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

Report Nos.: 50-413/94-11 and 50-414/94-11

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

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: April 3, 1994 - May 7, 1994

Inspectors: R E Carroll for 6/1/94
R. J. Freudenberger, Senior Resident Inspector Date Signed

P. C. Hopkins, Resident Inspector
J. Zeiler, Resident Inspector
R. E. Carroll, Project Engineer, NRC Region II

Approved by: M V Sinkule 6/2/94
Marvin V. Sinkule, Chief Date Signed
Projects Branch 3
Division of Reactor Projects

SUMMARY

Scope: This resident inspection was conducted in the areas of plant operations, maintenance, engineering, plant support, previously identified items, and Licensee Event Reports. As part of this effort, backshift inspections were conducted.

Results: In the operations area, good plant management involvement and direction was noted in the investigation and corrective actions of Residual Heat Removal equipment problems prior to entering reduced reactor coolant system inventory operations during the early portions of the Unit 2 End-of-Cycle 6 refueling outage (paragraph 3.a).

In the maintenance area, a violation was identified regarding the failure to follow Unit 2 Power Range Instrument Analog Channel Operational Test procedures which resulted in two of the channels being left with non-conservative Neutron Flux High Trip setpoints. Job Supervisory reviews of the completed work packages were not adequately performed, in that the procedural errors were not detected (paragraph 4.c). Additionally, inadequate post maintenance testing was identified by the licensee following the replacement of

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

Report Nos.: 50-413/94-11 and 50-414/94-11

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

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: April 3, 1994 - May 7, 1994

Inspectors: R E Carroll for 6/1/94
R. J. Freudenberger, Senior Resident Inspector Date Signed

P. C. Hopkins, Resident Inspector
J. Zeiler, Resident Inspector
R. E. Carroll, Project Engineer, NRC Region II

Approved by: M V Sinkule 6/2/94
Marvin V. Sinkule, Chief Date Signed
Projects Branch 3
Division of Reactor Projects

SUMMARY

Scope: This resident inspection was conducted in the areas of plant operations, maintenance, engineering, plant support, previously identified items, and Licensee Event Reports. As part of this effort, backshift inspections were conducted.

Results: In the operations area, good plant management involvement and direction was noted in the investigation and corrective actions of Residual Heat Removal equipment problems prior to entering reduced reactor coolant system inventory operations during the early portions of the Unit 2 End-of-Cycle 6 refueling outage (paragraph 3.a).

In the maintenance area, a violation was identified regarding the failure to follow Unit 2 Power Range Instrument Analog Channel Operational Test procedures which resulted in two of the channels being left with non-conservative Neutron Flux High Trip setpoints. Job Supervisory reviews of the completed work packages were not adequately performed, in that the procedural errors were not detected (paragraph 4.c). Additionally, inadequate post maintenance testing was identified by the licensee following the replacement of

a control switch associated with "A" Train Control Room Ventilation and Chill Water System (paragraph 4.a).

In the engineering area, investigation and corrective actions for a switchyard current transformer equipment problem were thorough; however, corrective actions for a damaged bus connection that was identified during these investigations was not timely (paragraph 7.a).

REPORT DETAILS

1. PERSONS CONTACTED

Licensee Employees

B. Addis, Training Manager
* M. Brady, Operations Section Manager
S. Coy, Radiation Protection Manager
* J. Forbes, Engineering Manager
W. Funderburk, Work Control Superintendent
* T. Harrall, IAE Superintendent
W. McCollum, Station Manager
W. Miller, Operations Superintendent
* K. Nicholson, Compliance Specialist
* M. Patrick, Safety Assurance Manager
R. Propst, Chemistry Manager
* D. Rehn, Catawba Site Vice-President
J. Roach, Security Manager
D. Rodgers, Mechanical Superintendent
* Z. Taylor, Compliance Manager

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

* Attended exit interview.

