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

Report Nos.: 50-348/92-03 and 50-364/92-03

Licensee: Southern Nuclear Operating Company, Inc.
P.O. Box 1295
Birmingham, AL 35201-1295

Docket Nos.: 50-348 and 50-364 License Nos.: NPF-2 and NPF-8

Facility Name: Farley 1 and 2

Inspection Conducted: February 3 - 7, 1992

Inspection at Farley site near Dothan, Alabama

Inspector: Curt Rapp for 3/12/92
P. T. Burnett Date Signed

Accompanying Personnel: C. W. Rapp

Approved by: for T O Burke 3/12/92
R. V. Crlenjak, Chief Date Signed
Operational Programs Section
Operations Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, unannounced inspection involved a review of reactor trips experienced during 1991.

Results:

Ten reactor trips were experienced by the two units during 1991. Other than two lightning strikes, no commonality was detected among the trips. Review of licensee-generated incident reports did not reveal any precursors to the trips, but need for rework maintenance was noted in several instances.

One previous violation was closed.

No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*W. R. Bayne, Supervisor Safety Audit, and Engineering Review
T. W. Cherry, Instrumentation and Controls Supervisor
*S. F. Fulmer, Superintendent Operations Support
D. N Morey, General Manager - Farley Nuclear Plant
*C. D. Nesbitt, Manager Operations
*J. J. Thomas, Manager Maintenance
*L. M. Stinson, Assistant General Manager - Plant Operations
*B. R. Yance, Manager Systems Performance

Other licensee employees contacted included, operations personnel, maintenance and I&C personnel, security force members, and office personnel.

NRC Resident Inspectors

*G. F. Maxwell, Senior Resident Inspector
M. J. Morgan, Resident Inspector

*Attended the exit interview on February 7, 1992.

2. Review of the Reactor Trips in 1991 and Early 1992 (93802)

The inspectors reviewed the circumstances and precursors for the reactor trips that occurred in 1991 and January 1992. As a result of the review the inspectors noted the following:

a. Incident report number 2-91-99: On April 1, 1991, Unit 2 experienced a negative rate reactor trip. A dropped rod while testing control rod bank C for operability caused this trip. After investigating the cause of the trip, a reactor startup was attempted on April 7. During this attempt, one bank-C control rod failed to move out of the core with the other bank C rods. The plant was immediately returned to a shutdown mode of operation. Rods were again tested to find the cause of the single rod remaining in the core.

Persistent trouble shooting by the licensee and the NSSS vendor revealed the problem to be one of poor fabrication of the printed circuit cards used in the rod drive controls. Numerous cold solder joints were detected along with misaligned contacts on the cards, which led to intermittent contact with the control cabinet.

b. Incident report number 2-91-110: On April 4, 1991, the plant operators manually tripped Unit 2 following a loss of the operating 2A main feedwater pump. The pump loss was attributed to a fatigue failure in the electro-hydraulic system piping to the main feedwater pump turbine. The evidence for fatigue failure was not totally conclusive, but no other reasonable explanation was put forth.

c. Incident report number 2-91-125: On April 20, 1991, Unit 2 experienced an automatic reactor trip due to a partial loss of main condenser vacuum and a subsequent automatic trip of the turbine generator unit. The loss of the main condenser vacuum was attributed to a loss of instrument air to the steam jet air ejector air operated control valve. The apparent cause of the incident was inadvertent closure of a valve by a cleaning crew working in the area.

d. Incident report number 1-91-160: On May 24, 1991, Unit 1 experienced an automatic reactor trip from the over-temperature delta-T circuits. Plant electrical drawings did not properly reflect the as-wired condition for one RTD following the recently completed RCS RTD bypass loop modification. Consequently, with one over-temperature delta-T circuit in bypass/trip for testing, accessing a presumed spare RTD, which was actually in another trip circuit, led to a coincidence and a trip.

Discussions with plant personnel confirmed that it is not their practice to work on two loops simultaneously. Only the belief that the RTD was a spare led to the breach of their standard practice.

e. Incident report number 1-91-191: On June 29, 1991, Unit 1 experienced an automatic reactor trip due to a loss of voltage to the 1B 4160V bus and a subsequent automatic trip of the turbine generator unit. Over current on the low side neutral of the auxiliary transformer was detected by two over-current relays and the transformer was isolated. Subsequent testing of the transformer did not reveal a problem. However, the event was classified as real since two independent detectors sensed the high current. The auxiliary transformer was taken out of service for continuous monitoring under voltage, but not under load. The load is being carried by the startup transformer that has an equal load capacity.

f. Incident report number 1-91-229: On August 2, 1991, Unit 1 experienced an automatic reactor trip due to an inadvertent opening of a breaker which supplies power to the 1E Solatron voltage regulator. The regulator

provides power for the 1C RCP breaker contact position indication. The reactor trip was caused, in part, by operator error due to poor communications between the plant system operator and the main control board operator.

g. Incident report number 2-91-236: On August 6, 1991, Unit 2 experienced an automatic reactor trip due to a lighting induced power surge that momentarily created a transient in the rod control system of that unit.

h. Incident report number 1-91-249: On August 19, 1991, Unit 1 experienced an automatic reactor trip due to a lighting strike that cause an instantaneous overcurrent condition on phase 2 of the 1B start-up transformer.

