



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

Report Nos. 50-369/95-24 and 50-370/95-24

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

Docket Nos.: 50-369 and 50-370

License Nos.: NPF-9 and NPF-17

Facility Name: McGuire Nuclear Station 1 and 2

Inspection Conducted: September 3, 1995 - October 7, 1995

Inspectors: S. B. Rudisail for 10/13/95
George F. Maxwell, Sr. Resident Inspector Date Signed

Garry A. Harris, Resident Inspector
Marvin D. Sykes, Resident Inspector

Approved by: R. V. Crlenjak 10/19/95
R. V. Crlenjak, Chief, Branch 3 Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine resident inspection was conducted in the areas of plant operations, maintenance, engineering, and plant support. Some of the inspections were conducted during backshift hours. Backshift inspections were conducted on September 8, 15, 22, 29, 30, and October 1, 2, 3, and 6.

Results: In the area of operations:

A consolidated performance audit was thorough and effective in identifying areas needing improvement at the station (paragraph 3.a). During a unit 1 manual reactor trip, operator performance was good (paragraph 3.b). During a unit 1 automatic reactor trip, operator performance was good. Management involvement was evident and appropriate during resolution of the root causes. The licensee's root cause analysis was timely, detailed, and effective (paragraph 3.c).

Enclosure

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In the area of maintenance:

Two instances occurred where the unit 1 turbine generator circuit breakers opened on reverse power while attempting to return the unit to 100 percent power. Although a comprehensive root cause analysis was conducted, the licensee was unable to identify the root causes (paragraph 4.a). Repair activities for the unit 1 reactor coolant drain tank pump to pressurizer relief tank isolation valve were satisfactorily completed (paragraph 4.b).

In the area of engineering:

Modifications to provide additional degraded voltage protection for the 4kV essential busses were implemented to improve equipment reliability (paragraph 5.a). Radiation monitoring equipment unavailability has become a challenge (paragraph 5.b).

In the area of plant support:

The station has provided good support to the ALARA team in insuring station activities are planned and scheduled with ALARA considerations (paragraph 6).

REPORT DETAILS

1. PERSONS CONTACTED

Licensee Employees

- *A. Batts, Electrical Systems Engineering
- J. Boyle, Superintendent Work Control
- *M. Cash, Reactor Engineering
- R. Cross, Compliance Specialist
- T. Curtis, System Engineering Manager
- *R. Deese, Safety Review Group
- *E. Geddie, Station Manager
- *P. Herran, Engineering Manager
- D. Jamil, Manager, System Engineering
- R. Jones, Superintendent of Operations
- *J. Keirnan, Electrical Systems Engineering
- W. Matthews, Electrical System Engineering
- *T. McMeekin, Site Vice President
- *M. Nazar, Maintenance Superintendent
- M. Rains, System Engineer
- J. Silver, Operations Staff Manager
- *J. Snyder, Regulatory Compliance Manager
- *P. Stiles, Component Engineering
- J. Thrasher, Mechanical Engineering
- B. Travis, Component Engineering Manager
- *M. Weiner, Operations

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

NRC Resident Inspectors

- *G. Maxwell, SRI
- G. Harris, RI
- *M. Sykes, RI

*Attended exit interview

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

2. PLANT STATUS

a. Unit 1

Unit 1 operated essentially at 100 percent power until a manual reactor trip was initiated on September 27. The trip was initiated by the operator at the controls following an unanticipated closure of the "A" steam generator main steam isolation valve, 1SM7AB. On October 2, while the unit was being returned to full power, the unit automatically tripped from approximately 50 percent power on reactor coolant low flow after the "D" reactor coolant pump tripped. On two occasions while

attempting to return the unit to full power operation following the reactor trips, the turbine generator output breakers tripped on reverse power. The unit was returned to 100 percent power on October 3.

b. Unit 2

Unit 2 operated essentially at 100 percent power throughout the reporting period.

c. Inspections and Items of Interest

Inspection of the licensee operator training program was conducted by region based inspectors during the week of September 25. The results of the inspection will be documented in inspection reports 50-369,370/95-23 and 50-369,370/95-300. The McGuire Systematic Assessment of Licensee Performance (SALP) presentation was conducted by Senior NRC management on October 2. State and local officials were present. A meeting between the NRC, state, and local officials was held following the SALP presentation.