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

2. PLANT STATUS

a. Unit 1 Summary

Unit 1 operated at essentially full power for the duration of the report period.

b. Unit 2 Summary

Unit 2 began the report period operating at full power. On April 27, a power reduction was initiated to start End-of-Cycle 6 refueling outage. The unit was taken off-line on April 29, beginning the scheduled 59 day refueling outage. On May 1, Mode 5, Cold Shutdown was achieved. The unit remained shutdown for the remainder of the report period.

c. Inspections and Activities of Interest

During the week of April 25, a specialist inspection was conducted of the licensee's Operator Requalification Program during which an operating examination was administered to one Senior Reactor Operator candidate. Results of this inspection are documented in NRC Inspection Report 50-413,414/94-300.

During the week of May 2, a specialist inspection of the licensee's security area was conducted. Results of this inspection are documented in NRC Inspection Report 50-413,414/94-12.

3. **OPERATIONS** (NRC Inspection Procedures 40500 & 71707)

Throughout the inspection period, facility tours were conducted to observe operations and maintenance activities in progress. The tours included entries into the protected areas and the radiologically controlled areas of the plant. During these inspections, discussions were held with operators, radiation protection, and instrument and electrical technicians, mechanics, security personnel, engineers, supervisors, and plant management. Some operations and maintenance activity observations were conducted during backshifts. Licensee meetings were attended by the inspector to observe planning and management activities. The inspections confirmed Duke Power's compliance with 10 CFR, Technical Specifications, License Conditions, and Administrative Procedures.

a. Reduced Reactor Coolant System Level Operation

In preparation for the Catawba, Unit 2, End-of-Cycle 6 Refueling Outage, the inspector reviewed the licensee's administrative controls for operation of the reactor coolant system in reduced inventory and midloop conditions. At Catawba, plant administrative procedures consider the plant to be in a reduced inventory condition when the reactor coolant system level is below the reactor vessel flange with fuel in the core. This corresponds to a plant reference elevation of 574 feet 2 inches or 25 percent as indicated on reactor vessel level indication. Midloop is defined as reactor coolant system water level below the top of the flow area of the hot legs at the junction of the hot legs to the reactor vessel with fuel in the core. This corresponds to 7.25 percent as indicated on reactor vessel level indication.

The planned schedule for the outage includes two periods of operation in reduced inventory, one for Reactor Head removal beginning on May 6, 1994, and a second on May 31, 1994, for Reactor Head replacement. The second period, performed under low decay heat conditions, will also allow for the removal of the steam generator nozzle dams. Following head installation, the schedule calls for entering midloop on June 5, 1994, for Vacuum Refill of the reactor coolant system.

The inspector observed preparations for and draining of the reactor coolant system to reduced inventory for head removal. Review of preparations included monitoring the licensee's investigation and corrective actions for two equipment related problems with the A train Residual Heat Removal (RHR) system. The first problem involved a tubing leak on the 2A RHR pump mechanical seal housing. This was identified on May 1, soon after the pump was placed in service for plant cooldown. The tubing leak was at a threaded joint in the supply pipe to the pump's mechanical seal heat exchanger.

The licensee determined that only one RHR pump was necessary to maintain cold shutdown conditions. In addition, the steam generators were still available for decay heat removal, if needed. Based on this evaluation, the licensee decided to remove the 2A RHR pump from service in order to repair the leak. On May 2, the second equipment problem occurred while this repair activity was in progress. The problem involved the failure of valve 2ND-2A to open. Valve 2ND-2A is one of the two in-series reactor coolant loop to A train RHR isolation valves. The licensee determined that the torque switch in the valve actuator had failed. To faciiitate the failure analysis the licensee chose to replace the entire valve actuator. The following day, a detailed evaluation and action plan was developed specifically to address the repairs necessary to return A train RHR to service. The licensee determined that gagging 2ND-2A open would not degrade the operability of A train RHR. Therefore, once the mechanical seal heat exchanger tube repair was completed, valve 2ND-2A was gagged in the open position for the actuator replacement. On May 5, all A train RHR work was completed without further complications.

The licensee conducted numerous management meetings to discuss the A train RHR equipment problems and action plans. The inspector attended these meetings and noted good involvement and direction by plant management. A detailed operability and shutdown risk evaluation was performed for the RHR repairs, which included consideration of licensing and design basis requirements, as well as Probalistic Risk Assessment information. The inspector concluded that appropriate action was taken for these equipment problems.

b. Nuclear Safety Review Board Meeting

A Nuclear Safety Review Board meeting was held at Catawba on April 26 through 28, 1994. The inspector attended several sessions of the meeting to observe and monitor responses to action items identified as important to safe plant operations by the Nuclear Safety Review Board.

