UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report No.: 50-261/95-21

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

Docket No.: 50-261 License No.: DPR-23

Facility Name: H. B. Robinson Unit 2

Inspection Conducted: June 18 - July 15, 1995

Lead Inspector: for W. T. Orders, Senior Resident Inspector 8/10/95 Date Signed

Other Inspectors: C. R. Ogle, Resident Inspector
C. W. Rapp, Reactor Inspector (paragraph 5)

Approved by: David M. Verrelli, Chief 8/10/95 Date Signed
Reactor Projects Branch 1A
Division of Reactor Projects

SUMMARY

SCOPE:

This routine resident inspection was conducted in the areas of plant operations, maintenance activities, engineering efforts, and plant support functions.

RESULTS:

Plant Operations [Paragraph 3]:

Personnel performance in the area of Operations was mixed. Operators responded well to a reactor trip and proficient performance was noted during two reactor startups. However, operators failed to detect and counter a relatively straightforward, slow moving SG level transient.

One violation was identified involving the failure of the operating crew to monitor plant status.

Maintenance [Paragraph 4]:

Performance in this functional area was good during this evaluation period. Based on the results of this inspection, the licensee effectively implemented the maintenance program. There were no findings.

Engineering [Paragraph 5]:

Operators aborted a reactor startup on July 1, 1995, when it was determined, based on 1/M projections, that the reactor would not achieve criticality within the allowed tolerance of the ECP. It was subsequently determined that an outdated boron sample had been used to calculate the ECP and that there were inaccuracies in a predictive computer code utilized. These deficiencies are the focus of an Inspector Followup Item.

Plant Support [Paragraph 6]:

Performance in this functional area was adequate.

A weakness in the area of Chemistry was identified involving an example of configuration control. The inspectors detected that sample valves WD-1789, and WD-1794, which are containment isolation valves, were open when they should have been closed.

A violation was identified involving a repeat offense situation pertaining to a blocked open fire door.

REPORT DETAILS

1. PERSONS CONTACTED

Licensee Employees:

*M. Brown, Superintendent, Design Control
B. Clark, Manager, Maintenance
*T. Cleary, Manager, Mechanical Maintenance
*M. Herrell, Manager, Training
*S. Hinnant, Vice President, Robinson Nuclear Project
*P. Jenny, Manager, Emergency Preparedness
R. Krich, Manager, Regulatory Affairs
B. Meyer, Manager, Operations
G. Miller, Manager, Robinson Engineering Support Section
H. Moyer, Manager, Nuclear Assessment Section
*D. Stoddard, Manager, Operating Experience Assessment
*R. Warden, Manager, Plant Support Nuclear Assessment Section
D. Whitehead, Manager, Plant Support Services
*T. Wilkerson, Manager, Environmental Control
*D. Young, Plant General Manager

Other licensee employees contacted included technicians, operators, engineers, mechanics, security force members, and office personnel.

NRC Personnel:

*W. Orders, Senior Resident Inspector
C. Ogle, Resident Inspector
C. Rapp, Region II Inspector

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

2. PLANT STATUS AND ACTIVITIES

Operating Status

The unit began the report period in cold shutdown. As was reported in the previous report, the licensee was forced to perform a plant cooldown to effect repairs of the C reactor coolant pump after an RCS leak was identified on the main flange of the pump as the unit prepared to restart from the refueling outage. The reactor was taken critical on June 18, 1995; zero and low power physics testing were successfully completed and the unit achieved 100 percent power on June 28, 1995. The unit operated at virtually full power until 2:26 p.m., on the afternoon of June 30, 1995, when the unit experienced an automatic reactor trip. Details of the trip are delineated in paragraph 3. After completion of a post trip review and necessary repairs, the licensee attempted to restart the reactor on July 1, 1995, but aborted the startup when it was

determined that the reactor would not achieve criticality within the allowed ECP window. Details of this event are delineated in paragraph 5. Ultimately, the reactor was taken critical on July 5, 1995, and achieved full power on July 8, 1995. The unit operated for the remainder of the report period at power.

3. PLANT OPERATIONS (71707)

The inspectors evaluated licensee activities to determine if the facility was being operated safely and in conformance with regulatory requirements.

