



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

Report Nos.: 50-413/92-06 and 50-414/92-06

Licensee: Duke Power Company  
 P.O. Box 1007  
 Charlotte, N.C. 28201-1007

Docket Nos.: 50-413 and 50-414

License Nos.: NPF-35 and NPF-52

Facility Name: Catawba Nuclear Station Units 1 and 2

Inspection Conducted: February 9, 1992 - March 7, 1992

Inspectors:	<u>W. T. Orders, Senior Resident Inspector</u>	<u>3-30-92</u> Date Signed
	<u>P. C. Hopkins, Resident Inspector</u>	<u>3-30-92</u> Date Signed
	<u>J. Zeiler, Resident Inspector</u>	<u>3-30-92</u> Date Signed
Approved by:	<u>George A. Delisle, Chief</u> Projects Section 3A Division of Reactor Projects	<u>3/30/92</u> Date Signed

SUMMARY

Scope: This routine, resident inspection was conducted in the areas of review of plant operations; surveillance observations; maintenance observations; and, licensee event reports.

Results: One Unresolved Item was identified involving single failure design problems associated with the control circuitry for the Auxiliary Feedwater Systems (Paragraph 7).

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

S. Bradshaw, Shift Operations Manager  
J. Forbes, Engineering Manager  
S. Frye, Operations Support Manager  
R. Futrell, Regulatory Compliance Manager  
E. Geddie, Operations Superintendent  
\*T. Harrall, Safety Assurance Manager  
\*J. Lowery, Compliance  
W. McCollum, Station Manager  
K. Seasely, Compliance  
M. Tuckman, Catawba Site Vice-President

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

#### NRC Resident Inspectors

W. Orders  
\*P. Hopkins  
\*J. Zeiler

\*Attended exit interview.

### 2. Plant Status

#### a. Unit 1 Summary

Unit 1 began the report period operating at 100 percent power. On March 4, during routine stroke testing of selected main turbine steam valves, Stop Valve #4 failed to close. To facilitate work on the valve, reactor power was reduced to 65 percent. On March 5, following repairs to the valve, power was increased to 85 percent where it remained for the duration of the report period.

Details pertaining to the valve problem are described in Paragraph 8.

#### b. Unit 2 Summary

Unit 2 began the report period operating at 100 percent power. On February 24, during routine stroke testing of the selected main turbine steam valves, Intermediate Stop Valve #2 failed to reopen after being closed. The following day, reactor power was reduced to 65 percent to facilitate work on the valve. On February 26, when efforts to repair the valve on-line failed, power was reduced to 10 percent and the turbine was taken off-line. Later that day, repairs

were completed and the turbine was placed back on-line. The unit returned to 100 percent power the following day and remained at essentially full power for the remainder of the report period. Details pertaining to the valve problem are described in Paragraph 8.

### 3. Plant Operations Review (71707)

The inspectors reviewed plant operations throughout the report period to verify conformance with regulatory requirements, Technical Specifications (TS) and administrative controls. Control Room logs, the Technical Specification Action Item Log, and the Removal and Restoration (R&R) log were routinely reviewed. Shift turnovers were observed to verify that they were conducted in accordance with approved procedures. The complement of licensed personnel on each shift inspected, met or exceeded the requirements of Technical Specifications. Further, daily plant status meetings were routinely attended.

Plant tours were performed on a routine basis. The areas toured included but were not limited to the following:

- Turbine Buildings
- Auxiliary Building
- Units 1 and 2 Diesel Generator Rooms
- Units 1 and 2 Vital Switchgear Rooms
- Units 1 and 2 Vital Battery Rooms
- Standby Shutdown Facility

During the plant tours, the inspectors verified by observation and interviews that measures taken to assure physical protection of the facility met current requirements. Areas inspected included the security organization, the establishment and maintenance of gates, doors, and isolation zones in the proper conditions, and that access control badging were proper and procedures followed.

In addition, the areas toured were observed for fire prevention and protection activities and radiological control practices. The inspectors also reviewed Problem Investigation Reports (PIRs) to determine if the licensee was appropriately documenting problems and implementing corrective actions.

No violations or deviations were identified.