The sessions observed by the inspector included the following:

- Licensee Event Reports, other significant events, and regulatory status of items (e.g., special reports, etc..).

- Current Justifications for Continued Operation and conditional operability items.

- Corrective action program status and trends.

- Self assessment briefing.

- Component mispositioning events and trends.

In general, discussions were concerned with identified problems and actions taken to address them. Further discussions centered on measured effectiveness of improvements, and internal assessment effort effectiveness in identifying weaknesses.

Positive comments regarding Catawba performance included: the improvements in safety system unavailability, the reduction of mispositioning events, the control room operators' knowledge level and professionalism, the improving trend in the outstanding PIP corrective actions, and improvements in the proper use of fuses. Items which the Nuclear Safety Review Board felt should receive management attention included: improved communication among the site groups and management regarding plant equipment conditions, improved integration of plans to ensure the long-term reliability of the Service Water system, the control room outstanding removal and restoration items, and the preparation of a Design Basis Document for the Catawba electrical power system from the 4 kilovolt switchgear to the switchyard.

The inspector noted that the reports and discussions observed were probing and constructive.

No violations or deviations were identified.

4. **MAINTENANCE** (NRC Inspection Procedures 61726, & 62703)

Surveillance tests were observed to verify that approved procedures were being used; qualified personnel were conducting the tests; tests were adequate to verify equipment operability; calibrated equipment was utilized; and TS requirements were appropriately implemented.

In addition, the inspector observed maintenance activities to verify that correct equipment clearances were in effect; work requests and fire prevention work permits, as required, were issued and being followed; quality control personnel performed inspection activities as required; and TS requirements were being followed.

The following items were reviewed in detail.

a. Control Room Area Ventilation System Chiller Maintenance

During the week of April 18, 1994, the inspector observed the teardown/inspection of the A (VC/YC) chiller (WO# 94009979-01 & 02). This significant maintenance activity placed both units in a 7 day action statement per TS 3.7.6.a. and was being performed as part of the followup corrective action associated with the January 11, 1993 failure of the B Train VC/YC chiller compressor motor. Investigation into that failure revealed that cracks around the outer bolt holes of the motor's two-piece windage baffle had propagated (due to vibration) until a piece broke off and became wedged in the motor windings to cause a ground fault. Although not to the point of imminent failure, similar cracking of the A Train

VC/YC compressor motor's two-piece windage baffle was revealed during the observed teardown/inspection. As was done on Train B to preclude the vibration/cracking problem, the inspector verified that the A Train compressor motor was reassembled with a one-piece windage baffle.

Other VC/YC maintenance activities observed by the inspector during this time frame included yearly chiller preventive maintenance (WO# 94026534-01: oil and filter change, cooler cleaning/inspection, etc..); air handling unit preventive maintenance (WO# 94028528-01: grease, inspect, change belts, etc..); and replacement of the chiller head pressure controller (WO# 93074105-01: replace proportional controller with proportional/integral/derivative controller). No major problems were identified with these maintenance activities. As with the chiller teardown/inspection, applicable procedures were observed to be in the field and being followed, Quality Control was present where procedurally required, and system cleanliness was maintained.

On April 26, the A Train VC/YC System was again removed from service in order for a new hoist to be installed above the chiller. This hoist could not be installed simultaneously with the previous preventive maintenance because the extra time and impact would have involved greater than the allowed 7 days. This placed both units in a 7 day action statement per TS 3.7.6.a. Later that day, personnel noticed that the chiller oil pump was still operating even though the chiller was shutdown. As a result, oil had been pumped into the chiller refrigerant system. Subsequent licensee troubleshooting determined that the oil pump had continued to run following shutdown of the chiller due to a malfunction of the chiller program timer. This malfunction was caused by the incorrect installation of a microswitch in the chiller program timer control. Upon recognizing the VC/YC operability concern, the licensee initiated PIP 0-C94-0486. In evaluating the PIP, the licensee determined that the timer malfunction could have prevented the chiller from starting if an emergency start signal had been received; therefore, the A Train VC/YC system had been inoperable during this degraded condition.