3. **OPERATIONS** (NRC Inspection Procedure 71707 and 40500)

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

a. Consolidated Performance Audit

The inspectors attended the debrief following a licensee initiated consolidated performance audit. The three week audit was conducted by a team of eight auditors from the Duke Power corporate office. The areas audited included operations, maintenance, engineering, safety assurance, and commodities and facilities. The audit team identified activities needing additional organizational focus and made recommendations for improving performance. The audit team recommended corrective action in the areas of implementation of vendor guidelines, procurement, and procedural adequacy. Following a review of audit findings and discussions with audit team members, the inspectors concluded that the audit was thorough and effective in identifying areas needing improvement at the station.

b. Unit 1 Manual Reactor Trip Following Main Steam Isolation Valve (MSIV) Closure

On September 27, unit 1 was manually tripped from 100 percent power. The trip was initiated following the unexpected closure of the "A" steam generator isolation valve MSIV, 1SM7AB. The operators at the controls attempted to reopen the valve but were unsuccessful and subsequently manually tripped the reactor in anticipation of an automatic trip on low steam generator level. The inspectors responded to the event and observed that operator performance was good. Post trip conditions were normal.

Unit 1 remained in Mode 3 while the unexpected closure of the MSIV was investigated. Associated solenoids, fuses, relays, and switches were evaluated. The inspectors evaluated the licensee's actions taken and methods used while trying to determine the root causes of the valve closure. The inspectors determined that although the licensee efforts were extensive, no root causes were identified. To reduce the probability of a recurrence, the licensee replaced the solenoids, fuses, and relays that could have potentially been the cause for the MSIV closure. The licensee also conducted an investigation into solid state protection system testing that was in progress at the time of the MSIV closure. The testing condition was recreated and the valve was cycled to identify any unanticipated effects on the valve. No effects were identified. After completing the investigation, the licensee held a restart meeting and decided to restart the unit. The inspectors evaluated the licensee's assessment and agreed with the licensee's decision to restart the unit. On September 30, the unit was returned to power operation.

c. Unit 1 Automatic Reactor Trip on Low Reactor Coolant Flow

On October 1, unit 1 automatically tripped from approximately 50 percent power. The trip was caused by low reactor coolant flow after the circuit breakers for the "D" reactor coolant pump (RCP) motor opened. The inspectors responded to the event and observed that operator performance was good. The inspectors determined that the post trip conditions were normal. The inspectors evaluated the results documented on the event recorders and noted that a ground was detected on the neutral phase (Y) of the "D" RCP motor. This ground caused the motor's safety and non-safety 6.9 kV power breakers to trip open on high ground fault current. The licensee initiated troubleshooting activities to locate the ground fault.

The inspectors verified that the cables, penetrations, switchgear and relays associated with the RCP motor were tested. No ground faults were identified. The surge capacitors located at the motor terminal box were disconnected and capacitance tested. One of the three capacitors, Westinghouse Part Number 634A269A01, was found to have zero capacitance indicating that it was shorted to ground.

The shorted capacitor was replaced. No other ground faults were identified.

The inspectors reviewed the maintenance history for the RCP power cables and associated capacitors. The inspectors determined that both the cables and capacitors had been tested satisfactorily during the most recent refueling outage. This test practice has been in place since 1988. The inspectors observed that management involvement was evident and appropriate. The inspectors concluded that the licensee evaluation and root cause analysis was timely, detailed and effective. Following the repairs to the RCP motor, the licensee held a restart meeting and decided to restart the unit. The unit was returned to 100 percent power on October 3.

4. **MAINTENANCE** (NRC Inspection Procedures 62703, 61726 and 92902)

The inspectors witnessed selected surveillance tests to verify that approved procedures were available and in use, test equipment in use was calibrated, test prerequisites were met, system restoration was completed, and acceptance criteria were met. In addition, resident inspectors reviewed and/or witnessed routine maintenance activities to verify, where applicable, that approved procedures were available and in use, prerequisites were met, equipment restoration was completed, and maintenance results were adequate.

The selected tests and maintenance activities below were reviewed and/or witnessed in detail:

<u>Procedure/Work Order</u>	<u>Equipment/Test</u>
IP/0/A/3250/69	Containment Hydrogen Analyzer 18-month Calibration
IP/0/A/3090/19A	Maintaining Containment Integrity
PT/0/A/4206/01B	Safety Injection Pump 2B Performance Test
OP/1/A/6300/01	Turbine Generator Operation

The inspectors concluded that the above tests and maintenance activities were conducted in accordance with the procedures. No violations or deviations were identified.

a. **Main Generator Reverse Power Trip**

On September 30 and October 2 while returning unit 1 to power operation following two reactor trips, the unit main generator circuit breaker tripped on reverse power. In both instances, operators performing OP/1/A/6300/01, Turbine Generator Operation,

had synchronized unit 1 to the electrical grid and were in the process of increasing the governor valve limiter position in order to begin increasing main generator load. The reactor was unaffected by these turbine generator circuit breaker trips.

Initial licensee investigations into the September 30 incident identified operator error in conjunction with an incorrect actuation of a pressure switch as the root cause for the main generator trip. Engineering determined that the operator at the controls inadvertently pressed the governor limiter down pushbutton instead of the up pushbutton, reducing turbine steam and causing the generator to "motorize." Following calibration checks of the pressure switch, the generator was re-synchronized to the grid and power escalation continued to approximately 50 percent power. While at 50 percent power, the unit experienced an automatic trip when the "D" reactor coolant pump circuit breaker opened.

