



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

Report No.: 50-261/88-04

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: February 11, 1988 - March 10, 1988

Inspectors: *L. W. Garner* 4/22/88  
L. W. Garner, Senior Resident Inspector Date Signed  
*R. M. Latta* 4/22/88  
R. M. Latta, Resident Inspector Date Signed

Contributing Inspector: M. Degraff, Reactor Engineer

Approved by: *P. E. Fredrickson* 4/25/88  
P. E. Fredrickson, Chief Date Signed  
Reactor Projects Section 1A  
Division of Reactor Projects

SUMMARY

Scope: This routine, announced inspection was conducted in the areas of operational safety verification, physical protection, surveillance observation, maintenance observation, ESF system walkdown, onsite followup of events at operating power reactors, onsite review committee, meetings with local officials, and followup of CAL involving single failure design deficiencies.

Results: One violation was identified involving the failure to properly control work activities associated with the reinstallation of a pipe support with instructions not appropriate to the circumstances, as required by 10 CFR 50 Appendix B, Criterion V (paragraph 4); and one additional example of a previously identified violation relating to SI pump availability was identified (paragraph 9.c).

## REPORT DETAILS

### 1. Licensee Employees Contacted

- R. Barnett, Maintenance Supervisor, Electrical
- G. Beatty, Vice President, Robinson Nuclear Project Department
- C. Bethea, Manager Training
- R. Chambers, Engineering Supervisor, Performance
- D. Crocker, Supervisor, Radiation Control
- \*J. Curley, Director, Regulatory Compliance
- R. Femal, Shift Foreman, Operations
- W. Flanagan, Manager, Design Engineering
- W. Gainey, Support Supervisor, Operations
- P. Harding, Project Specialist, Radiation Control
- \*E. Harris, Director, Onsite Nuclear Safety
- D. Knight, Shift Foreman, Operations
- E. Lee, Shift Foreman, Operations
- F. Lowery, Manager, Operations
- D. McCaskill, Shift Foreman, Operations
- R. Miller, Maintenance Supervisor, Mechanical
- R. Moore, Shift Foreman, Operations
- \*R. Morgan, Plant General Manager
- D. Myers, Shift Foreman, Operations
- D. Nelson, Operating Supervisor
- D. Quick, Manager, Maintenance
- B. Rieck, Manager, Control and Administration
- D. Sayre, Senior Specialist, Regulatory Compliance
- D. Seagle, Shift Foreman, Operations
- R. Steele, Shift Foreman, Operations
- \*H. Young, Director, Quality Assurance/Quality Control (QA/QC)

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

#### NRC Resident Inspectors

- \*L. Garner
- \*R. Latta

\*Attended exit interview on March 18, 1988

### 2. Exit Interview (30703)

The inspection scope and findings were summarized on March 18, 1988, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report. No written material was given to the licensee by the Resident Inspectors during this report period.

Note: A list of abbreviations used in this report is contained in paragraph 13.

| <u>Item Number</u> | <u>Status</u> | <u>Description/Reference Paragraph</u>  |
|--------------------|---------------|---|
| 261/88-04-01       | Open          | Violation - Failure to Properly Control Work Activities Associated With Reinstallation of Pipe Support (Paragraph 4). |
| 261/88-04-02       | Open          | UNR* - ISI for Reinstalled Supports and Supports Adjacent to Code Boundary (Paragraph 4).                             |
| 261/88-03-04       | Open          | Violation - Additional Example  |

\*Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations.

3. Licensee Action on Previous Enforcement Matters (92702)

Not Inspected.

4. Operational Safety Verification (71707))

The inspectors observed licensee activities to confirm that the facility was being operated safely and in conformance with regulatory requirements, and that the licensee management control system was effectively discharging its responsibilities for continued safe operation. These activities were confirmed by direct observations, tours of the facility, interviews and discussions with licensee management and personnel, independent verifications of safety system status and LCOs, and reviews of facility records.

Periodically, the inspectors reviewed shift logs, operations records, data sheets, instrument traces, and records of equipment malfunctions. Specific items reviewed include control room logs, maintenance work requests, auxiliary logs, operating orders, standing orders, jumper logs, and equipment tagout records. The inspectors routinely observed shift changes to verify that continuity of system status was maintained and that proper control room staffing existed. The inspectors also observed that access to the control room was controlled and operations personnel were carrying out their assigned duties in an attentive and professional manner. The control room was observed to be free of unnecessary distractions. The inspectors performed channel checks, reviewed component status and safety related parameters, including SPDS information, to verify conformance with the TS.