The inspector reviewed the circumstances which led to the chiller program timer malfunction. The program timer microswitch was installed incorrectly on April 20 under WO 94031330-01 concurrent with the teardown/inspection of the A train VC/YC chiller. This maintenance activity had started on April 18, at 3:00 a.m., when both units were placed in a 7 day action statement per TS 3.7.6.a. The chiller was therefore required to be returned to an operable condition by April 25, at 3:00 a.m. During this maintenance activity, IAE noticed that microswitch PT-1 in the chiller program timer control was cracked and needed replacement. When the new switch was installed, it was positioned so that the switch contacts would not operate properly. After completing all work associated with the teardown/inspection activity, the chiller was started and verified to run properly; however, a complete startup and shutdown

cycle of the chiller was not performed. The inspector noted that the functional test requirements for WO 94031330-01 only required that the chiller be run, which was not adequate to ensure that the switch contacts were operating properly. The A train VC/YC system was returned to service with this degraded condition on April 24, at 3:20 a.m. At this time, the licensee considered A train VC/YC operable and exited the TS action statement. Since the degraded chiller condition existed through April 25 (in excess of the 7 day LCO), a violation of TS 3.7.6.a resulted. The licensee plans to submit an LER regarding this violation. The inspector determined that B Train VC/YC remained operable during the short time that the A Train was in this degraded condition.

The inspector reviewed Catawba Maintenance Management Procedure (MMP) 1.12, Post-Maintenance Testing Program. This procedure defines a "functional verification" as testing performed following maintenance which demonstrates that a component will operate and perform its intended functions. The inspector considered that the licensee had failed to follow this procedure, in that adequate functional verification was not prescribed nor performed for the replacement of microswitch PT-1 in the chiller program timer control. Corrective actions planned by the licensee include the development of a post maintenance test procedure for the chiller program timer and an assessment of the adequacy of other component level post maintenance test requirements. The inspector will review the adequacy of the licensee's corrective actions upon issuance of the LER for this issue.

b. Nuclear Service Water Pond Swapover Testing

On April 13 and 25, the inspector observed licensee testing to verify the proper operation of the RN emergency low pit level circuitry and SNSWP swapover logic. This testing was being conducted as a result of a recommendation from a licensee Self-Initiated Technical Audit of the RN system, which noted that the RN swapover function was not being periodically tested. The SNSWP is the safety-related assured water source for the RN System. During normal operation, the RN pumps take suction from Lake Wylie and return to Lake Wylie via the Low Pressure Service Water system discharge. Upon receipt of an emergency low RN pumphouse pit level signal, interlocks isolate RN from Lake Wylie, align RN to the SNSWP, close certain discharge header crossover valves, and start all four RN pumps. On April 13, the B train swapover function was tested, and on April 25, A Train was tested. The results of this testing confirmed that the system would function as designed.

The inspector monitored testing from the control room and RN pumphouse, attended the pretest briefing, reviewed the test procedures, and verified a sample of the valve pre-lineups. The inspector noted that the test procedures, PT/0/A/4400/26A(B), were detailed and provided considerable precautions and notes to aid in the performance of the activities. The inspector considered the

pre-test briefing provided to the operators to be detailed and complete. The inspector noted one minor weakness in the work planning coordination area during the performance of A train testing. Testing required that both trains of VC/YC be operable; however, during the test, it was realized that one train of VC/YC had been removed from service earlier in the day for unrelated maintenance. Testing was interrupted for several hours in order to return the VC/YC train to service.

c. Unit 2 Power Range ACOT Discrepancies

On April 29, Unit 2 was being shutdown in order to start a refueling outage. Once power was reduced below 50 percent, the Power Range Neutron Flux High Trip Setpoints were reduced to 55 percent of rated thermal power. This was performed as a conservative measure, not to meet a TS action requirement. At approximately 20 percent power, two IAE technicians performed monthly TS required surveillance ACOTs on the four power range nuclear instrumentation channels (i.e., N-41, N-42, N-43, and N-44). Testing included a check of each channel's Neutron Flux Low Trip, Power Above Permissive P8, Power Above Permissive P9, and Neutron Flux High Trip setpoints. The ACOTs were conducted under WOs 94033227-01 (N-41), 94031595-01 (N-42), 94032934-01 (N-43), and 94028426-01 (N-44) using procedures IP/2/3240/04H,I,J, and K, respectively.