### 4. Activation of Fire Brigade for Unit 1 Electrical Inverter Fire (71707)

At 11:35 a.m., on the morning of March 3, 1992, the Catawba fire brigade was dispatched to combat a fire reported in the Unit 1 interior "dog house" (penetration room).

Two resident inspectors responded with the fire brigade and the remaining inspector responded to the control room. Upon arriving at the scene, the fire brigade detected that the "fire" was actually an overheated transformer and circuit card in an electrical inverter located outside the door to the Unit 1 interior dog house.

Operations staff secured power to the inverter and smoke emission ceased by approximately 11:42 a.m. Equipment supplied by the inverter was un-perturbed since the inverter loads had transferred to the alternate power source.

Operations staff evaluated the event for reportability and concluded that an NRC notification was not warranted.

Operations staff subsequently requested that Systems Engineering staff evaluate the impact of the smoke on applicable ventilation system filter medium. Analysis indicated that no deleterious effects had occurred.

Ultimately, the inverter was repaired and returned to service on March 4, 1992.

The response, teamwork, and performance of the security, operators, and fire brigade personnel were noteworthy.

No violations or deviations were identified.

#### 5. Conduct of Annual Emergency Drill (71707, 82301)

An annual Catawba Emergency Preparedness exercise was conducted on March 4, 1992. The exercise was held to meet the requirements of 10 CFR 50, Appendix E. The counties of York, Gaston, and Mecklenburg, and the states of North and South Carolina participated.

Two of Catawba's resident inspectors were players in the drill, participating in both the Technical Support Center (TSC) and Control Room. The remaining resident inspector performed the function of Evaluator in the TSC.

The drill was classified as "Fully Successful" although there were two minor weaknesses identified. The details of the NRC's evaluation of the drill are documented in NRC Inspection Report Nos. 50-413, 414/92-05.

No violations or deviations were identified.

#### 6. Review of Upcoming Unit 1 Outage Plans (71707)

The inspectors performed a preliminary review of the licensee's preparations for the upcoming Unit 1 EOC6 outage scheduled to begin on June 26, 1992. The primary emphasis of the review was to evaluate the licensee's efforts to manage shutdown risks.

The following is a brief synopsis of some of the initiatives which were reviewed and are to be implemented during IEOC6 in order to better manage shutdown risk:

A new "block tagout" procedure will be implemented to better maintain configuration control.

A revised Station Directive on the "independent verification" process will be implemented based on a new departmental directive which has already been issued. The Station Directive will address "separate" and "double" verification as technical methods for component positioning and verification. The directive also stresses the need for "self-verification."

The ultrasonic level sensors used during reactor coolant system reduced inventory conditions will be moved to the non-flow loops of the reactor coolant system. This will increase their reliability and enhance signal quality.

The vacuum refill process, successfully accomplished on Unit 2, will also be performed on Unit 1. The process will not be changed although some enhancements will be implemented.

There will be a dedicated operator to assure containment integrity and ensure special restrictions are adhered to relative to the switch yard alignment.

Other outage improvements of note include the development of a re-designed outage scheme to maintain essential electrical equipment available for a higher percentage of time and a review of the outage plan by CSRG for shutdown risk issues.

No violations or deviations were identified.

#### 7. Auxiliary Feedwater System Design Problem (71707)

On March 2, 1992, at approximately 8:40 p.m., with Units 1 and 2 at 100 percent power, the licensee determined that the Auxiliary Feedwater (AFW) systems on both units were inoperable. During a review of a Problem Identification Report (PIR), the licensee identified a single failure which could prevent the AFW systems from performing their intended safety function of providing at least 492 gpm to two un-faulted steam generators. An example of one possible single failure scenario is as follows: Assuming that the initiating event is a "B" S/G Feedwater line break, and the single failure is the fuse in a control power circuit to the "B" AFW pump breaker, the "B" AFW pump would not start, and the "A" AFW pump circuitry would not detect that the "B" AFW pump had received a start signal. As a result, the "A" AFW pump to "B" S/G valve, CA-58A, would not



close on the failure of the "B" CA pump to start. At this point in the scenario, the "B" CA pump would not be running, the "A" CA pump and the CAPT would be discharging to the faulted "B" S/G prohibiting the system from performing its intended safety function.

