prioritized items be included in the plant-wide schedule. There was no required review or priority migration based on an items age. This would result in low priority items accumulating reducing the effectiveness of the program. The licensee was establishing a plant-wide computer system specifically for this program to allow for easier access by both plant staff and management. This program was made affective in June 1990, with full computer-based implementation by December 1991.

This item will remain open until the prioritization and operability determination programs have been in effect long enough to evaluate the programs' effectiveness.

- b. (Closed) Violation 50-261/89-11-03, Component Cooling Water Heat Exchanger Plugging Performance Without the Required 10 CFR 50.59 Review.

This violation involved the plugging of a number of tubes in each Component Cooling Water heat exchanger

without preparing the required safety evaluation, resulting in changes to the heat transfer characteristics of the Component Cooling Water heat exchangers as described in the Final Safety Analysis Report. The licensee's immediate corrective actions for this violation included the establishment of an analytical basis for the required Component Cooling Water heat transfer capability and the quantification and documentation of the effect of the tube plugging on this heat transfer requirement. Additional corrective actions included the provision of a documented basis for future tube plugging by revision of Corrective Maintenance Procedure CM-201, Safety-Related Heat Exchanger Maintenance, Revision 5, to require the notification of the System Engineer for plug mapping and plug type prior to performance of tube plugging activities. In order to document the ability of the Component Cooling Water heat exchangers to meet design requirements for both normal and accident conditions, the licensee also performed an additional review of the results of the preliminary calculations, enhanced them as needed, and developed them into formalized calculations.

These actions were reviewed during this inspection and during a previous NRC inspection documented in NRC Inspection Report No. 50-261/90-06. During the previous inspection, it was determined that the licensee's actions with regard to the procedure revision were insufficient to prevent recurrence of a similar situation because the revision did not reflect the requirement for the performance of an engineering safety evaluation to determine the maximum number of tubes that may be plugged prior to the heat exchangers becoming degraded to a point where they fail to meet their design criteria. The licensee's October 16, 1989, response to this violation indicated that the applicable maintenance procedure would be revised to either incorporate a specific tube plugging limit or to have the System Engineer contacted to evaluate the acceptability of plugging a given number of tubes in a specific safety-related heat exchanger. This procedure (CM-201) has since been revised (Revision 9 effective February 26, 1991) to incorporate the requirement for the adherence to or the establishment of a tube plugging limit. The revised procedure also no longer included the requirement for the notification of the System Engineer for plug mapping and plug type prior to the performance of tube plugging activities. This procedure revision still referred to the Component Cooling Water heat exchanger tubes as admiralty brass tubes in lieu of the new 90/10 copper nickel. (Refer

to the discussion below for more information on the new 90/10 copper nickel tubes.) This discrepancy will be corrected during the next procedure revision and will be tracked via Attachment 7.3 of Maintenance Instruction MI-018-2, Procedure Validation, dated March 27, 1991.

In addition to the above actions, the licensee developed a Technical Support Plan for upgrade of the "A" and "B" Component Cooling Water heat exchangers. This plan was documented in a memorandum dated May 7, 1990. It summarized the history of the problems as well as the status of the subject equipment. It also recommended a plan to perform a more thorough root cause investigation of the tube failures during the 1990 refueling outage rather than proceeding with replacement of these units during the 1990 outage. A decision on a course of action would then be made based on the results of the investigation.

During the 1990 refueling outage, the Metallurgical Services Section performed an analysis of the "A" and "B" heat exchangers (Project No. 90-313) and determined that the tube failures were due to the following factors:

- 1) Galvanic corrosion between the carbon steel tube sheet and admiralty brass tubes,
- 2) Erosion/corrosion arising from turbulent flow of corrosive fluids (caused by naturally corrosive lake water which is also treated with sodium hypochlorite) on the channel head, and
- 3) Fatigue failure arising from cyclic loading (caused from poor design or tube installation).

As a result of this investigation, a decision was made to refurbish both the "A" and "B" Component Cooling Water heat exchangers during the 1990 refueling outage. This was performed under procedure CM-201 and was augmented by actions recommended by Engineering. Evaluation No. EE-093, Special Procedure for Expanded Maintenance and Repair of Component Cooling Water Heat Exchangers "A" and "B." Refurbishment items included the replacement of all Component Cooling Water heat exchanger tubes with a more corrosion/erosion resistant 90/10 copper nickel alloy. The tubesheets and channel heads were also grit blasted and coated with a metallic epoxy. An actual heat balance to revalidate the Component Cooling Water heat exchangers has not yet been performed, but one was scheduled to be performed

during the next two or three weeks via Engineering Surveillance Test Number 103. This action is being tracked on the Work Management System as item Number 4053.