On May 2, after the unit was shutdown, the inspector revieweu the completed WOs and procedures discussed above. During this review, the inspector noted that the allowable voltage range for Neutron Flux High Trip Setpoint on channels N-42, N-43, and N-44, were calculated in error. Per Enclosure 11.2 of the respective procedures, the setpoint tolerance should have been calculated as +0.0 volts and -0.01 volts. Instead, the tolerance was incorrectly calculated to be +/-0.01 volts. This error allowed channel N-44 to be left 0.005 volts (approximately 0.06 percent power) above the required trip setpoint. The as-found setpoints for the other three channels were within the required allowable range; therefore, only channel N-44 should have been adjusted. The inspector also noted that while the correct voltage tolerance was calculated for channel N-41, the setpoint was not adjusted when it was found outside the allowable range. The trip setpoint for N-41 was left 0.004 volts above the required trip setpoint allowable range.

Upon identification, the inspector determined that no immediate corrective actions were necessary for these errors since the plant was shutdown. The inspector also learned that approximately 8 hours following the performance of the ACOTs on April 29, the Neutron Flux High Trip setpoints for each of the power range channels were verified after adjusting them to 2 percent of rated thermal power. At that time, channel N-44 was found to be 0.002 volts above the required setpoint and had been adjusted to within the allowable

range. The other three channels were found to be within the allowable tolerance. Based on this, the setpoint error associated with N-44 had existed for approximately 8 hours before being corrected.

The inspector determined that this setpoint problem did not result in a violation of TSs. This was based on the Neutron Flux High Trip setpoints being adjusted to 55 percent of rated thermal power as a conservative action, and not in response to a TS action requirement. The inspector considered that the nonconservative .06 percent setpoint error on N-44 had no nuclear safety significance. However, the inspector was concerned that these errors occurred even though independent verification had been used in the setpoint calculation process. After discussing the errors with the technicians involved, the inspector considered the errors to be the result of inadequate independent verification and a lack of attention to detail.

The inspector also noted the following problems related to the adequacy of the supervisory review of the ACOTs:

- One of the two IAE technicians who performed the work signed as the Job Supervisor on the WOs for N-42, N-43, and N-44. The inspector was concerned over the adequacy of such practice since this did not involve independent review and the setpoint errors described previously were not identified during these reviews.

- A Single Point of Contact team supervisor reviewed and signed as the Job Supervisor on the WO for N-41. The inspector was concerned because this individual's background was in mechanical maintenance; therefore, the individual had limited, if any, familiarity with the ACOT activity or related procedures. In addition, the individual did not identify that the as-left Neutron Flux High Trip setpoint was above the allowable range by 0.004 volts during the WO package review.

The inspector reviewed Maintenance Management Procedure (MMP) 1.0, Work Request Preparation. This procedure requires that the responsible Job Supervisor of maintenance work shall review and signoff the WO. Section 4.10.1 of this procedure describes those review items that the Job Supervisor is responsible for. Among these items include verification that all acceptance criteria have been met and that all entries have been correctly entered in the WO and procedures. The inspector considered the Job Supervisor reviews of these WOs to be inadequate, in that the aforementioned problems were not identified and the technician that performed the work on N-42, N-43 and N-44 reviewed and signed off as the Job Supervisor. Based on discussions with IAE management concerning this latter item, the inspector learned that the IAE department had an informal policy that allowed technicians to review and sign as the Job Supervisor for their own work, but only in limited cases where activities required expeditious handling. In such cases, the

regular supervisor needed to designate an "in charge" technician, ahead of time that was determined qualified to review and sign as the Job Supervisor of the WO. The inspector noted that apparently an "in charge" technician had not been designated for these work activities. The licensee plans to review the adequacy of the current Job Supervisor WO review process, including the role of the Single Point Of Contact team, as part of PIP 2-C94-0507 that was initiated by the licensee to address the problems associated with this issue. The inspector plans to review the results of the corrective actions for this PIP upon completion.