After declaring the systems inoperable, compensatory action was initiated to return the systems to service. The compensatory action required a dedicated licensed operator on each unit to take the necessary steps to mitigate hypothesized single failure scenarios.

At the end of the report period, both units were operating with the compensatory measures in place. Pending review of the licensee's action to correct this single-failure design flaw, the issue will be tracked and documented as Unresolved Item (UNR) 413, 414/92-06-01: Single-Failure Design Flaw in the CA Circuitry.

No violations or deviations were identified.

#### 8. Main Turbine Valve and Hydraulic Oil Problems (71707)

During this report period, both Units 1 and 2 experienced problems during the periodic stroke testing of the Main Turbine Stop Valves, Control Valves, and Combined Intermediate Valves (CIVs). Due to the recent failures experienced at other nuclear facilities involving solenoid-operated valves in the turbine trip system, the inspectors closely monitored the licensee's corrective actions for the turbine valve problems encountered.

On February 24, Unit 2 Intermediate Stop Valve (ISV) #2 failed to reopen after being closed during periodic testing. On the following day, in order to investigate the cause of the valve problem without risking a reactor trip, reactor power was reduced to 65 percent. Below 69 percent power, a turbine trip does not automatically cause a reactor trip. The licensee determined that the problem was the failure of solenoid-operated valves in the ISV's test circuitry, and that the ISV would still have closed on a valid turbine trip signal. Since only the test portion of the turbine valve actuation hydraulics was affected, the valve was determined to be operable. In order to repair the test solenoid valve, it was necessary to take the turbine off-line. On February 26, reactor power was reduced to 10 percent and the turbine was removed from service.

The solenoid test valves for ISV #2 were replaced, and following testing, the turbine was placed back on-line early the next day. Later, when the solenoid test valves which had malfunctioned were disassembled and analyzed, metal filings were found in one and a piece of an o-ring was found in another. It is believed that the foreign material had interfered with the normal movement of the solenoid valves and had prevented the ISV from re-opening. The licensee indicated that there had been no past

problems with these valves nor had foreign material of this nature ever been found in the Main Turbine Hydraulic Oil (LH) System. The oil is routinely sampled to ensure that it has not been contaminated or degraded. Although this appeared to be an isolated event, the licensee was considering the implementation of a preventive maintenance program on the Turbine Control System solenoid-operated valves.

On March 4, Operations personnel were performing testing of the Main Turbine Stop Valves and CIVs for Unit 1. During this testing, Stop Valve #1 initially failed to stroke within acceptable time limits and Stop Valve #4 failed to reopen after being closed. In order to investigate the cause of the valve problems without risking a reactor trip, reactor power was reduced to 65 percent. While decreasing power, problems were also noticed in the operation of the LH System that eventually led to the discovery of foreign material in the oil reservoir. Samples of the oil in the LH reservoir indicated the presence of water and mineral oil.

On March 5, attempts to close Stop Valve #4 were successful after manually manipulating one of its associated solenoid test valves. Analysis of the failed solenoid test valve revealed that the water in the oil had resulted in the formation of rust in the valve which had in turn prevented it from changing position when energized.

Based on the degraded conditions of the LH oil and solenoid test valves, the inspectors questioned the operability of the emergency portion of the Turbine Control System. The licensee concluded that the degraded oil would not adversely impact the emergency portion of the system. This was predicated primarily on the fact that, unlike the test solenoid valves, the components in the emergency trip system were made of stainless steel. As an added precaution, increased testing of the emergency trip and test portion of the Main Turbine Control System was conducted to ensure the continued reliability of the system. The licensee indicated that during the upcoming refueling outage, all major components in the emergency trip system would be inspected to ensure that no degradation had occurred.

On March 5, following replacement of the solenoid test valve for Stop Valve #4, reactor power was increased to 85 percent. Clean-up of the oil was initiated, involving replacement of the oil through a bleed and feed method. At the end of the report period, oil clean-up activities were continuing.