Reactor Trip

At 2:26 p.m., on June 30, 1995, a reactor trip occurred from 100 percent power as a result of a low level in steam generator B. The inspectors were in the control room at the time of the trip and noted that control room operators responded well. The shift functioned smoothly and procedure usage was evident. The operators quickly diagnosed that the cause of the trip was MSIV B having closed. At 3:11 p.m., the licensee made a 4-hour non-emergency report to the NRC in accordance with 10 CFR 50.72 (b)(2)ii.

Subsequent licensee analysis revealed the cause of the MSIV closure was the interruption of control power to the opening solenoids on the valve. This vented motive air from the underside of the operating piston and allowed the valve to shut. The interruption in control power to the valve was attributed to loose fuse clips on one of the dc power inputs to the circuit. This condition was corrected by replacing the fuse clips. The licensee advised the inspectors that an inspection of other similar fuse clips revealed one additional loose fuse clip which was also corrected.

The inspectors reviewed the sequence of events printout, various stripcharts, and ERFIS data for key plant parameters and the licensees post-trip review in accordance with Operations Management Manual, OMM-010, Post Trip/Safeguards Review. The inspectors have no further questions on this event.

Failure To Monitor Plant Status

At 6:37 p.m., on June 30, 1995, both MDAFW pumps started, the steam generator blowdown isolation valves shut, and the running main feedwater pump tripped. This occurred as a result of a high level in steam generator A. The operators stopped the MDAFW pumps, defeated AFW autostart circuitry, and shut the feedwater header section valves. At 9:10 p.m., a 4-hour non-emergency event notification to the NRC was made in accordance with 10 CFR 50.72 (b)(2)ii. This was based on the licensee's initial determination that closure of the blowdown isolation

valves, which are containment isolation valves, constituted an ESF actuation. High steam generator level is not a containment isolation signal. Accordingly, the licensee withdrew the notification on August 14, 1995.

When advised of the event, the inspectors responded to the site. The inspectors noted excursions recorded on all three steam generator level stripchart recorders. These were characterized by a gradual, steady increase over about a 45 minute period. The SCO advised the inspectors the following day, that other ongoing evolutions may have diluted watchstander efforts at correcting the rising SG levels. Additionally, the RO dispatched to isolate feedwater leakage into the generators, stated that he experienced great difficulty in shutting the bypass inlet isolation valves. Based on a review of historical WR/JOs the inspectors noted that leakage through the FRVs had been a previously identified deficiency. The inspectors concluded that the performance of the operating crew in correcting this slow moving transient was inadequate.

Operations Management Manual Procedure, OMM-001, Operations - Conduct Of Operators, provides administrative procedures to ensure that plant operations are conducted in an effective, consistent manner in accordance with the operating license, plant procedures, and applicable regulatory requirements. The procedure requires that the Operations personnel assigned to the shift continuously monitor the plant and its associated equipment during all phases of operation and take corrective actions during abnormal or emergency conditions.

The operating crew assigned to the shift at 6:37 p.m., on June 30, 1995, did not effectively monitor the plant for a 45 minute period. They allowed the water levels in all three steam generators to increase until a high level condition in the A steam generator resulted in a trip of the running main feedwater pump, an automatic start of the motor driven auxiliary feedwater pumps, and an automatic isolation of the steam generator blowdown isolation valves. This is identified as a Violation, VIO 50-261/95-21-01, Operator Failure To Monitor Plant Status.

Reactor Startups

On July 1, 1995, the licensee attempted a reactor startup in accordance with General Procedure, GP-003, Normal Plant Startup From Hot Shutdown To Critical. At 9:49 p.m., the startup was aborted when control room personnel recognized that criticality would not be achieved within the tolerance associated with the ECP. The control bank rods and shutdown bank B rods were inserted and an investigation was conducted into the failed startup. The NRC inspection of this event is discussed in paragraph 5 of this report.

The inspectors attended the prejob brief and were present in the control room for the startup. Overall, the performance of the crew was good. The SCO's performance in the area of command and control was strong. The inspectors noted that the crew made a conservative decision to terminate the startup prior to reaching the ECP upper limit for rod withdrawal.