This issue is considered to be a violation of the requirements of TS 6.8.1, for failing to follow procedures IP/2/3240/04H,I,J, and K, and MMP 1.0. VIO 414/94-11-01: Procedure Errors and Inadequate Reviews of Power Range ACOTs.

6. **ENGINEERING** (NRC Inspection Procedures 71707)

a. Switchyard Current Transformer Failure and Inspections

On January 2, 1994, Unit 2 experienced an automatic runback from full power to 50 percent load due to a primary to secondary fault (short) which occurred in the current transformer associated with phase "Z" of Power Circuit Breaker 23. (The details of this transient were discussed in NRC Inspection Report 50-413,414/93-34.) Current transformers are located adjacent to each Power Circuit Breaker in the switchyard and are used in conjunction with the switchyard protective relaying. The current transformer that failed on January 2 was replaced and the licensee initiated a root cause investigation of its failure. In April, the licensee completed their investigation. The licensee determined that the transformer's internal metal shield tube which houses the secondary wiring had moved closer to, or in contact with, the primary portion of the transformer inside housing. A short could have occurred if contact was made or if the distance between the two surfaces were small enough for arcing to occur. The shield tube is welded to the base of the transformer at one end and is free at the other. The base weld was found to be cracked, allowing the free end to move closer to, or in contact with, the transformer inside housing. The licensee determined that the crack may have developed during shipping of the transformer before it was installed. Since the transformer was shipped in the horizontal position, excessive stresses were placed on the base of the shield tube which could induce the weld cracks. Corrective actions included plans to inspect each of the similar style current transformers in the switchyard to determine if any other shield tubes were off-center. An off-center shield tube would be indicative of a weld crack.

On April 8, the licensee began radiograph inspections of the 18 current transformers of this style in the Catawba switchyard. The licensee determined that these inspections could be conducted on-line by isolating and inspecting one Power Circuit Breaker at a

time. Following inspection of 9 current transformers (3 Power Circuit Breakers), one was identified to be off-center and in need of replacement. This current transformer was replaced on April 9.

On April 15-16, the licensee conducted radiograph inspections of the current transformers associated with the remaining 3 Power Circuit Breakers. Two transformers had shield tubes that were slightly off-center, but the distance from the transformer inside housing was great enough to not be considered an immediate concern. The licensee planned to replace these transformers in the near future.

The inspector learned that the current transformers were shipped with shock indicators to detect excessive motion. Based on discussions with licensee personnel familiar with the original receipt of this equipment from the Vendor (Moser-Glaser), some of these indicators were tripped when delivered. The inspector reviewed the Vendor manual for the equipment and noted that the vendor had recommended that if both shock indicators on a current transformer were tripped, the transformer should be returned to the manufacturer. Although shipping records were not available for review at the end of the report period, it appeared that the manufacturer's recommendations were not followed.

The inspector considered the licensee's investigation into the current transformer equipment problem to be thorough and the corrective actions adequate to prevent failures similar to the one that occurred on January 2, 1994.

The inspector observed portions of the initial radiography inspections on April 8, verifying that adequate safety precautions and tagout controls were implemented. Although not witnessed, one weakness was identified from the licensee's switchyard radiography inspections on April 16. During the conduct of these activities, radiographers and switchyard personnel noticed that a metal bus section associated with Power Circuit Breaker 15 was damaged. The damaged section was reportedly bent and the weld at the bottom support bracket was broken. Operations shift personnel decided that this problem could wait until the following Monday (April 18) for a detailed evaluation. On April 18, the inspector became aware of this problem and visually observed the damage. Based on the condition of the bus section and its potential impact on offsite power availability, more timely action appeared to be warranted upon initial identification.

b. Breaker Preventive Maintenance

On March 29, 1994, with Unit 2 at 100% power, breakers 2LXG-4C and 2LXA-4C failed to trip as expected during the performance of preventive maintenance. The 600 volt ABB breakers were installed in nonsafety-related switchgear located in the turbine building.

Licensee investigation identified that hardened grease and dirt on the jackshaft caused mechanical binding that prevented the breakers from opening on an electric trip signal. The breakers functioned manually opening and closing and the breaker closed electrically.

