

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-413, 50-414

License Nos: NPF-35, NPF-52

Report Nos: 50-413/99-08, 50-414/99-08

Licensee: Duke Energy Corporation

Facility: Catawba Nuclear Station, Units 1 and 2

Location: 422 South Church Street
Charlotte, NC 28242

Dates: November 21, 1999 - January 1, 2000

Inspectors: D. Roberts, Senior Resident Inspector
R. Franovich, Resident Inspector
M. Giles, Resident Inspector
R. Moore, Reactor Inspector (Section E8.2, E8.3)

Approved by: C. Ogle, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Enclosure

EXECUTIVE SUMMARY

Catawba Nuclear Station, Units 1 and 2
NRC Inspection Report 50-413/99-08, 50-414/99-08

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six-week period of resident inspection; as well as an in-office review by one regional inspector. [Applicable template codes and the assessment for items inspected are provided below.]

Operations

- Based on a review of control room activities and plant parameters following the December 30, 1999, reactor trip, the inspectors concluded that control room operators handled this event well and the plant responded as expected. The trip was not caused by a computer-related problem associated with the transition to Year 2000. (Section O2.1; [POS - 1B])

Engineering

- A non-cited violation was identified for a 1989 modification that would have caused the annulus ventilation system to be unable to perform its design function as described in the Updated Final Safety Analysis Report under certain conditions. (Section E8.1; [NCV - 4A])
- A non-cited violation was identified for an inadequate surveillance procedure which failed to properly verify operability of the control room area ventilation system. (Section E8.3; [NCV - 2B])

Report Details

Summary of Plant Status

Unit 1 operated at or near 100 percent power throughout the inspection period.

Unit 2 began the inspection period at approximately 100 percent power. A unit downpower was initiated on December 3, 1999, to replace a diaphragm associated with main feed-water regulating valve 2CF-55. The downpower was halted at 17 percent power on December 4, 1999. The valve diaphragm was replaced, but the unit remained at 16 percent power because main feedwater isolation valve (MFIV) 2CF-51 failed a functional test on December 4, 1999. The licensee replaced the B train solenoid valve associated with the safety-related nitrogen supply to the MFIV's actuator on December 5, 1999, and completed post-maintenance testing later that day. The valve was declared operable on December 5, 1999, and a power increase was initiated. The unit returned to 100 percent power operation on December 6, 1999. The unit operated at or near 100 percent power until December 30, 1999, when a reactor trip/turbine trip occurred. The trip was caused by a loss of main turbine electro-hydraulic control system oil pressure (a detailed discussion is provided in Section O2.1 of this inspection report). The unit remained in Mode 3 for the remainder of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

The inspectors conducted frequent control room tours to verify proper staffing, operator attentiveness and effective communications, and adherence to approved procedures. The inspectors: (1) attended operations shift turnovers and site direction meetings to maintain awareness of overall plant status and operations; (2) reviewed operator logs to verify operational safety and compliance with technical specifications (TS); (3) periodically reviewed instrumentation, computer indications, and safety system lineups, along with equipment removal and restoration tagouts, to assess system availability; (4) reviewed the TS Action Item Log (TSAIL) for both units daily for potential entries into limiting conditions for operation (LCO) action statements; (5) conducted plant tours to observe material condition and housekeeping; and (6) routinely reviewed Problem Identification Process reports (PIPs) to ensure that potential safety concerns and equipment problems were resolved. The inspectors identified no major problems from the above reviews.