The inspectors also witnessed the licensee's approach to criticality on July 5, 1995. The evolution was well conducted.

One violation was identified in this functional area involving operator failure to monitor plant status.

4. MAINTENANCE

a. Maintenance Observation (62703)

The inspectors observed selected safety-related maintenance activities to determine if that these activities were conducted in accordance with TS, approved procedures, and appropriate industry codes and standards. One particular maintenance activity observed by the inspectors was WR/JO 95 ABDT001, Calibrate Flow Transmitter FT-605.

b. Surveillance Observation (61726)

The inspectors observed selected safety-related surveillance activities to determine if these activities were conducted in accordance with license requirements. Specifically, the inspectors witnessed and/or reviewed portions of the following test activities:

OST-013	Weekly Checks And Operations
OST-102	Chemical And Volume Control System Valve Test
OST-207	Motor Driven Auxiliary Feedwater Pump Test
OST-905	Radiation Monitoring System
OST-252	RHR Component Test
OST-051	Reactor Coolant System Leakage

Based on the results of this inspection, the licensee effectively implemented their maintenance program.

No violations or deviations were identified in this functional area.

5. ENGINEERING

a. Onsite Engineering (37551)

Failed Restart Following Reactor Trip

On July 1, 1995, the licensee attempted to restart the reactor following a reactor trip on June 30, 1995. Operators aborted the startup when 1/M plots indicated that the reactor would not achieve criticality within the administrative limit of +/-500 pcm of the calculated ECP.

The licensee determined the reactor was subcritical by approximately 708 pcm at the time when the restart was terminated. Remaining control rod worth was approximately 425 pcm. Therefore, the reactor would not have achieved criticality with all control rods fully withdrawn. Site, corporate, and vendor engineering groups investigated to determine the cause of the failure to achieve criticality. The licensee reviewed the ECP calculation for errors in either the data used or the calculation. The licensee identified that an outdated boron concentration was used for the ECP calculation, which accounted for about 147 pcm of the total reactivity error. Further investigations by corporate and vendor engineering groups found that assumptions used in the predictive computer codes did not accurately represent core conditions for a core with an exposure of 6.7 EFPD. In particular, the computer codes assumed an equilibrium concentration of Samarium. Due to the Samarium buildup in the new fuel, this assumption resulted in an underprediction of Samarium concentration. Consequently, the reactor was less reactive than predicted. The vendors' analytical determination of power defect was another source of potential error that was examined. The vendor calculated the power defect reactivity worth using their standard design code and an advanced nodal code. The results indicated the standard design code overpredicted power defect reactivity worth. An overprediction would result in an artificially higher boron concentration to maintain shutdown margin requirements.

To eliminate errors caused by the predictive computer codes and the outdated born sample, the licensee recalculated the ECP using critical data from the initial refueling (BOC, HZP conditions) restart. Adding in the effect of 6.7 EFPD burnup, the licensee determined this accounted for about 431 pcm of the 708 pcm discrepancy. The remaining 363 pcm was believed to be due to Xenon buildup since initial restart.

For the first 14 EFPD, the licensee used BOC HZP data as the reference conditions for ECP calculations. Reactivity contributions due to fuel burnup, and Xenon and Samarium were explicitly calculated to determine the new ECP. Using this method for ECP calculations, the reactor was restarted on July 5, 1995.

The reactivity difference between the estimated and actual critical position was about 25 pcm; well within the +/-500 pcm administrative limit.

The licensee's corrective actions will be reviewed during future inspections. This item will be tracked as IFI 50-261/95-21-02, Review Of Vendor Supplied Information Associated With Failure To Achieve Criticality.

b. Followup - Engineering

(CLOSED) VIO 93-34-01, Inadequate Procedure
(CLOSED) VIO 93-34-02, QA Failure

Violations 93-34-01, which dealt with a failure to establish and implement procedures for refueling operations and plant startup, and 93-34-02, which dealt with a failure to assure that purchased fuel conformed to procurement documents, were issued as a result of deficiencies identified during inspection of the Cycle 16 core misdesign event. Specifically, the deficiencies identified were failure to recalibrate the Intermediate Range Nuclear Instruments, inadequate procedures that resulted in improper calibration of the Power Range Nuclear Instruments, operation of the Intermediate Range Nuclear Instruments outside of approved procedures, and failure to assure that new fuel conformed to the procurement documents.