Engineering Evaluation Number 90-093, Revision 1, identified that the overall thermal performance of the heat exchangers with the 90/10 copper nickel tubes versus the original admiralty brass tubes would be reduced by approximately 1.5 percent. Calculation RNP-MN/MECH-1112, Analysis for Component Cooling Water Heat Exchanger Heat Transfer With 90/10 Tubes, Revision 0, was used to demonstrate that the lower thermal conductivity of the 90/10 copper nickel tubing resulted in the 1.5 percent lower heat transfer rate at design temperatures and flow rates on the shell and tube sides of the Component Cooling Water heat exchangers. Calculation RNP-M/MECH-1074, Analysis for Effect of Tube Plugging on Component Cooling Water Heat Exchanger and System Performance, Revision 0, was used to evaluate the effects of tube plugging on the performance of the Component Cooling Water heat exchangers and Component Cooling Water system. This calculation showed that the Component Cooling Water heat exchangers could perform their design function and meet their operational requirements with up to 300 tubes plugged in each heat exchanger and that the system limitation for the Component Cooling Water heat exchangers to perform their safety-related function was 7 percent lower than the design operating point of  $29.4 \times 10^6$  BTU/hour. The licensee was performing an analysis similar to Calculation RNP-M/MECH-1074 in order to determine the new tube plugging limit of the Component Cooling Water heat exchangers with the 90/10 copper nickel tubes and to establish the margin of safety. This action was being tracked as item Number 2 on the Required Actions List for Engineering Evaluation Number 90-093. The current completion goal for this item is April 1991. The third item on this tracking list involved the revision of the Final Safety Analysis Report, system description, Component Cooling Water design basis document, and Component Cooling Water heat exchanger technical manuals to incorporate the changes resulting from the heat exchanger retubing project.

In addition, an assumption used in Calculation RNP-M/MECH-1074 states that heat loads on the Component Cooling Water system are limited to  $5.5 \times 10^6$  BTU/hour in addition to the loads imposed by the Residual Heat Removal system. The worst case heat load may be as high as 8 or  $9 \times 10^6$  BTU/hour. Therefore the Licensee will review the current plant configuration to ensure

that this system is still bounded by this calculation.

A partial review of the engineering calculations was performed, and there appeared to be discrepancies between the thermal values identified in Marks' Standard Handbook for Mechanical Engineers, the licensee's calculations, and the vendor computer generated calculations. Examples of these differences include values for the thermal conductivity of the admiralty brass and 90/10 copper nickel tubes and for the heat exchanger shell side pressure drop. The licensee was aware of these discrepancies and was investigating this issue. These discrepancies will be resolved prior to the completion of action item Number 2 on the Required Actions List for Engineering Evaluation Number 90-093.

- c. (Closed) IFI 50-261/89-11-06, Independent Verification Procedures should be improved.

The licensee committed to review and include the suggested improvements in the procedure as applicable. The inspectors reviewed changes made to PLP-030, Independent Verification, Revision 4. An attempt had been made to include the suggested improvements; however some concerns remain. Procedure PLP-030 allows concurrent independent verification at supervisors' discretion but contained no guidelines on how or when it can be used. Procedure PLP-030 required all valve positions be independently verified by turning the valve in the closed direction. This requirement did not address throttled valves as an exception or give other guidance for throttled valves. Procedure PLP-030 required all initial valve alignments be independently verified. The inspectors checked several Operations Procedures, but did not find direction for conducting Independent Verification. A "Verified by" column in the Operations Procedures did exist, but the Operations Procedures did not state this column was for Independent Verification. The licensee committed to review these concerns and had issued Adverse Condition Report 91-133 to track this commitment with the Corrective Actions Program.

- d. (Closed) IFI 50-261/89-11-08, Annunciator Panel Procedure Weaknesses.

The licensee reviewed the Annunciator Panel Procedures to improve the overall quality and usability of these procedures. All Annunciator Panel Procedures were reviewed by operations as part of the required biennial procedure review. Comments from the this review were

included in revising the procedures. Also, an independent engineering review was conducted to verify operator actions, referenced instrumentation, and setpoints. The inspectors evaluated four draft review packages for completeness of review and comment incorporation. The packages reviewed were APP-01, Miscellaneous NSSS; APP-05, Nuclear Instrumentation and Reactor Control System; APP-07, Condensate and Feedwater; and APP-10, HVAC, Emergency Generators, and Miscellaneous Systems. Substantial revision to the Annunciator Panel Procedures reviewed was evident and appropriate references to drawings and direction to procedures had been included. These Annunciator Panel Procedures were not reviewed by management for implementation. All other Annunciator Panel Procedures were with the procedure writers for comment review and inclusion. Based on the four packages reviewed, the Annunciator Panel Procedure review and upgrade program appeared to be effective. The expected completion date for the Annunciator Panel Procedure upgrade was about September 1991.

- e. (Closed) IFI 50-216/89-11-11, Lack of a time limit for incorporation or evaluation of comments made in plant procedure two year review.

As corrective action for this deficiency, the licensee included a time limit for incorporation or evaluation of biennial review comments. The inspectors reviewed AP-04, Procedure Control, Revision 32, and determined that a six month time limit for resolution of biennial review comments had been appropriately incorporated. The inspectors also evaluated four Annunciator Panel Procedure review packages to determine if biennial review comments were appropriately dispositioned. The comments from this sample were reviewed within the required time frame.