During this reporting interval, the inspectors verified compliance with selected LCOs. This verification was accomplished by direct observation of monitoring instrumentation, valve positions, switch positions, and review of completed logs and records. The inspectors verified that axial flux difference was within the values required by the TS.

Plant tours were routinely conducted to assess the operability of standby equipment and general plant/equipment conditions, such as the existence of unusual fluid leaks, excessive pipe vibrations, pipe hanger and seismic restraint abnormalities, various valve and circuit breaker positions, equipment clearance tags, component status verifications, instrument calibrations, and operability of fire fighting equipment (including fire alarms, suppression equipment, and emergency lighting equipment).

The inspectors determined the following: plant personnel including operation staff members were knowledgeable of plant conditions including equipment out of service and maintenance activities, that appropriate radiation controls were properly established and implemented, and that fire hazards and combustible materials were properly controlled. The inspectors also selectively examined radiation protection instrumentation such as area monitors, friskers, and portal monitors to verify operability and adherence to calibration frequency requirements. Plant housekeeping and contamination control were observed to be adequate.

On February 23, 1988, while the unit was in cold shutdown, the inspectors conducted an inspection of various components and systems inside the containment. In particular, the inspectors examined piping supports, equipment foundations, HVH fan cooler units, service water piping, the seal table room, containment RHR recirculation screen and sump, and the pressurizer cubical. Several items were identified to the licensee as a result of this inspection including: loose or missing instrumentation, tubing supports, damaged or loose piping insulation, loose fasteners on the HVH cooler units, and missing valve handwheels. It is noted that none of these items constituted an operability concern and that prompt corrective action, as deemed necessary, was taken by the licensee to rectify these items.

While examining piping supports in the upper portion of the PZR cubical, subsequent to the reinstallation of the PZR cubical cover, the inspectors identified deficiencies in the following hanger assemblies:

- a. Spring hanger 339 located on the PZR spray line had one of the 4 base plate anchor bolts missing and with a gap between the base plate and the cubical cover. Additionally, the eye bolts on the hanger were made without the required jam nut.
- b. Spring hanger 690 had one of the mounting bolts left loose.
- c. Spring hanger 1785 located on the PZR PORV line had a gap between the mounting plate and the cubical cover. Also the hanger bottom eyelet bolt did not have full thread engagement.

The inspectors determined that the above hanger assemblies were interference items that had been disconnected under the control of W/R 87-AMMY1, which removed and reinstalled the PZR cubical cover in order to complete repair of the PZR manway cover. Although the location of the hanger deficiencies addressed above were not the specific point of hanger disconnection, they were within the immediate work area and should have been detected and corrected. The W/R states in part, "reconnect piping supports and set at noted cold setting." As stated by the licensee, the removal and reinstallation of the PZR cover is a repetitive work evolution during outages, and the subject W/R instructions rely on skill of the craft for proper pipe support reinstallation and verification of proper pipe support configuration.

Following the identification of the above conditions the licensee issued W/Rs to correct the identified deficiencies; however, the failure to adequately control the work activities with instructions appropriate to the circumstances to prevent damaged components from being reassembled without initiating repair is identified as a violation: Failure to Properly Control Work Activities Associated With Reinstallation of Pipe Support (261/88-04-01).

The inspectors also observed that no preservice inspection was performed on any of the subject hangers subsequent to their reinstallation. The inspection requirements for these hangers, including hanger 1785 which is the first hanger downstream of the class 1 piping boundary on the PZR PORV line, are being investigated. This item is considered as an unresolved item pending review of this issue by Region II ISI specialists: ISI for Reinstalled Supports and Supports Adjacent to Code Boundary (261/88-04-02).

One violation was identified within the areas inspected.

5. Physical Protection (71707)

In the course of the monthly activities, the inspectors included a review of the licensee's physical security program. The inspectors verified by general observation, perimeter walkdowns, and interviews that measures taken to assure the physical protection of the facility met current requirements. The inspectors visited the central and secondary alarm stations at various times during the reporting period to ensure that they were properly staffed and operational.

The performance of various shifts of the security force was observed to verify that daily activities were conducted in accordance with the requirements of the security plan. Activities inspected included protected and vital areas, access controls, searching of personnel, packages and vehicles, badge issuance and retrieval, escorting of visitors, patrols, and compensatory measures. In addition, the inspectors routinely observed protected and vital area lighting and barrier integrity.