The licensee identified lack of formal communication and improper scheduling as the causes for failure to recalibrate the IRNIs. Additionally, the licensee identified lack of operator self-assessment as a contributing cause. As for inadequate procedures that resulted in improper calibration of the PRNIs, the licensee found that limitations on the calibration methodology were not identified, and corrective or preventative actions from similar events were not implemented. Operation of the IRNIs outside of approved procedures resulted from the lack of operator self-assessment.

Lack of adequate review of the vendor's fuel design and fabrication process was identified as the cause of failure to assure that new fuel conformed to the procurement documents. Because of the overall breakdown in management controls, the licensee conducted an in-depth self-assessment of all refueling associated activities at site, corporate, and vendor offices to identify long-term corrective actions. Corrective actions recommended as a result of this self-assessment were documented in ACR 93-284.

As a result of the self-assessment, the licensee implemented the following corrective actions:

The licensee changed the methodology for determining PRNI weighting factors. Also, the results were checked against previous cycle weighting factors and the calculation was checked by corporate and by the fuel vendor if necessary.

Procedure GP-005, Power Operations, was changed to require that PRNI indicated reactor power be verified from independent parameters such as core dt, first stage turbine pressure, or IRNIs. Power increases would be stopped if any significant deviation between PRNIs and the independent parameters existed.

Enhanced refueling restart training for operations crews including the STA and reactor engineer.

Further strengthen management expectations for Management Designated Monitor including maintaining the appropriate chain of command.

Establish interface documents between site, corporate, and vendor offices to define individual responsibilities.

Based on a review of plant procedures and other documents, the inspector concluded these corrective actions had been implemented. Accordingly, Violations 93-34-01 and 93-34-02 are closed. Several corrective action recommendations were assigned to either corporate or vendor offices and tracked by their respective tracking systems. No review of the implementation of these recommendations could be conducted at the site. Vendor activities were inspected by Vendor Inspection Branch and included a review of corrective actions to this particular event. To determine if corporate corrective actions had been effective, the results from the Cycle 17 refueling restart were reviewed. The data taken during conduct of Low Power Physic Testing was reviewed. Based on a review of this information, the inspector concluded the corrective actions had been effective. However, during a subsequent restart attempt, the reactor failed to achieve criticality as predicted. Review of corporate activities will be reviewed as part of IFI 50-261/95-21-02, Review Of Vendor Supplied Information Associated With Failure To Achieve Criticality.

6. PLANT SUPPORT (71750)

Misalignment Of Valves WD-1789 And WD-1794

At approximately 9:30 a.m., on June 26, 1995, the inspectors detected that valves WD-1789 and WD-1794, RCDT Sample Line To Gas Analyzer were open. These are containment isolation valves and are normally shut except when the gas analyzer is aligned to sample the RCDT. The

inspectors determined that no such sample analysis was in progress. Licensee personnel cycled the gas analyzer and the valves closed. A condition report was generated to address this issue.

In response to this event, the inspectors reviewed the ACR; Chemistry Procedure, CP-015, Gas Analyzer; Operating Procedures, OP-702, Waste Disposal Gas; and OP-923, Containment Integrity. The inspectors also reviewed an ERFIS printout documenting the valves positions prior to the inspectors' observation, reviewed CWDs for the valves, and interviewed the cognizant chemistry supervisor.

Based on this review, the inspectors determined that the valves indicated open for over six hours prior to the inspectors observation. The valves probably failed to return to their normally closed position following the completion of a RCDT sample with the gas analyzer at about 3:50 a.m. that morning. No actual determination of the valve stem positions was performed by the inspectors at the time of the observation. However, based on the CWD logic and the valve position indication observed by the inspectors (red lights on, green lights off) it is probable that both valves were nearly full open.