O2 Operational Status of Facilities and Equipment

O2.1 Automatic Reactor Trip Due To A Short In Main Turbine Electrical Trip Solenoid Connector

a. Inspection Scope (93702, 71707, 37551, 40500)

On December 30, 1999, at 6:21 p.m., Unit 2 experienced an automatic reactor trip from 100 percent power. At the time the trip occurred, the plant was operating at steady state conditions. The inspectors responded to the site following the trip to assess plant conditions and to ensure that the unit was stable in Hot Standby (Mode 3). The inspectors reviewed the licensee's post-trip report, the Failure Investigation Process (FIP) report, PIP C-99-05255, and the Updated Final Safety Analysis Report (UFSAR)

Chapter 15, Accident Analysis, to assess operator actions and verify that plant equipment responded appropriately to the trip.

b. Observations and Findings

Following the reactor trip, control room operators entered Emergency Operating Procedure E-0, Reactor Trip or Safety Injection, and subsequently transitioned to Procedure ES 0.1, Reactor Trip Response, for post-trip recovery actions. The inspectors verified through control room observations that plant conditions were stable with the unit in Mode 3. No significant system deficiencies were noted.

Troubleshooting activities performed by the licensee's FIP team later determined the root cause of this event to be an electrical short in the pin connector at the main turbine electrical trip solenoid valve. This short caused the electrical solenoid valve to inadvertently actuate, dumping turbine hydraulic control oil and tripping the main turbine. When oil pressure decreased to approximately 550 pounds per square inch gauge, trip logic circuitry in the reactor protection system was satisfied and the reactor automatically tripped. Licensee personnel corrected the problem by replacing the pin connector and successfully performing turbine trip testing. The inspectors determined that the pin connector failure (and subsequent plant trip) was not a computer-related problem.

The inspectors reviewed PT/0/A/4150/02, Revision 3, Transient Investigation, to assess plant response as compared with that specified in the Updated Final Safety Analysis Report (UFSAR), Chapter 15, Accident Analysis. No system functional discrepancies were identified. The inspectors attended licensee-conducted restart meetings and observed the Plant Operations Review Committee (PORC) meeting that approved restart of the unit. Plant personnel and PORC committee members maintained the proper focus on safety during these meetings while resolving minor issues identified during and following the event.

c. Conclusions

An automatic Unit 2 trip occurred following the failure of a pin connector on the main turbine electrical trip solenoid. Based on a review of control room activities and plant parameters following the trip, the inspectors concluded that control room operators handled this event well and the plant responded as expected. The trip was not caused by a computer-related problem associated with the transition to Year 2000.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments on the Conduct of Maintenance and Surveillance Activities (62707, 61726)

The inspectors observed all or portions of the following maintenance and surveillance activities:

- PT/2/A/4250/003A, Revision 34, Auxiliary Feedwater Motor Driven Pump 2A Performance Test
- PT/2/A/4200/007C, Revision 15, Standby Makeup Pump #2 Performance Test

- PT/2/A/4200/018B, Revision 13, CF Valve Inservice Test (CS)
- MP/0/A/7450/080, Revision 11, Troubleshooting and Corrective Maintenance of HVAC Dampers (Including Fire Dampers)
- PT/0/A/4450/004A, Revision 43, Auxiliary Building Filtered Exhaust System Performance Test

Maintenance and surveillance activities were performed using good workmanship, proper procedural adherence, and appropriate controls for using calibrated measuring and test equipment. Appropriate radiological practices were also observed where necessary.

M8. Miscellaneous Maintenance Issues (92902, 92700)

M8.1 (Closed) Licensee Event Report (LER) 50-414/98-004-01: Error During Tagout Causes De-Energization of Vital Bus and Actuation of Low Temperature Overpressure Protection

This LER documented a September 6, 1998, event that was discussed in NRC Inspection Reports (IR) 50-413,414/98-09; 98-10; and 99-03. The original LER was closed in IR 99-03. Revision 1 to the LER was issued to correct some content errors in the original LER. No further inspection of this event was warranted and Revision 1 of the LER is closed.