No violations or deviations were identified within the areas inspected.

## 6. Monthly Surveillance Observation (61726)

The inspectors observed certain surveillance related activities of safety related systems and components to ascertain that these activities were conducted in accordance with license requirements. The inspectors determined that the surveillance test procedures listed below conformed to TS requirements, that all precautions and LCOs were met, and that the surveillance test was completed at the required frequency. The inspectors also verified that the required administrative approvals and tagouts were obtained prior to initiating the test, that the testing was accomplished by qualified personnel in accordance with an approved test procedure and that the required test instrumentation was properly calibrated. Upon completion of the testing, the inspector: observed that the recorded test data was accurate, complete, and met TS requirements; ensured that test discrepancies were properly rectified and; independently verified that the systems were properly returned to service. Specifically, the inspectors witnessed/reviewed portions of the following test activities:

## a. OST-553 (revision 3) Turbine Mechanical Overspeed Trip Test

This surveillance test was conducted subsequent to repairs on the turbine generator stub shaft in order to verify the operability of the turbine mechanical overspeed trip mechanism. The inspectors witnessed all aspects of this test and determined that the turbine overspeed trip occurred at 1966 RPM which was within the acceptable tolerance of 1930 to 1988 RPM.

## b. OST-160 (revision 7) Hot Leg, Cold Leg, and RHR Cold Leg Check Valve Back Leakage Test

The satisfactory completion of this test constitutes compliance with TS 3.1.5.4 and Table 4.1-3 Item 17. The inspectors determined that the leak rate data obtained during this test conformed to the acceptance criteria stated in TS Table 3.1-1.

## c. OST-401 (revision 16) Emergency Diesels

During the performance of surveillance tests on both EDG A and B, the inspectors observed that the licensee was recording peak starting RPM and had instrumented the EDGs with vibrational amplitude recording devices. The inspectors observed that both EDGs started, were paralleled to the grid and operated satisfactorily throughout the 90 minute tests.

## d. OST-151 (revision 23) Safety Injection System Component Test

The inspectors observed that the suction and differential pump pressures, as well as the vibration amplitude values, were within the acceptable range specified in the subject procedure. The inspectors also verified proper valve stem travel and position indications for the associated SI valves.

No violations or deviations were identified within the areas inspected.

7. Monthly Maintenance Observation (62703)

The inspectors observed several maintenance related activities of safety-related systems and components to ascertain that these activities were conducted in accordance with approved procedures, TS and appropriate industry codes and standards. The inspectors determined that these activities were not violating LCOs and that redundant components were operable. The inspectors also determined that the procedures used were adequate to control the activity, that QC hold points were established where required, that required administrative approvals and tagouts were obtained prior to work initiation, that proper radiological controls were adhered to, that appropriate ignition and fire prevention controls were implemented, and that replacement parts and materials used were properly certified. The inspectors confirmed that these activities were accomplished by qualified personnel using approved procedures, and that the effected equipment was properly tested before being returned to service. In particular the inspectors observed/reviewed the following maintenance activities:

a. MST-007 (revision 7) Reactor Coolant Low-Temperature Overpressure Protection System Test

The monthly conduct of this surveillance test demonstrates the operability of the overpressure protection system channels and satisfied the TS requirements of Section 4.1.1 and Table 4.1-1, Item 31. During the conduct of this surveillance activity the inspectors confirmed that the stipulated annunciators gave the proper status and alarms and that the measured voltages were within the specified tolerance of plus or minus 0.02 volts.

b. MST-016 (revision 4) Containment Pressure Protection Channel (Set I, II, & III) Testing

For the portions of the test observed the inspectors noted that the affected bistables and test switches were properly returned to service and that the ERFIS points were correctly restored.

c. EDG Maintenance W/Rs:

WR/JO 88-ACKE1 - EDG B Fuel Oil System Inspection/  
Repair and Overspeed Trip Device Adjustment

WR/JO 88-ACKD1 - EDG A Fuel Oil System Inspection  
and Repair/Overspeed Trip Device Adjustment

WR/JO 88-ACAR1 - Trouble Shooting EDG A

WR/JO 88-ABYT1 - Trouble Shooting EDG B

No violations or deviations were identified within the areas inspected.