On October 2, after plant restart following the "D" RCP repairs, unit 1 was synchronized to the grid and experienced another reverse power generator circuit breaker trip. The trip occurred at the same step in procedure OP/1/A/G300/01 as the September 30 generator circuit breaker trip. The licensee evaluated the actions that had been taken for the previous event and elected to replace one of the two non-safety pressure switches associated with the turbine trip circuitry for analysis and testing. The licensee also replaced the main control board governor valve limiter pushbuttons for analysis.

The inspectors responded to both events and were present during the decision making process. The inspectors agreed with the licensee's decisions to synchronize and load the main generator to the electrical grid. On October 3, the unit was returned to full power without incident. The inspectors determined that although a comprehensive root cause assessment was conducted, the licensee was unable to identify the root causes.

b. Reactor Coolant Drain Tank Pump to Pressurizer Relief Tank Isolation Valve (1WL33) Maintenance

On September 29, while preparing to place the turbine generator on-line following the unit 1 manual reactor trip, the reactor coolant drain tank pump to pressurizer relief tank (PRT) isolation valve, 1WL33, failed in the closed position. This valve is necessary for PRT cooling. Reactor power was reduced to the intermediate range while maintenance to repair the valve was completed. Tests were conducted to identify the cause for the valve failure. Preliminary indications showed that air pressure at the valve operator was not sufficient to adequately stroke the valve. As a result, the air regulator, valve solenoid, and diaphragm were replaced. The valve was satisfactorily tested and

returned to service. The inspectors evaluated the work activities and determined that the valve repairs were satisfactorily completed.

- c. (CLOSED) LER 50-369/94-10: Failure to perform TS required surveillance due to improper work practices

While preparing to perform PT/2/A/4200/02C, Containment Integrity Verification During Core Alterations, the licensee discovered that a spare Unit 2 containment penetration, 2-M313A, was not included in the procedure. Penetration 2-M313A was then added to PT/2/A/4200/02C prior to completion of the procedure on December 1, 1994. During subsequent investigations, additional spare penetrations were identified on both units that were not included in the applicable procedures. After further review, the licensee determined that TS surveillances 4.9.4.1 and 4.6.1.1 had been missed since these penetrations had not been included in the containment integrity verification procedures.

The inspector reviewed the licensee's corrective actions. The penetrations were inspected and no caps were missing. The inspectors also verified that the caps on the penetrations had been tack welded in accordance with controlling procedures to prevent unauthorized removal. Since no caps were found missing and the penetrations were accounted for during Integrated Leak Rate Testing, the inspectors concluded that containment integrity had been maintained. The inspectors also determined that the licensee's procedural updates should prevent recurrence. This item is closed.

- d. (CLOSED) LER 50-370/94-03: Failure to perform a TS required surveillance due to an inappropriate action

During an investigation and review of procedures, the licensee determined that the nuclear instrumentation (NIS) testing of the power range high flux (low setpoint) bistable was not being performed in accordance with TS requirements. The applicable test procedure PT/0/A/4600/14D (E,F,G), NIS Power Range Analog Channel Operational Test was not adequately testing the high flux (low setpoint) bistable. The licensee evaluated the tests and determined that both units had operated under conditions where the bistable had not been verified operable. As a result, the licensee modified the test procedure and tested the bistable. The bistable was determined to be past and present operable. The inspectors reviewed and evaluated the corrective actions and confirmed that all actions identified had been completed and were adequate. This item is closed.

- e. (CLOSED) LER 50-369/94-06: Failure to perform a slave relay test associated with one containment isolation valve due to improper work practices

On August 10, 1994, the licensee determined that the "B" steam generator blowdown sample inside containment isolation valve, INM200B, had been inadvertently omitted from procedure PT/1/A/4200/28B, Unit 1 Train B Slave Relay Test. The omission occurred during a procedure change in August 1991. The individuals involved in the procedure change process apparently failed to recognize the omission. The affected valve, INM200B, was a one inch Kerotest valve that had not been operated since March 1989 and had remained in its normally closed position.

The inspectors verified that licensee revised the procedure and successfully tested the valve on August 10, 1994, and confirmed past and present operability. The inspectors also verified that the licensee reviewed all of the Unit 1 and Unit 2 Train A and B procedures to assure all components actuated by the slave relays were included in this test procedure. This item is closed.