- f. (Closed) IFI 50-261/89-11-12, Weakness in Operations Corrective Action Program.

The weakness included untimely closeout of corrective actions, substandard root-cause analysis, and ineffectual trending to prevent recurrence. The following is a list of IR 89-11 weaknesses identified in the corrective action tracking system and off normal condition analysis reports and the licensee's corrective actions:

- 1) The IR 89-11 stated "Closeout of corrective actions were not performed in a timely manner. Only 13 out of 82 had been completed during the



time reviewed." The inspectors reviewed the current practice of closeout of corrective actions. Of the 118 issued during 1990, 112 had been appropriately dispositioned. The balance of the remaining items were partially completed and had not been initiated until late in 1990.

- 2) The IR 89-11 stated "Many off normal conditions analysis did not contain a root-cause analysis. In some cases this resulted in repeat events." The inspectors reviewed a selected sample of off normal condition analysis reports. The sample included appropriate root-cause analysis. For the sample selected, there were no repeated events.
- 3) The IR 89-11 stated "Trending of non-significant off normal conditions needs improvement to prevent repeat events." For the sample selected, there were no repeated events.

The inspectors evaluated Operations Management Manual Procedure OMM-027, Operations Corrective Action Program, Revision 3, which established the guidelines for Operation's Corrective Action Program. Additionally, this procedure provided the criteria for the identification, documentation, evaluation, and tracking correction of off-normal conditions that did not require initiation of an Adverse Condition Report. The Licensee revised Plant Program procedure PLP-026, Corrective Action Program, Revision 5, to reduce the threshold of items that were covered under the program. Because of this lowered threshold most items that were formally in the OMM-027 program were now covered under the PLP-026 program. PLP-026 is more restrictive and requires tighter controls over item reviews and follow-up. The effectiveness of this expanded program will be reviewed in future inspections.

- g. (Closed) IFI 50-269/88-11-14, Review implementation of MOD-18, Revision 4 and MOD-13, Revision 5 in temporary modification program.

These procedure changes concerned changes to the Temporary Modification Program. The inspectors reviewed all seven of the open Temporary Modifications to determine if the problems identified in IR 89-11 had been adequately addressed. The temporary modifications reviewed were:

<u>Number</u>	<u>Date</u>	<u>Description</u>	<u>Note(s)</u>
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89-708	6/28/90	PASS Oxygen Analyzer Bypass	1
89-714	10/15/90	CVC-350 Control Switch	2,3
91-700	1/13/91	Service Water System HVH-4 Pipe Repair	2
91-703	3/6/91	Installation of Check Valve Bonnet Sealing Enclosures on AFW-68 and AFW-69	4
91-704	3/21/91	Repair Bonnet Leaks on PRV 1342 B2 Using Flowable Sealant	4
91-705	3/21/91	Repair High Pressure Turbine Horizontal Joint on Number 2 Steam Gland	4
91-706	3/22/91	Installation of Valve Bonnet Sealing Enclosures on ES-68	4

## Notes:

- 1) Currently bypassed, scheduled to be removed.
- 2) Scheduled to be replaced by permanent modification.
- 3) Long lead time for replacement parts.
- 4) Temporary leak repair.

The temporary modifications did not have the problems identified in the previous inspection. Additionally, the inspectors reviewed the specific procedural changes made for Modification and Design Control Procedure MOD-18, Temporary Modifications, Revision 4. At the time of the this inspection MOD-13, Revision 5 had been deleted. All temporary modifications that were still installed were covered under MOD-18. The changes made in MOD-18, Revision 4, adequately addressed the previously identified concerns and the program appears to have been implemented effectively.

- h. (Closed) IFI 50-261/89-16-07, Evaluate Emergency Operating Procedure Immediate Operator Actions.

As corrective action for this deficiency the licensee included the Westinghouse Emergency Response Guideline immediate action steps into procedures that entered the Emergency Operating Procedure network. The inspectors reviewed PATH-1, Revision 8 (Emergency Response Guideline procedure E-0), EPP-01, Loss of All AC Power, Revision 9 (Emergency Response Guideline procedure ECA-0.0), and FRP-S.1, Response to Nuclear Power Generation/ATWS, Revision 3, and found the Emergency Response Guideline immediate action steps had been included. The inspectors also checked OMM-41, Writer's Guide for the Development and Revision of Flowpath and Two Column Format Procedures, Revision 0. This procedure stated entry procedures into the Emergency Operating Procedure network may have certain steps designated as immediate actions. The inspectors found that OMM-41 did not contain direction about how to determine which steps should be immediate action steps. The licensee committed to adding criteria for determining immediate action steps to OMM-41.

3. Exit Interview

The inspection scope and findings were summarized on March 28, 1991, with those persons indicated in paragraph 1. The NRC described the areas inspected and discussed in detail the inspection findings. No proprietary material is contained in this report. No dissenting comments were received from the licensee.