M8.2 (Closed) LER 50-413/99-008-02: Operation Prohibited by Technical Specification 3.5.2 due to an Inoperable Centrifugal Charging Pump and Operation Prohibited by Technical Specification 3.7.12 due to Inadequate Control of the Auxiliary Building Filtered Ventilation Exhaust System Pressure Boundary

This LER documented a June 10, 1999, event in which both trains of the auxiliary building filtered ventilation exhaust system were inoperable after plant personnel blocked open a pressure boundary door associated with the 1B centrifugal charging pump room. The original LER and Revision 1 were closed in IR 50-413,414/99-07. Revision 2 to the LER was issued to correct details regarding the identification and duration of the violation. No further inspection of this event was warranted and Revision 2 of the LER is closed.

III. Engineering

E8 Miscellaneous Engineering Issues (92903, 92700, 90712)

E8.1 (Closed) LER 50-413/99-012-00: Adverse System Interaction Between the Annulus Ventilation System and the Auxiliary Building Ventilation System due to Inadequate Design

This report documents an adverse system interaction (ASI) identified by the licensee on May 19, 1999. The ASI had the potential to adversely affect the annulus ventilation (VE) system, which is designed to minimize the release of radioiodines from the primary containment to the environment during an accident. The VE system performs its safety function by drawing down annulus pressure following a safety injection actuation signal and maintaining annulus pressure at a differential pressure of -1.5 inches water gauge. The pressure transmitters that provide control signals to the VE system are located in electrical penetration rooms in the auxiliary building.

The licensee determined that the ASI was generated in 1989, when station modifications were implemented to install cooling units in the electrical penetration rooms. The ASI involved an interaction between the VE system and the auxiliary building ventilation (VA) system such that, under certain circumstances, the VA system could pressurize an electrical penetration room. This could cause the pressure transmitter in that room to control annulus pressure at a less negative pressure setpoint than -1.5 inches water gauge.

Section 9.4.9.2, System Description, of the Catawba UFSAR states that the annulus ventilation system is activated by a safety injection signal and maintains a negative pressure of approximately -1.5 inches water gauge in the annulus to ensure that, under all conditions, all points of the annulus will be at least -0.5 inches water gauge. Since the 1989 modification would have caused the annulus ventilation system to be unable to perform its design function as described in the UFSAR under certain conditions, a violation of 10 CFR Part 50, Appendix B, Criterion III was identified. However, the licensee's safety analysis indicated that the differential pressure between the annulus and atmosphere would have been maintained at -0.5848 inches water gauge (hence more negative than the design basis limit of -0.5 inches water gauge) at the top of the highest reactor building penetration (the equipment hatch), accounting for thermal gradients at that corresponding reactor building elevation. The LER also stated that the differential pressure at the top of the reactor building would have been -0.162 inches water gauge at a very cold outside temperature (the temperature value was not provided). The licensee determined that this differential pressure was sufficient to prevent leakage from the annulus into the environment. Based upon this analysis, the inspectors concluded that the issue did not cause an increase in the potential for radioactive releases to the environment and that the event had no effect on public health and safety. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. This violation is in the licensee's corrective action program as PIP C-99-2001. This item is identified as NCV 50-413,414/99-08-01: Ventilation System Changes Introduce a Potential Adverse System Interaction With the Annulus Ventilation System.

The licensee implemented immediate corrective actions to prop open access doors to the four electrical penetration rooms and doors associated with access stairwells to ensure that pressure perturbations in the electrical penetration rooms would not significantly affect those rooms and, hence, the VE system instrumentation in them. The licensee declared the system operable but degraded with these compensatory measures in place. The licensee's permanent corrective actions were to implement modifications CE-61487 and CE-61488 to route the transmitter's reference legs to the interior main steam doghouses, where they would not be affected by pressure perturbations in the electrical penetration rooms. The inspectors observed portions of the modification implementation in the field and verified that this corrective action was completed on August 20, 1999, for Unit 1 and August 18, 1999, for Unit 2. These corrective actions, which were identified in the PIP and the LER were appropriate.