8. ESF System Walkdown (71710)

The inspectors verified the operability of an engineered safety features system by performing a walkdown of the accessible portions of EDG A and its associated systems. The inspectors confirmed that the system lineup procedures matched plant drawings and the as-built configuration. The inspectors verified the absence of equipment conditions and items that might degrade performance such as loose pipe supports, the presence of debris or loose materials, and unauthorized jumpers or evidence of rodents inside electrical and instrumentation cabinets. Valves were verified to be in the proper position with power available and locked as appropriate. Local and remote indications were verified to be consistent.

Specifically, the inspectors walked down EDG A using flow diagram G-190204-A, sheet 1, revision 15, and sheet 2, revision 6, and verified that valves in the system: were installed correctly, that they did not exhibit excessive packing leakage, and that there were no bent stems or missing handwheels. The inspectors also determined that major components were properly labeled, that equipment coatings appeared adequate, that prohibited ignition sources or flammable materials were not present in the vicinity of the EDG, and that during surveillance testing when the associated diesel generator room fire doors were inoperable, a continuous fire watch was posted. The inspectors determined that required support systems such as starting air and fuel oil were operational, that the required breakers had control power available and that the remote indications on the reactor turbine generator board were correct. The inspectors did identify several missing valve label plates on various EDG components during the walkdown. These items were given to the licensee and will be evaluated during future inspections.

No violations or deviations were identified within the areas inspected.

9. Onsite Followup of Events at Operating Power Reactors (93702)

a. Emergency Diesel Generator Overspeed Trips

While performing special procedure SP-796 on February 12, 1988, at 3:26 p.m., EDG B started on a SI coincident with a loss of power signal, but immediately shutdown. Engine control panel annunciation indicated that the mechanical overspeed trip mechanism had actuated. As previously described in Inspection Reports 261/88-03 and 261/88-05, SP-796 was being conducted as a post modification acceptance test. The unit was in cold shutdown, at the time. Prior to the trip, EDG B had successfully started that same day at 10:48 a.m. and 1:12 p.m., in response to similar simulated signals. Later that evening, at 10:52 p.m., during an unrelated performance of surveillance procedure MST-11, an unanticipated SI signal started both EDGS. EDG B performed satisfactorily; however, EDG A shutdown

during starting with indication of an overspeed trip condition. EDG A had experienced three successful starts that day, at 10:48 a.m., 1:12 p.m., and 3:26 p.m. Previous history indicates that EDG A had experienced four known similar occurrences, two on August 26, 1987, and two on September 8, 1987. In addition, EDG A experienced another 10 trips out of approximately 43 starts during trouble shooting and repair evolutions between September 9, 1987, and September 17, 1987, when repairs were thought to be complete and it was declared operable. It is not possible to determine from available information how many of these were contributed to by work activities in progress versus completely spurious trips. Best estimate by the inspectors is that 3 or 4 of these were totally spurious with no contribution from ongoing work activities. EDG B had no previous history of such an event. Additional information of the EDG's recent performance problems is provided in paragraph 9.b below.

On February 23, 1988, at 1:00 p.m., while RPM was being recorded, EDG A again appeared to trip on overspeed. Between February 12, 1988, and March 4, 1988, the licensee's investigative team directed inspections and testing of the EDGs to determine the root cause of the unexpected engine shutdown on starting. The team utilized resources from the HBR technical support, mechanical maintenance, I&C, operations and ONS staffs. Onsite assistance to the team included engineers from the corporate office and the Brunswick site, technical representatives from Woodward Governor and Fairbanks-Morse, including the Manager of Design Engineering for Fairbanks-Morse. The latter personnel are representatives of the the vendors associated with the EDG's governor and engine, respectively. On March 4, 1988, the investigative team presented a summary of its efforts and associated results to the PNSC. The team concluded that no sole definitive root cause could be identified. However, the consensus of the team is that the February 23, 1988 EDG A trip was due to either a worn emergency stop latch or low RPM actuation of the overspeed governor weight. The EDG A and B trips on February 12, 1988, were attributed to the above and/or a combination of contributing factors (discussed below) which raised the trip setpoint RPM. Because the applicable portion of these items had been addressed and special operability testing, as well as normal surveillance testing had been successfully performed, the team concluded that there is reasonable assurance that no further overspeed trips will occur on the diesels. Based upon this information and their review of supporting documentation, the PNSC declared the EDGs operable on March 4, 1988. The licensee has also stated that the manufacturer of both the diesels and the governors have reviewed the information and have suggested no other items to consider. The inspectors acknowledge that the licensee's efforts have been thorough, systematic and exhaustive. Therefore, the inspectors concurred with the licensee that the EDGs were operable per TS, but the inspectors believe that these overspeed problems, along with other recent problems, are

indicative of a reliability problem which needs to be addressed by the licensee (see paragraph 9.b below). The following paragraphs are a summary of the licensee's efforts and items inspected.