The licensee advised the inspectors that troubleshooting by Chemistry personnel failed to duplicate the anomalous valve operation. On June 11, 1995, almost two weeks after the initial inspectors' observation, a WR/JO was generated to perform additional troubleshooting.

The inspectors reviewed the CWD and noted that the contacts used to reposition the valves from the gas analyzer are different than those used to shut the valves on a containment isolation signal. Hence, if some abnormality in gas analyzer operation caused the valves to stay open, this probably did not impact the ability of the valves to shut on a containment isolation signal.

Overall, the inspectors concluded that the safety significance of the valves being open for six hours was minimal. However, this is another example of the continuing problem of relatively straightforward indications of simple abnormalities not being recognized by licensee personnel. This is identified as a weakness.

Inoperable Fire Door

On June 26, 1995, the inspectors observed that the automatic fire door to pipe alley was inoperable as a result of it being blocked open by materials placed in the door swing area to support decontamination activities in the area. This observation was subsequently confirmed by the on-shift Fire Protection Technician. He advised the inspectors that he was previously unaware of this condition and hence, the paperwork and checks necessary for declaring the door inoperable had not been instituted. The materials were removed until the door could be administratively removed from service. A condition report was generated to address the event.

In response to this event, the inspectors interviewed the on-shift fire protection technician, interviewed the cognizant supervisor, and reviewed a written statement made by the individual responsible for blocking open the door. The inspectors also reviewed Fire Protection Procedure, FP-014, Control Of Fire Barrier Penetrations.

Based on this review, the inspectors concluded that the door blockage was the result of a non-cognitive error on the part of the decontamination technician. The licensee estimated that the door was blocked open for approximately 30 minutes. The door was clearly marked as a fire door and a precaution to avoid blocking it was also displayed on the door. The same warning, painted on the floor beneath the door, was partially obstructed by a contamination area step off pad.

The inspectors noted that this occurrence was similar to fire door blockages identified by the inspectors and described in IR 92-34 (NCV 92-34-02) and IR 94-12 (VIO 94-12-01). In those events, the same door was obstructed, first by an air hose placed across the door's threshold for maintenance and then by a pedestal-mounted portable sign.

Overall, the inspectors concluded that blocking the door and hence rendering it inoperable was contrary to the requirements of FP-014. This is identified as a Violation, VIO 50-261/95-21-03, Fire Door Blocked Open Contrary To The Requirements of FP-014.

7. EXIT INTERVIEW

The inspectors met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on July 21, 1995. During this meeting, the inspectors summarized the scope and findings of the inspection as they are detailed in this report. The licensee representatives acknowledged the inspector's comments and did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. No dissenting comments from the licensee were received

Item Number	STATUS	Description/Reference Paragraph
VIO 95-21-01	Opened	Operator Failure To Monitor Plant Status, paragraph 3.
IFI 95-21-02	Opened	Review Of Vendor Supplied Information Associated With Failure To Achieve Criticality, paragraph 5a.
VIO 95-21-03	Opened	Fire Door Blocked Open Contrary To The Requirements Of FP-014, paragraph 6.

VIO 93-34-01	Closed	Inadequate Procedure, paragraph 5b.
VIO 93-34-02	Closed	QA Failure, paragraph 5b.

8. ACRONYMS AND INITIALISMS

ACR	Adverse Condition Report
AFW	Auxiliary Feedwater
BOC	Beginning Of Cycle
CWD	Control Wiring Diagram
dc	direct current
ECP	Estimated Critical Position
EFPD	Effective Full Power Days
ERFIS	Emergency Response Facility Information System
ESF	Engineered Safety Feature
FRV	Feedwater Regulating Valve
GP	General Procedure
HZP	Hot Zero Power
IFI	Inspection Followup Item
IRNI	Intermediate Range Nuclear Instrument
MDAFW	Motor Driven Auxiliary Feedwater
MSIV	Main Steam Isolation Valve
pcm	per cent milli
PRNI	Power Range Nuclear Instrument
RCDT	Reactor Coolant Drain Tank
RO	Reactor Operator
SCO	Senior Control Operator
SG	Steam Generator
STA	Shift Technical Advisor
TS	Technical Specification
WD	Waste Disposal