Following a review of the LER, the inspectors determined that the LER was not submitted to the NRC in a timely manner. The ASI was identified on May 19, 1999; however, an inadequate operability determination at that time caused a delay in the licensee's determination that the VE system was inoperable until June 11, 1999. Thirty-four days later, on July 15, 1999, the licensee determined that the system was past inoperable. The licensee finally concluded 13 days afterwards on July 28, 1999, that the

issue was reportable per 10 CFR Part 50.73. The failure to report the past inoperability of the VE system within 30 days constituted a violation of minor significance and is not subject to enforcement action. The LER also contained inaccurate information with regard to the realignment of the VA system to its filtered exhaust mode of operation during certain design basis events. Specifically, the VA system was modified in 1996 to always operate in the filtered mode. Inspectors identified similar inaccuracies in the licensee's UFSAR in May 1998 as part of an escalated enforcement item associated with failed surveillance tests of the VA system. The item was characterized as a SL IV violation of 50.71(e) on June 11, 1998. The inspectors verified that the UFSAR has been updated to reflect the current system operation.

E8.2 (Closed) LER 50-413/99-004-00: Inappropriate Technical Specification (TS) Requirements for Control Area Ventilation System (CRAVS) and Auxiliary Building Filtered Ventilation Exhaust System (ABFVES)

(Closed) URI 50-413.414/99-01-02: Notice of Enforcement Discretion (NOED) for TS 3.3.7 and 3.3.8 Surveillance Requirements

(Closed) NOED 99-6-003: Catawba Units 1 and 2 Request for Enforcement Discretion Regarding TS 3.3.7 (CRAVS Actuation Instrumentation) and 3.3.8 (ABFVES Actuation Instrumentation)

Based on an in-office review, the inspectors determined that the licensee's review of the improved TS identified that solid state protection system (SSPS) surveillance requirements specified in TS for the actuation instrumentation for CRAVS and ABFVES could not be implemented as written. This was documented in LER 50-413/99-004-00. A NOED was requested and granted for the period from March 11, 1999, until the TS could be amended to delete the inappropriate surveillance requirements. A URI was initiated to track the completion of the NOED requirements, to review previous opportunities to identify this deficiency and to review the lower tier logic testing of the CRAVS.

The licensee identified that these TS surveillance requirements were inappropriate because these systems did not receive an SSPS actuation signal. Instead, system actuation was accomplished directly from the emergency diesel generator sequencer and was periodically tested by the engineered safety features actuation system (ESFAS) testing. As the systems were being periodically tested, this TS deficiency was not safety significant. Closure of the NOED was based on completion of TS Amendments 177 and 169 for Units 1 and 2, respectively, which were issued on April 8, 1999.

The licensee's previous opportunities to identify this deficiency included a 1990 modification to the ABFVES which deleted an SSPS actuated open signal to a single room damper and replaced it with a locked open configuration. This was the only SSPS application to either system. Additionally, the licensee's review for GL 96-01, Testing of Safety Related Logic Circuits, could have identified that TS 3.3.7 and 3.3.8 were inappropriate to the Catawba design for the CRAVS and the ABFVES. Although not safety significant, the licensee's incorrect TS is a condition adverse to quality which had not been promptly identified and corrected as required by 10 CFR 50, Appendix B, Criterion XVI, Corrective Action. This noncompliance with 10 CFR 50 Appendix B, constitutes a violation of minor significance and is not subject to formal enforcement action.

E8.3 (Closed) LER 50-413/99-011-00: Missed Surveillance on Both Trains of CRAVS Resulted in a TS Violation Due to a Defective Procedure