In the draft report presented to the PNSC, the team considered twenty factors which were eliminated as possible causes and determined 10 additional ones which may have contributed to the trips. The non-contributing factors and reason for elimination are provided in the following table:

| <u>Non Contributing Factor</u>                                 | <u>Justification for Elimination</u>   |
|--|--|
| (1) Malfunction of Low Speed Relay (starting air concern)      | Calibration of relay verified by I & C. Note 1.*   |
| (2) Circuitry and/or Voltage Regulator Malfunction             | ERFIS data showed normal voltage during the 2/12/88 EDG B trip. Note 1.*   |
| (3) Increased Starting Air Pressure                            | Note 1.*   |
| (4) Air in the Governor Oil                                    | Visual inspection of oil revealed no air bubbles.  |
| (5) Diesel Fuel Oil Out of Specifications                      | Oil verified within specifications   |
| (6) Intake or Exhaust Problems                                 | Flapper valve inspection demonstrated correct operation.*  |
| (7) Rebuilt Governor   | Review of September 1987 and February 1988 RPM data discloses no correlation.  |
| (8) Duration Between Prelube and Diesel Start                  | Data review and test runs no increase in startup RPM.*   |
| (9) Loose Governor Output Shaft Linkage                        | Mechanical linkage check indicated no binding.   |
| (10) Governor Load Indicator Position After Diesel Has Stopped | Initial position determined not to be important due to speed at which governor opens fuel racks to full open position. |

| <u>Non Contributing Factor<br/>(cont'd)</u>  | <u>Justification for Elimination</u>  |
|--|---|
| (11) Longer Starting Air Blow Time<br>(Air Start Solenoids Failed<br>to Remain Open) | Note 1.*  |
| (12) Governor Feedback Linkage<br>Condition  | Inspection of physical<br>condition of linkage revealed<br>no abnormalities.              |
| (13) SP-796 Versus OST-401 Diesel<br>Operation                                       | Procedure difference would<br>result in a lower RPM.*                                     |
| (14) Mod 947 and SP-796 Effects  | Review of work activity<br>revealed no adverse effects.*                                  |
| (15) Personnel Error   | Interviews with personnel<br>disclosed no errors.   |
| (16) Procedural Deficiency   | Procedural reviews determined<br>that no deficiency existed.                              |
| (17) Human Factor Deficiency   | Review of work being<br>performed at time of the<br>trips indicates this was<br>unlikely. |
| (18) Time Duration Between Starts  | Data review reveals no<br>discernable pattern.  |
| (19) Injector Nozzles or Injector<br>Pumps   | Present cylinder temperatures<br>are comparable to historical<br>values.                  |
| (20) Dirty Governor Oil  | Oil analysis showed no<br>abnormal particulates. Oil<br>changed.*                         |

Note 1: Malfunction deliberately induced during testing. No effect observed on peak startup RPM of either one or both EDGs.

\*Activities observed or conditions independently verified by inspectors on either one or both EDGs.

Contributing Factors and actions taken or planned to address them are provided in the following table:

Contributing FactorHow Addressed

- |  |   |
|--|---|
| (1) Cold Governor Oil  | Testing Verified that RPM increases slightly but can not be sole cause of trip. Evaluating installation of heater in governor.  |
| (2) Low Mechanical Overspeed Device Setpoint                     | Margin between normal peak RPM and trip setpoint have been increased by more than 100%.*  |
| (3) Lube Oil in Combustion Chamber                               | Test on EDG B did not show effect.* Vendor recommends engine be barred over after every run to clear oil. PCN 87-059 issued to determine feasibility of a modification.   |
| (4) Operating Speed Overshoot During Startup                     | Fuel rack maximum position is now controlled by mechanical stop instead of governor load limit setting. This has allowed a more optimum governor compensation setting.*   |
| (5) Diesel Startup Time  | Considering additional analysis which would allow slower engine start times. Not a sole cause contributor but could reduce peak startup RPM.  |
| (6) Stuck Fuel Racks   | Inspection demonstrated that racks were free of binding. Deposits were noted at point of normal travel. Racks cleaned in place. Disassembly and complete cleaning to be conducted during next refueling outage. |
| (7) Items Other Than Overspeed Which Can Cause an Overspeed Trip | Could not totally eliminate inadvertent actuation of EDG A emergency stop button on 2/12/88. Considered low probability. No action required.  |