A variety of lightning mitigation systems were being reviewed by the licensee.

i. Incident report number 1-91-320: On October 3, 1991, Unit 1 experienced a manual turbine trip/reactor trip due to the loss of both main feedwater pumps following a MFW system pressure transient. The transient was created by a significant power reduction (70%), causing S/G water levels to shrink.

j. On January 22, 1992, Unit 2 was tripped manually after finding a SW leak in a heat exchanger for the exciter of the electrical generator.

No equipment-based or personnel-based commonality was noted in the review of these reactor trips. As discussed in paragraph 3, below, incident reports contemporary to those describing the trips were reviewed to determine if they were precursors to the trips or had common features shared with the trip events.

No violations or deviations were identified.

3. Review of Incident Reports and Repetitive Maintenance (93802)

During this review of these reactor trips, the inspectors questioned whether repeat maintenance could be a contributory cause. The inspectors reviewed recent maintenance work requests and identified several components as having repeated failures or maintenance. None of these failures had a direct contribution to any of the trips. Among these, diesel driven fire pumps, the containment air monitor pumps, and the rod control system had very high failure rates. The inspectors reviewed the plant trending and root cause analysis programs to check if these high failure rates had been recognized.

a. Plant Trending Program

A formal plant trending program has been in place for only about one year. Prior to this, each department trended equipment performance but there was no formal program directing how the trending was to be done or what components were to be trended. To develop a baseline, a work history of each system was performed. This information was entered into a database that had only generic sorting capability. This limited sorting capability has been recognized and a new database will be installed that allows for more detailed sorts. Due to the limited capabilities of the database, only major safety systems were being trended. The remainder of plant systems will be added when the new database is installed in March. The plant trending group received all Operations and Maintenance incident reports for review. Information on equipment failures or incomplete maintenance was entered in the trending database to identify repeat failures. After the incident reports have been reviewed, they are forwarded to the OER group for a HPES review. No root cause analysis was performed by the OER group.

Recommended actions for identified repeat failures were derived from the OER group HPES review. The inspectors asked if this approach was effective in identifying and correcting the root cause of repeat failures. The licensee stated the HPES review identify a root cause, but would narrow the possibilities. These recommendations were forwarded to appropriate managers for review to determine which recommendations would be implemented. The inspectors then asked how it would be determined if the implemented recommendations was effective. The licensee stated it would be reflected in the plant trending program by a reduced failure rate. Given the time necessary to develop a trend, this could take 18 to 24 months. There were four engineers assigned to do plant trending; however, one was being used in the development of the site specific PRA. There was another engineer assigned to perform the HPES reviews. Training was done mainly by OJT.

b. Root-Cause Analysis

Root cause analysis was performed by MESG. There was no formal communication between MESG and the trending group. Root cause analysis was performed based only on maintenance data. A procedure formalizing communications between MESG and plant trending was in review at the time of this inspection. The inspectors did not review the

root cause analysis program because this procedure had not been approved.

Based on the inspection review, the trending program was effective. All components identified by the inspectors were identified by the trending program. However, due to lack of sufficient time history and limited personnel, it could not be determined if the trending program will remain effective when all plant systems are being trended. Also, the decentralization of the root cause analysis is seen as a further weakening the trending program effectiveness.

c. Control and Validation of RTD Curve Fitting Constants

In response to incident report number 1-91-160 and the reactor trip on May 24, 1991, the inspectors reviewed the licensee's procedures for calibrating and replacing RTDs. These loop-specific procedures included: FNP-1-STP-201.19, .20, and .21 (Revisions 33, 27, and 24, respectively), Reactor Coolant System (RTD) Loop Calibration and Functional Test. Each procedure contained the RTD curve fitting constants for the RTDs in the loop under test. Thus, it is necessary to revise the procedure any time an RTD is replaced, an uncommon occurrence, or when new calibration constants are determined for the RTDs. No formal process for assuring that the procedures were revised was found. The engineer responsible for maintaining the fitting constants was not available during the inspection. This subject was addressed during the exit interview.

No violations or deviations were identified.

4. Followup of Previous Violation (92702)

(Closed) Violation 50-364/90-08-01: The high flux trip setpoint was greater than the LSSS of TS 2.2.1.

The licensee acknowledged the violation in a letter dated April 23, 1990, which also described commitments to corrective action. The inspector's review of the revised FNP-0-AP-16, Conduct of Operations - Operations Group and the included Return to Service Check List confirmed that corrective actions had been completed.

5. Exit Interview

The inspection scope and findings were discussed with those persons identified in paragraph 1 on February 7, 1992. The inspection findings were discussed in detail. The licensee acknowledged the inspection findings. In response to the inspectors' questions and comments on control of RTD constants (paragraph 3.d) the licensee stated that procedural enhancements were being considered. Proprietary material was reviewed by the inspectors during this inspection, but is not included in this report.

6. Acronyms and Abbreviations

RTD	Resistance Temperature Detector
PRA	Probability Risk Analysis
RCS	Reactor Coolant System
RCP	Reactor Coolant Pump
MFW	Main Feedwater
S/G	Steam Generator
SW	Service Water
LSSS	Limiting Safety Systems Settings
TS	Technical Specifications
HPES	Human Performance Evaluation System
OER	Operating Experience Review
MESG	Maintenance Engineering Support Group
NSSS	Nuclear Steam Supply System
OJT	On-the-job Training