The licensee's review of lower tier CRAVS logic testing identified that the test procedure was inadequate for the relay that provided the idle train start actuation. This testing surveillance requirement was specified in TS 3.7.10.3. The test was inadequate in that it required visual observation of the plunger actuated position but did not verify the actual start of the idle train. The licensee reported this as a missed TS surveillance due to inadequate procedure for the CRAVS trains in LER 50-413/99-011. The licensee revised the test procedure to require verification of idle train start in conjunction with the relay plunger position. Performance of the revised test procedure verified that the idle train started with the change in relay plunger position which demonstrated CRAVS train operability. No actual CRAVS or CRAVS actuation instrumentation unavailability occurred as a result of the missed surveillance. Although the missed CRAVS surveillance was not a safety significant condition as demonstrated by the successful revised test performance, the missed TS surveillance due to inadequate procedure was not an isolated occurrence at Catawba. Similar occurrences were identified in LERs 50-413/96-002, 50-413/97-008, and 50-413/98-005. Failure to properly verify CRAVS train operability is a violation of TS 3.7.10.3. This Severity Level IV violation is being treated as an NCV, consistent with Section VII.B.1 of the NRC Enforcement Policy and is identified as NCV 50-413,414/99-08-02: Failure to Properly Verify CRAVS Train Operability as Required by TS 3.7.10.3 Due to Inadequate Procedure. This deficiency is entered into the licensee's corrective action program as PIP C-99-03010.

IV. Plant Support

R1 Radiological Protection

R1.1 General Comments (71750)

The inspectors toured the facility to assess the licensee's radiological controls and work practices. The licensee's performance in this area was adequate and no issues were identified by the inspectors.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management on January 12, 2000. The licensee acknowledged the findings presented. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

T. Beadle, Emergency Preparedness Manager
 R. Beagles, Safety Review Group Manager
 M. Boyle, Radiation Protection Manager
 G. Gilbert, Regulatory Compliance Manager
 R. Glover, Operations Superintendent
 P. Grobusky, Human Resources Manager
 P. Herran, Engineering Manager

R. Jones, Station Manager
 R. Parker, Maintenance Superintendent
 G. Peterson, Catawba Site Vice-President
 F. Smith, Chemistry Manager
 D. Sweigart, Safety Assurance Manager

INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering
 IP 40500: Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
 IP 61726: Surveillance
 IP 62707: Maintenance Observation
 IP 71707: Plant Operations
 IP 71750: Plant Support Activities
 IP 90712: In-Office Review of Written Reports of Nonroutine Events
 IP 92700: Onsite Followup of Written Reports of Nonroutine Events
 IP 92902: Followup - Maintenance
 IP 92903: Followup - Engineering
 IP 93702: Prompt Onsite Response to Events at Operating Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-413,414/99-08-01	NCV	Ventilation System Changes Introduce a Potential Adverse System Interaction With the Annulus Ventilation System (Section E8.1)
50-413,414/99-08-02	NCV	Failure to Properly Verify CRAVS Train Operability as Required by TS 3.7.10.3 Due to Inadequate Procedure (Section E8.3)

Closed

50-414/98-004-01	LER	Error During Tagout Causes De-Energization of Vital Bus and Actuation of Low Temperature Overpressure Protection (Section M8.1)
50-413/99-008-02	LER	Operation Prohibited by Technical Specification 3.5.2 due to an Inoperable Centrifugal Charging Pump and Operation Prohibited by Technical Specification 3.7.12 due to Inadequate Control of the Auxiliary Building Filtered Ventilation Exhaust System Pressure Boundary (Section M8.2)
50-413/99-012-00	LER	Adverse System Interaction Between the Annulus Ventilation System and the Auxiliary Building Ventilation System due to Inadequate Design (Section E8.1)

50-413/99-004-00	LER	Inappropriate TS Requirements for CRAVS and ABFVES (Section E8.2)
50-413,414/99-01-02	URI	NOED for TS 3.3.7 and 3.3.8 Surveillance Requirements (Section E8.2)
99-6-003	NOED	Catawba Units 1 and 2 Request for Enforcement Discretion Regarding TS 3.3.7 (CRAVS Actuation Instrumentation) and 3.3.8 (ABFVES Actuation Instrumentation) (Section E8.2)
50-413/99-011-00	LER	Missed Surveillance on Both Trains of CRAVS Resulted in a TS Violation Due to a Defective Procedure (Section E8.3)