| <u>Contributing Factor</u><br>(cont'd)                             | <u>How Addressed</u>   |
|--|--|
| (8) Fuel Rack Mechanical Stop                                      | Mechanical load limit set at 2750 KW.*   |
| (9) Worn Overspeed Trip Mechanism                                  | New latch installed on EDGs.*  |
| (10) Non-Repeatability of Over-Speed Governor Weight Trip Setpoint | Initial 2 test showed a RPM trip setpoint in the expected startup RPM range of the EDG. Results could not be repeated. All subsequent tests were repeatable with setpoints 30 RPM higher than the expected range.* Trip setpoint margin increased. |

\*Activities observed or conditions independently verified by inspectors on either one or both EDGs.

After performance of the above work, special procedure SP-799 and OST-401 were performed to demonstrate TS operability. SP-799 demonstrated the ability of the EDGs to accept loads and reject loads without tripping. OST-401 is the TS required surveillance which is run weekly to demonstrate the ability of the EDGs to carry rated loads. Operability was also demonstrated by the number of successful starts with no malfunctions after reassembly and initial testing of the EDG overspeed trip mechanisms. For example, including the SP-799 and OST-401 starts, EDG A experienced 14 successful normal starts during the period of 11:00 p.m. on February 28, 1988, until 12:45 a.m. on March 4, 1988. Similarly, 10 successful starts were performed on EDG B during the period of 10:00 a.m. on February 29, 1988, to 12:45 a.m. on March 4, 1988.

In addition to the items identified above, the inspectors observed performance of SP-799 and OST-401 on each EDG and attended the PNSC on March 4, 1988. The inspector's observations and conclusions involving selected activities are discussed below.

The March 2, 1988 dynamic testing of the overspeed trip mechanism performed on the lathe indicates that once all variables were set, there is a high level of setpoint repeatability. However, the inspectors noted adjustment of the mechanism, including rotational offset, movement of the flyweight spring and removal and/or addition of shims results in either an increase or decrease in the trip setpoint. These consequences can be overcome provided reassembly techniques account for these variables, and once the device is installed on the engine, testing verifies that the desired setpoint has been obtained.

The performance and results of SP-799 indicate to the inspectors that the licensee's retest of EDG A and B following the recovery efforts from the overspeed trip events do provide adequate assurance that the EDGs should start and accept load under accident conditions. The SI/Blackout start performed as part of SP-799 indicates that the EDG governing system recovered well during load transients, returning the EDG speed and frequency to an acceptable value within a nominal time frame. Additionally, the load rejection performed as part of SP-799 indicates that the EDGs should withstand a load reject without a resulting overspeed trip. Four overspeed tests of each EDG demonstrated an adequate repeatability of the mechanical overspeed trip setpoint.

b. EDG Reliability

During the past year, EDG A and B have experienced a number of operational deficiencies which are indicative of a degrading equipment condition and/or overall declining reliability trend from that experienced in previous years. Examples of such indicators are:

March 1987 - EDG B lube oil heat exchanger tube leaks. Forty eight tubes plugged. (See Inspection Report 261/87-06.)

March 1987 - EDG B scavenging air blower failure. (See Inspection Report 261/87-06 and LER 87-001.)

August 1987, September 1987, and February 1988 - EDG A and B overspeed trips. (See paragraph 9.a above and Inspection Reports 261/87-28, 261/87-30 and LER 87-23.)

November 1987 - EDG B inboard air start solenoid malfunction. (See Inspection Report 261/88-01 and LER 87-028.)

In addition to the above, problems have also been incurred with sticky fuel injectors, rubbing observed on the EDG A scavenging air blower, a component failure in the voltage regulator circuit, and a crack in one of the exhaust manifolds.