Similar breakers used in applications throughout the electrical distribution system were installed during construction and have received routine preventive maintenance (i.e., lubrication and testing). The licensee had initiated actions to establish a breaker refurbishment program in 1993. The licensee planned to perform refurbishment of nonsafety-related breakers first in order to gain experience with the procedures. The failures mentioned above were assessed by the licensee as an indication that the reliability of the breakers is declining as they approach the end of their service life; therefore, implementation of the refurbishment program may be expedited.

Since the similar breakers in safety-related applications are in better environmental conditions (i.e., air conditioned and filtered air) the service life is expected to be longer than those in nonsafety-related applications.

To gain an understanding of the condition of the safety-related 600 volt breakers, the licensee took the following actions:

- The remaining alternate 600 volt breakers were cycled to verify their ability to operate on demand. No failures occurred.

- Four breakers were sent to ABB for evaluation and refurbishment. Two of the four were spares and two were in service as normal Motor Control Center feeders.

- An analysis of Nuclear Plant Reliability Data was initiated in an attempt to establish mean time to failure for the breakers.

Based on the results of these actions, the licensee plans to reevaluate the schedule and priority of implementation of the refurbishment program. The inspector considered the engineering support, demonstrated by questioning the condition of similar breakers and developing plans to determine their condition, to be appropriate.

No violations or deviations were identified.

7. **PREVIOUS INSPECTION FINDINGS AND LICENSEE EVENT REPORTS** (NRC Inspection Procedure 90712 & 92700)

a. (Closed) LER 413/92-08: Engineered Safety Feature System Actuation Due To Possible Equipment Malfunction

On July 12, 1992, at 10:53 a.m., while shutting down for a refueling outage, an unexpected Engineered Safety Feature Actuation occurred on Unit 1 while in Mode 4 (Hot Shutdown). The Engineered Safety Feature Actuation, an Auxiliary Feedwater System auto start, occurred while swapping lube oil pumps on the 1A main feedwater pump turbine to allow a periodic test to be performed that would temporarily de-energize the motor control center which supplies power to lube oil pump 1A2. Lube oil pump 1A1 tripped as pump 1A2 was being stopped. The instrumentation detected low lube oil pressure and tripped the 1A main feedwater pump turbine. The 1B main feedwater pump had been removed from service and was tagged out for maintenance work. Since both main feedwater pump turbines were tripped, the logic for Auxiliary Feedwater System auto start was satisfied. At 10:58 a.m., the 1A1 lube oil pump was restarted, main feedwater pump 1A was reset, and the Auxiliary Feedwater System was shutdown. The licensee reported the event in accordance with 10 CFR 50.72. A work request was initiated to investigate and repair the lubricating oil system pump. The root cause of this event was attributed to possible equipment malfunction by the licensee. Further troubleshooting of the equipment did not identify malfunctions.

To prevent recurrence of the Engineered Safety Feature actuation, procedures OP/1/A/6100/02 and OP/2/A/6100/02 were revised to remove the auxiliary feedwater system from standby status earlier in the plant shutdown evolution, when it is not required. Inadvertent starts of the Auxiliary Feedwater System have not recurred during subsequent plant shutdowns.

b. (Closed) LER 413/93-07: Engineered Safety Feature Actuation due to an Unexpected System Interaction.

On March 15, 1993, with Unit 1 operating at full power, an unexpected Auxiliary Feedwater System auto-start signal was received. Both motor driven Auxiliary Feedwater System pumps started simultaneously and the steam generator blowdown and sampling systems isolated as designed. The Control Room operators verified that the auto-start signal was not the result of a valid condition; therefore, the Auxiliary Feedwater System pumps were secured and the steam generator blowdown and sampling systems were realigned to their normal configurations. The licensee subsequently determined that the auto-start signal originated in the Anticipated Transient Without Scram (ATWS) Mitigation System Actuation Circuitry (AMSAC). The AMSAC outlet relays were tested and it was discovered that they were susceptible to contact chatter when in a high vibration environment. When the Auxiliary Feedwater System auto-start signal was generated, heavy equipment was being moved on the Turbine deck directly above the AMSAC electrical cabinet. The licensee determined that the vibration levels from this activity could have caused the contacts to chatter, resulting in the Auxiliary Feedwater System auto-start signal being generated.