The licensee was unable to determine conclusively how the oil had been contaminated. A probable cause was that someone had mistakenly introduced waste oil into the barrels of LH fluid left near the LH reservoir. The licensee indicated that occasionally, barrels of LH oil are left near the LH reservoir tank unattended. As part of the licensee's corrective action for this event, stricter controls of the LH oil will be implemented.

The inspectors will continue to monitor the licensee's clean-up of the LH oil and the implementation of stricter controls of the LH oil.

No violations or deviations were identified.

9. Surveillance Observation (61726)

During the inspection period, the inspectors verified plant operations were in compliance with various TS requirements. Typical of these requirements were confirmation of compliance with the TS for reactivity control systems, reactor coolant systems, safety injection systems, emergency safeguards systems, emergency power systems, containment, and other important plant support systems. The inspectors verified that: surveillance testing was performed in accordance with approved written procedures, test instrumentation was calibrated, limiting conditions for operation were met, appropriate removal and restoration of the affected equipment was accomplished, test results met acceptance criteria and were reviewed by personnel other than the individual directing the test, and any deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

Inspection areas included the following:

a. Observations

The following surveillances were witnessed or reviewed without any major discrepancies being identified:

PT/0/A/4200/17	Safety Shutdown Facility Operability Run
PT/2/A/4400/01D	Fire Pump Operability Test
PT/1/A/4350/02A	Diesel Generator 1A Operability Test
PT/1/A/4450/03A	Annulus Ventilation System Train 1A Operability Test
PT/2/A/4150/01D	Reactor Coolant System Leakage Calculation
PT/2/A/4200/16	Safety Injection System Power Disconnect Test
PT/2/A/4200/24	Ice Condenser Refrigeration System Valve Inservice Test
PT/2/A/4200/62	Nuclear Service Water System to Containment Penetration Valve Injection Water System Flow Verification
PT/2/A/4250/02B	Weekly Main Turbine Valve Movement
PT/2/A/4600/02A	Mode 1 Periodic Surveillance Items

b. Unit 2 Inservice Test of Safety Injection Pump 2B

On February 14, the inspectors observed the performance of the Inservice Test for Safety Injection (NI) Pump 2B, using PT/2/A/4200/05B. During the test, recirculation flow (miniflow) was measured at 43.8 gpm, which was below the acceptable limits of 45.1 to 46 gpm stated in the procedure. The pump was secured and it was later determined that back-leakage through 2NI-114, the NI Pump 2A Miniflow Check Valve, was causing the low flow condition.



Both NI pump miniflow lines tie into a common header, which returns to the Refueling Water Storage Tank (FWST). Upstream of this header, check valves are installed in both of the NI pump's miniflow lines which prevent back-leakage from one NI train to the other. The licensee performed an engineering analysis that determined that this small amount of back-leakage would have no adverse effect on NI or other ECCS operability. Based on this, the check valve was declared inoperable, but, both NI trains were determined to be operable.

On February 26, the inspectors witnessed portions of the attempted repair of check valve 2NI-114, which included replacing the valve's internals. The next day, following completion of maintenance, the valve was tested and the same amount of back-leakage was measured. On March 2, under a Station Modification, the licensee replaced the check valve's "hard seat" with a "soft seat," in hopes of improving the valve's seating capability. When the valve was tested again, the same amount of back-leakage was measured. At the end of the report period, the licensee was evaluating the next course of action to repair the check valve. The inspectors will continue to monitor the licensee's efforts to resolve the back-leakage problem with Check Valve 2NI-114. No discrepancies were noted in the licensee's activities.

No violations or deviations were identified.

#### 10. Maintenance Observations (62703)

##### a. General

Station maintenance activities of selected systems and components were observed/reviewed to ensure that they were conducted in accordance with the applicable requirements. The inspectors verified licensee conformance to the requirements in the following areas of inspection: activities were accomplished using approved procedures, and functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained; activities performed were accomplished by qualified personnel; and materials used were properly certified. Work requests were reviewed to determine the status of outstanding jobs and to assure that priority was assigned to safety-related equipment maintenance which may affect system performance.