Each one of the above items has been addressed on a case by case basis as they occurred. Furthermore, in Inspection Report 261/87-06, the NRC pointed out deficiencies in the frequency of calibrations of certain components associated with the EDGs, as well as a weakness for lack of inclusion of vendor recommendations associated with operation of the EDGs into procedures. When taken in the aggregate, it is apparent that the EDG's components and supporting systems now require more attention and additional effort over and above that which has been previously expended.

c. Single Failure Design Deficiency

The following is an updated status of the single failure design problems discussed in paragraph 10.c of Inspection Report 261/88-03. Available analysis indicates that for certain size SBLOCA, two SI pumps are required to prevent peak cladding temperature from exceeding the 10 CFR 50.46 (b)(1) ECCS performance criterion of 2200 degree F. As documented in Inspection Report 261/88-03, the licensee has corrected four of the single failure scenarios which would have resulted in a loss of two of the three pumps. Three of the single failure scenarios were known to be the result of design decisions made during pre-licensing construction. The other item, designated as scenario 1 in Inspection Report 261/88-03, involved the operational configuration of the supply breakers to the B SI pump. In the referenced report, it was stated that the time the plant had been operated in the configuration described by scenario 1 had not been determined. Subsequent review of operating procedures by the licensee has revealed that the configuration existed at least since the mid 1970's.

By the end of the 261/88-03 Inspection Report period, the licensee had identified, but had not completed their evaluation of two other potential scenarios. The item involving tie breaker coordination was subsequently determined not to be a problem. However, the remaining item, which involved malfunction of the EDG in such a manner that voltage or frequency on the emergency bus could degrade such that the associated SI pumps would become inoperable, was determined to be credible. This new scenario, designated as EDG Voltage or Frequency Malfunction (scenario 6), assumes that: an event such as a SBLOCA occurs which requires a minimum of two SI pumps; a loss of offsite power occurs; the three SI pumps are successfully loaded onto the two EDGs; and then a single failure occurs in the controls of the EDG which is supplying power to two of the SI pumps, thereby potentially damaging or rendering two SI pumps inoperable. The types of single failures postulated include a failure in the governor control which could result in the operation of the engine at a different than desired speed, thereby resulting in an improper output frequency or failure of the voltage regulator circuit at some intermediate value such that the generator output voltage is outside acceptable values.

Plant modification - 951, SI Pump B Deletion of Auto Start, was implemented to allow only manual operation of the B SI pump. This allows the B SI pump to be used as an installed spare (e.g., upon failure of one of the emergency buses, the B SI pump can be manually started onto the reliable supply). However, because allowable operator response time had not been completely reviewed, the licensee elected to take no credit for operator action. Therefore, assuming the worst case single failure, only one SI pump would be available to mitigate the consequences of a SBLOCA. The limiting case requires a reduction to 1380 MWT (60% power) as a condition to calculate

acceptable consequences. The licensee was granted an emergency TS change on March 7, 1988, to allow operation up to 1380 MWT. Operation under the emergency TS change, i.e. operation above 200 degrees F but below 1380 MWT with only two SI pumps, A and C, capable of automatically starting, was commenced on March 7, 1988.

Two violations had previously been identified concerning the single failure design deficiency in Inspection Report 261/88-03. Scenario 6 is identified as an additional example of violation 261/88-03-04.

One example of a previously identified violation was identified within the area inspected.

10. Onsite Review Committee (40700)

The inspectors evaluated certain activities of the PNSC to determine whether the onsite review functions were conducted in accordance with TS and other regulatory requirements. In particular, the inspectors attended the special PNSC meeting held on January 19, 1988, concerning the turbine trip/reactor trip which occurred while plant personnel were performing OST-551. It was ascertained that provisions of the TS dealing with membership, review process, frequency, qualifications, etc., were satisfied, and that the previous meeting minutes were reviewed to confirm that decisions and recommendations were accurately reflected in the minutes. The inspectors also followed up on selected previously identified PNSC activities to independently confirm that corrective actions were progressing satisfactorily.

No violations or deviations were identified within the areas inspected.

11. Meetings with Local Officials (94600)

On February 24, 1988, the regional Section Chief responsible for the site and the resident inspectors met with the Mayor and the City Manager of Hartsville, S. C. During the meeting, the resident inspectors were introduced, the mission and role of the NRC as it pertains to the site were discussed and an opportunity was provided for discussion of community concerns related to the operation of the facility. Later on the same day, the Section Chief and Senior Resident Inspector participated in a similar meeting with the Darlington County Administrator and the Director of the Darlington County Emergency Preparedness Agency. The local officials in both meetings stated that their constituents had not expressed any concerns involving the safe operation of the facility.