5. **ENGINEERING** (NRC Inspection Procedures 37550, 37551 and 92903)

a. Degraded Voltage Modification

The inspectors reviewed and witnessed portions of the final installation and testing of the degraded voltage modification for both units 1 and 2. An amendment was recently issued to the McGuire TS to add an additional level of undervoltage protective relaying on the 4kV essential auxiliary power system busses. The Nuclear Station Modifications, NSM-12392 (Unit 1) and NSM-22392 (Unit 2), were implemented to provide this additional protection to the 4kV busses against a "degraded voltage" condition in addition to the undervoltage (blackout) protection. The added protective relaying mitigates the potential for having sustained voltage droops that may cause damage to the windings of various safety-related motors.

New control room annunciators associated with the modification were installed. Also, two time delays were installed to prevent spurious alarms and initiate a separation and lockout of the 4kV essential bus from the offsite power source in the event of a sustained degraded voltage condition. This separation would cause total loss of voltage on the bus and a Blackout signal would be generated. A safety injection signal during a degraded voltage condition will result in an immediate separation from the offsite power source and a Blackout signal.

The inspectors evaluated the licensee's revisions to the abnormal and emergency procedures associated with loss of power. The inspectors determined that implementation of this modification should provide additional protection of safety related equipment.

b. Radiation Monitor Performance

Through document reviews, observations, and interviews, the inspectors noted that the plant has experienced an unexplained increase in the unavailability of certain area and process radiation monitors. These radiation monitors are necessary to provide adequate monitoring of the containment atmosphere as well as the unit vent system. The inspectors have identified previous concerns in the area of radiation monitoring equipment unavailability and have determined that corrective actions to date have not adequately addressed this issue. The inspectors discussed their observations with station management and this issue was reviewed by the licensee's Plant Operations Review Committee (PORC). The licensee has begun a review of overall radiation monitoring system performance. The inspectors determined that radiation monitoring equipment unavailability has become a challenge and will continue to track licensee progress in correcting this declining trend.

c. (CLOSED) LER 50-369/94-07: Emergency Diesel Generator (EDG) inadvertent starts

On at least three occasions in 1994, EDGs 1B and 2A unexpectedly started following closure of the 125V DC control power breaker during diesel generator operability testing and diesel engine break-in runs. The tests were conducted after modification work had been completed on the EDG electrical start circuits. Investigations by the licensee included analysis of the diesel auto start relay contacts for arcing and pitting. Following the investigation, the licensee concluded that these inadvertent starts were caused by a combination of factors in conjunction with recent design changes that added two new solenoid valves to the EDG auto start circuitry. Specifically, it was determined that when the 125V DC control power breaker was opened or closed, the induced voltage on the negative leg of the start circuit was significantly higher than during normal operation. The inspectors noted that this condition only occurred when the EDGs were in manual and did not affect their ability to function while in the automatic mode of operation.

The licensee implemented modifications to install transient suppression devices across the two new solenoid valve coils and limit the induced voltage. Also, the diesel auto start relay was replaced with a different type relay that has a larger air gap on its normally open contacts. The larger air gap eliminates the potential for future arcing problems.

The inspectors reviewed the corrective actions associated with this event and determined that the licensee's actions to preclude recurrence were satisfactory. This item is closed.

6. PLANT SUPPORT (NRC Inspection Procedures 71750)

Station Dose Goals

The inspectors reviewed the licensee's documentation concerning personnel exposure and noted that the station has performed well in meeting the established exposure goals. Exposure has remained below station goals since the middle of April 1995. The limited number of forced outages and strategies employed to keep the exposure as low as possible this year have resulted in actual exposures that are well below station goals. Station management has focused attention on exposure by holding individual groups responsible for meeting their exposure goals. Currently, all groups except Chemistry are on target to meet their annual goals. Radwaste and resin transfer operations to Barnwell, prior to the July deadline, was a significant contributor to the total Chemistry organization dose.

The inspectors evaluated the methods being utilized for new work orders that are being reviewed by the station ALARA team. The inspectors observed that the team assures the work orders are planned and scheduled when exposures are at optimum levels. Work associated with housekeeping and material condition upgrades is evaluated to determine the best time to do the work and whether the work needs to be done at all. The ALARA staff has also begun to place more emphasis on area based job planning and scheduling. The inspectors concluded that the station has provided good support to the ALARA team in ensuring station activities are planned and scheduled with ALARA considerations.

7. EXIT INTERVIEW

The inspection scope and findings identified below were summarized on October 5, 1995, with those persons listed in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection findings in the Summary and listed below. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection. The following items were discussed in detail:

<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
LER 50-369/94-10	CLOSED	Failure to perform TS required surveillance due to improper work practices (paragraph 4.c)
LER 50-369/94-03	CLOSED	Failure to perform a TS required surveillance due to an inappropriate action (paragraph 4.d)
LER 50-369/94-06	CLOSED	Failure to perform a slave relay test associated with one containment isolation valve

due to improper work practices
(paragraph 4.e)

LER 50-369/94-07

CLOSED

Emergency Diesel Generator
inadvertent starts (paragraph
5.c)