##### b. Maintenance Activities Reviewed

The inspectors witnessed or reviewed the maintenance activities associated with the following Work Requests:

570590 OPS	Investigate/Repair Problem with CA Pump 1B Minimum Flow Control Valve, 1CA-32
92013771-01	Seat Modification of Check Valve 2NI-114

91064542-01	Perform SSF Diesel Inspection
91019115-01	Calibrate Reactor Coolant Hotleg Lo-Range Pressure Switches
91019073-01	Calibrate Pressurizer Pressure Instrumentation

No violations or deviations were identified.

#### 11. Review of Licensee Event Reports (92700)

The below listed Licensee Event Reports (LERs) were reviewed to determine if the information provided met NRC requirements. The determination included: adequacy of description, verification of compliance with Technical Specifications and regulatory requirements, corrective action taken, existence of potential generic problems, reporting requirements satisfied, and the relative safety significance of each event.

##### a. (Closed) LER 413/90-22: Technical Specification Pressurizer Temperature Limits Violated Due to Management Deficiency

On March 25, 1990, with Unit 1 in Mode 5, I&E performed an engineering safety feature actuation periodic test which injected approximately 5000 gallons of water into the Reactor Coolant System. This surge of cold water into the pressurizer resulted in the 200 degree F per hour cooldown limit being exceeded. Conclusion of the test and action to reduce pressurizer level and pressure resulted in an outsurge of water which caused heatup in excess of 100 degrees F per hour limit. The inspectors reviewed the licensee's immediate and long-term corrective actions. Additional concerns were not identified.

##### b. (Closed) LER 414/90-12: Technical Specification Violation Due to Pressurizer Heatup Limit Exceeded Following Residual Heat Removal Pump Test

On September 1, 1990, with Unit 2 in Mode 5, Cold Shutdown, a temperature transient of the Reactor Coolant (NC) System Pressurizer (PZR) occurred which resulted in the violation of the Technical Specification (T/S) heatup limit. The transient occurred following performance of an IWP test on Residual Heat Removal (ND) System Pump 2B. With ND Train A operating to provide decay heat removal capability, and Chemical and Volume Control (NV) System Train A operating to provide NC System charging capability, ND Train B was aligned per the Performance ND Pump 2B Test procedure valve lineup. Control Room Operators (CROs) then isolated both ND Trains letdown to NV and started the ND pump in mini-flow to perform the test. CROs were closely monitoring PZR level indications and noticed a PZR cooldown which approached but did not exceed the T/S PZR cooldown rate limit. CROs reestablished ND letdown to secure the cooldown transient and aborted the test. Subsequently, while attempting to recover from the cooldown, a heatup of the PZR occurred which exceeded the T/S heatup rate limit due to temperature stratification

within the PZR. This incident is attributed to an Inadvertent Action and a Defective Procedure. Corrective actions included a PZR operability determination, a revision to the test procedure, and development of an enhanced training module that was presented to the operators.

- c. (Closed) LER 413/90-29: Inadequate Technical Reviews of a Compensatory Action Resulting in a Technical Specification Violation Due to Inadequate Directive/Policy.

On July 18, 1990, with Unit 1 in Mode 1, Power Operation, a Compensatory Action was approved to open the upper Annulus access door in order to perform maintenance on the Annulus Ventilation (VE) System. The resident inspectors voiced concerns regarding the adequacy of the Compensatory Action, which ultimately resulted in the licensee concluding that the "compensated" VE System was incapable of meeting certain TS requirements regarding system operation during accident conditions. It was determined that the safety evaluation which preceded implementation of the Compensatory Action was inadequate and indicated a weakness in the licensee's Compensatory Action Program.

As a result of the incident Station Directive 3.1.14, Operability Determination, was revised on May 1, 1991, to provide more specific guidance on establishing Compensatory Actions. The inspectors reviewed the revised station directive and determined that the licensee had adequately addressed the weaknesses associated with the Compensatory Action Program to preclude recurrence of similar incidents.

No violations or deviations were identified.

## 12. Exit Interview

The inspection scope and findings were summarized on March 11, 1992, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

<u>Item Number</u>	<u>Description and Reference</u>
UNR 413, 414/92-06-01	Single-Failure Design Flaw in the Auxiliary Feedwater System Circuitry (Paragraph 7).