No violations or deviations were identified within the areas inspected.

12. Confirmation of Action Involving Single Failure Design Deficiencies (92703)

On February 11, 1988, a CAL was issued concerning single failures which would result in the ECCS, for certain postulated accident conditions, not maintaining the peak cladding temperature at or below 2200 degrees F as

required by 10 CFR 50.46 (b)(1). These single failure scenarios are discussed in Inspection Reports 261/88-03 and 261/88-05. The items committed to are stated below:

- (1) Perform a detailed review of the Design Basis and as-built configuration of the H. B. Robinson 2 onsite electrical distribution system, as it applies to sequencing of the SI pumps, to evaluate the adequacy of that system to meet the plant licensing basis regarding single-failure vulnerability.
- (2) Submit for NRC review the results of the above detailed design review.
  - a. To include a description of your current design basis.
  - b. Your proposal regarding plant modification(s) to bring the electrical distribution system into compliance with single-failure criteria.
  - c. Your program of post modification testing to demonstrate that the H. B. Robinson 2 electrical distribution system meets its design basis.
  - d. Your evaluation regarding the need for training of plant personnel as a result of these modifications and a schedule for completion of any identified training.
  - e. Your evaluation regarding the need for changes to your current Technical Specifications resulting from the modification(s) and schedule for submission of these changes, if applicable.
- (3) Prior to final testing and completion of the proposed modifications, notify the NRC Region II and Senior Resident with adequate advance notice. Prior to restart, obtain the concurrence of the NRC Region II Regional Administrator or his designee.

The inspectors performed the following inspections:

- Verified that the NRC had received the results of the design review.
- Observed portions of the implementation of Modification 947, SI Pump Availability Upgrade, including acceptance testing.
- Performed a Technical review of modification 951, SI Pump B Deletion of Auto Start, and observed acceptance testing of the modification.
- Verified through discussions with operating personnel that they had received training on the modifications and were aware of the safety concerns which had necessitated the changes.

- ° Attended a pre-shift training session involving the emergency TS change and associated procedure changes.
- ° Verified that selected control room copies of operating procedures, including emergency procedures, have been changed to reflect the emergency TS change and Modification 951.

Based upon the above items, the inspectors concluded that the licensee had successfully complied with items (1) and (2) of the CAL. On March 7, 1988, the Regional Administrator was notified per item (3) that the plant was ready for restart. The Regional Administrator, through his designee, verbally communicated to the site Vice President his concurrence on restart.

A written letter of concurrence was issued to the licensee on March 8, 1988.

No violations or deviations were identified within the areas inspected.

### 13. List of Abbreviations

|        |  |
|--------|--|
| CAL    | Confirmation of Action Letter                  |
| CFR    | Code of Federal Regulations                    |
| CP&L   | Carolina Power & Light                         |
| ECCS   | Emergency Core Cooling System                  |
| EDG    | Emergency Diesel Generator                     |
| ERFIS  | Emergency Response Facility Information System |
| ESF    | Engineered Safety Feature                      |
| HBR    | H. B. Robinson                                 |
| HVH    | Heating Ventilation Handling                   |
| ISI    | Inservice Inspection                           |
| I&C    | Instrumentation & Control                      |
| KW     | Kilowatt                                       |
| LCO    | Limiting Conditions for Operations             |
| LER    | Licensee Event Report                          |
| MST    | Maintenance Surveillance Test                  |
| MWT    | Megawatts Thermal                              |
| NRC    | Nuclear Regulatory Commission                  |
| ONS    | Onsite Nuclear System                          |
| OST    | Operations Surveillance Test                   |
| PNSC   | Plant Nuclear Safety Committee                 |
| PORV   | Power Operating Release Valve                  |
| PZR    | Pressurizer                                    |
| QC     | Quality Control                                |
| RHR    | Residual Heat Removal                          |
| RPM    | Revolutions Per Minute                         |
| SBLOCA | Small Break Loss of Coolant Accident           |
| SI     | Safety Injection                               |
| SPDS   | Safety Parameter Display Systems               |
| SW     | Service Water System                           |
| TS     | Technical Specification                        |
| UNR    | Unresolved Item                                |
| W/R    | Work Request                                   |
| WR/JO  | Work Request/Job Order                         |