The licensee's corrective actions included replacing the AMSAC outlet relays on both units with relays that were less susceptible to vibration induced contact chatter. The inspector verified that the new contacts were installed by reviewing the WO packages which implemented the activity. In addition, the licensee performed a review of all applications where the original style relays were used in the plant. Based on this review, no other applications using these relays were identified that could potentially cause severe plant transients if the relays were to chatter. The inspector determined that adequate licensee corrective action for this equipment problem was implemented.

c. (Closed) LER 413/92-12: Auxiliary Feedwater Turbine Driven Pumps Inoperable after Design Analysis.

On December 1 and 8, 1992, the licensee identified two design deficiencies associated with both unit's turbine driven Auxiliary Feedwater System pump control circuitry. These design deficiencies involved the interaction of nonsafety-related equipment with safety-related control circuitry rendering the pumps inoperable, in that single active failure criteria for certain design accident scenarios could not be met. The portions of the control circuitry impacted were the assured water source swapover logic and the pump governor speed control logic. Following the identification of these design deficiencies, Temporary Station Modifications were installed on both units to correct them. Once the modifications were implemented, the pumps were returned to operable conditions.

This issue was considered a violation of NRC requirements involving the inoperability of the Auxiliary Feedwater Systems on both units since startup, in that they were not capable of performing their intended safety function for certain postulated design basis accidents. The licensee's analysis of the sequence of events necessary to result in core damage indicated that the frequency of core damage was 1.6 E-8/year; therefore, the risk to the public was not significantly increased by the problems. The inspector reviewed the licensee's corrective actions associated with this LER during followup of the violation, which is discussed below.

d. (Closed) Severity Level IV Violation 413/92-29-01: Electrical Design Errors in the Auxiliary Feedwater System.

The licensee responded to this violation by letter dated February 3, 1993, which included corrective actions to be taken to avoid further violations. The corrective actions included: (1) plans to implement permanent modifications to the Auxiliary Feedwater System turbine driven pump control circuitry which remove the nonsafety-related equipment from the safety-related control circuitry; and (2) review other Duke Power Company designed safety-related process systems for cross train interactions in the control systems. Originally, the modifications were scheduled to be implemented by Unit 1 End-of-Cycle 8 (May 3, 1995) and Unit 2 End-of-Cycle 7 (January 5, 1996),

respectively. Implementation of the modifications for Unit 2 was changed to the ongoing End-of-Cycle 6 refueling outage. The inspector verified that the modifications were scheduled and reviewed the modification packages (CE-2357 and CE-60130) developed for Unit 2. The inspector determined that the licensee had adequately evaluated whether there were any unreviewed safety questions associated with these modifications.

The inspector reviewed the licensee's evaluation of other safety-related systems for similar cross train interactions. While no significant safety issues were identified by the licensee as a result of this evaluation, several examples of potential cross train interactions were identified. The inspector verified that the licensee had adequately evaluated and implemented corrective actions, where appropriate, for these items.

8. EXIT INTERVIEW

The inspection scope and findings were summarized on May 11, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings addressed in the Summary and 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.

Item Number	Description and Reference
414/94-11-01	VIO: Procedure Errors and Inadequate Reviews of Power Range ACOTs (paragraph 4.c).

9. ACRONYMS AND ABBREVIATIONS

ACOT	-	Analog Channel Operational Test
AMSAC	-	ATWS Mitigation System Actuation Circuitry
ATWS	-	Anticipated Transient Without Scram
CA	-	Auxiliary Feedwater System
CFR	-	Code of Federal Regulations
IAE	-	Instrument and Electrical
LCO	-	Limiting Condition for Operation
LER	-	Licensee Event Report
MMP	-	Maintenance Management Procedure
PIP	-	Problem Investigation Process
PM	-	Preventative Maintenance
PT	-	Periodic Test
R&R	-	Removal and Restoration (Tagging Order)
RHR	-	Residual Heat Removal
RN	-	Nuclear Service Water System
SNSWP	-	Standby Nuclear Service Water Pond

TS - Technical Specifications
VC/YC - Control Room Ventilation and Chill Water System
VIO - Violation
WO - Work Order