U.S. NUCLEAR REGULATORY COMMISSION (NRC)

REGION II

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Licensee:	Southern Nuclear Operating Company, Inc.
Facility:	Farley Nuclear Plant (FNP), Units 1 and 2
Location:	7388 North State Highway 95 Columbia, AL 36319
Dates:	November 24, 1996 - January 4, 1997
Inspectors:	T. Ross, Senior Resident Inspector J. Bartley, Resident Inspector J. Blake, Reactor Inspector (Section M3.2) R. Wright, Project Engineer (Sections O1.2 & O1.3)
Approved by:	P. Skinner, Chief, Projects Branch 2 Division of Reactor Projects

Enclosure

EXECUTIVE SUMMARY

Farley Nuclear Power Plant, Units 1 And 2
NRC Inspection Report 50-348/96-15, 50-364/96-15

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a 6-week period of resident and regional inspections.

Operations

- Operations performed well in controlling plant conditions during Unit 1 steady state full power operation and Unit 2 startup following its refueling outage. The conduct of Operations personnel and management was consistently in compliance with procedures and regulatory requirements (Section O1).

- Procedures and controls for midloop operations were adequate. Shift operators were very attentive during the entire midloop drain down evolution and were very knowledgeable of plant status and ongoing activities, with one exception. A noncited violation (NCV) was identified for failing to establish a reactor coolant system vent path during midloop as required by operating procedure. (Section O1.2)

- Filling and venting of the Reactor Coolant System (RCS) was accomplished per procedure in a professional and competent manner (Section O1.3)

- Licensee management conservatively decided to manually trip the reactor during Unit 2 startup due to rod control malfunctions (Section O1.4)

- The Unit 2 approach to initial criticality, startup and power ascension were conducted in a smooth, controlled and uneventful manner except for the rod control problems following initial criticality. Unlike the previous fuel cycle, secondary systems functioned well. Full power operation was achieved in just a few days with no significant secondary side problems (Section O1.5).

- Overall housekeeping and physical conditions were generally adequate. Recovery from the Unit 2 outage was much better than from previous outages. In particular, the physical appearance of the Unit 2 piping penetration room on the 121 foot elevation has greatly improved (Section O2.1). The inspectors also expressed concerns regarding the effectiveness of tours performed by system operators and the program for identifying and replacing burned out light bulbs in the radiologically controlled area (RCA). (Section O2.1).

- System walkdowns verified that selected safety systems were properly aligned and capable of fulfilling their design function (Sections O2.2).

- Overall containment conditions looked very good during the Mode 4 containment closeout walkdown. Licensee efforts to cleanup containment following the outage were thorough and effective (Section O2.3).

- The licensee effectively implemented a program to protect safety-related systems against extreme cold weather with the exception of heat tracing circuits. An NCV was identified for inadequate guidance in a procedure for verifying that heat tracing circuits were energized (Section O2.4).

- Licensee efforts to identify, resolve, and prevent problems remained effective (Section O7.1).

Maintenance

- Maintenance and surveillance testing activities were routinely conducted in a thorough and competent manner by well qualified individuals in accordance with plant procedures and work instructions (Section M1.1).

- Unit 2 hot shutdown panel testing was successfully completed (Section M1.2).

- Troubleshooting and repair of rod control system malfunctions were thorough and were conducted by well-trained personnel. Management decisions were conservative (Section M1.4).

- The Freeze Protection maintenance program was adequate. However, two weaknesses were identified in the program. The heat tracing thermostats were not periodically calibrated and two external heat tracing circuits on the Unit 1 Refueling Water Storage Tank (RWST) were controlled by thermostats inside the structure (Section M1.6).

- Licensee efforts to improve the quality of the EDG Test Data Log had been effective (Section M3.1).

- The licensee's use of ultrasonic examinations, in-situ leak/pressure testing, and steam generator tube pulls appeared to be a conservative effort to obtain as much information as possible about the degradation mechanisms at work in the Unit 2 steam generators (Section M3.2).

Engineering

- Engineering Support personnel interfaced well with operations staff during Unit 2 startup and zero power physics testing (Section E2.1).

Plant Support

- Health Physics control over the RCA, and the work activities conducted within it, were good. Material condition and housekeeping in the RCA were much better than in the past. In particular, the removal and control of radioactive waste, and excess equipment and material, from the RCA after the outage were excellent (R2.1).

- Security activities continued to be performed in a conscientious and capable manner, assuring the physical protection of protected and vital areas (Section S1.1).

- Unit 1 containment fire detection system failed again in early November, and has been dysfunctional since then. Licensee compensatory measures were in accordance with the Fire Protection Program (Section F2.1).

Report Details

Summary of Plant Status

Unit 1 operated continuously at 100% power for the entire inspection period.

Unit 2 began the inspection report period on day 44 of its revised 64 day eleventh refueling outage (i.e., U2RF11). Initial criticality was achieved on December 13, 1996. However, due to rod control system problems, the unit was manually tripped from below the point of adding heat on December 14. Unit 2 reactor was returned to critical operation on December 17 and synchronized to the grid on December 18, which constituted the official end of U2RF11. Full power was achieved on December 21, and Unit 2 continued to operate at full power for the rest of the report period.

I. Operations

O1 Conduct of Operations

O1.1 Routine Observations of Control Room Operations

a. Inspection Scope (Inspection Procedure (IP) 71707)

Resident inspectors and a regional inspector (during the week of December 2 through 6, 1996) conducted frequent inspections of ongoing plant operations in the Main Control Room (MCR) to verify proper staffing, operator attentiveness, adherence to approved operating procedures, communications, and command and control of operator activities. The inspectors also regularly reviewed operator logs and Technical Specifications (TS) Limiting Condition of Operation (LCO) tracking sheets, walked down the Main Control Boards (MCB), and interviewed members of the operating shift crew to verify operational safety and compliance with TSs. The inspectors regularly attended daily plant status meetings to maintain awareness of overall facility operations, maintenance activities, and recent incidents. Morning reports and Occurrence Reports (ORs) were reviewed on a routine basis to assure that potential safety concerns were properly reported and resolved.

b. Observations, Findings and Conclusions

Overall control and awareness of plant conditions during the inspection period remained excellent. During tours of the MCR, the inspectors observed that the Unit 1 MCBs were frequently in a "blackboard" condition. Whereas, the Emergency Power Board had one or two persistent annunciator alarms and Unit 2 outage conditions resulted in numerous annunciator alarms. Aggressive efforts to maintain MCB deficiencies at very low levels were effective. The combined number of MCB deficiencies was below 20. Operator attentiveness and response to changing plant conditions was very good. Interviews with the operators indicated that they were well aware of plant conditions and the status of on-going activities.

O1.2 Unit 2 Midloop Operations (IP 71707)

Prior to midloop operations, a resident inspector reviewed the licensee's procedures and controls for midloop operations during the week of November 25, 1996. The procedures and controls in FNP-2-UOP-4.3, Mid Loop Operations, were adequate.

On December 3, the regional inspector observed the draining down of the reactor coolant system (RCS) level from the vessel flange elevation and stabilizing the RCS level at three inches above the desired midloop band. The drain down was stopped at 5:40 pm and stabilized above the desired band to allow Instrumentation and Controls personnel to investigate why the ultrasonic (narrow) range level indicators (LI) LI-2384 and LI-2385 were not tracking with the other level indicators as expected, beginning at the top indication range of 123'-10". The drain down operation was accomplished utilizing procedures FNP-2-SOP-1.9, Partial Reactor Coolant System Drain, and FNP-2-UOP-4.3. The inspector observed the pre-job briefing conducted by the Operations Manager for both day and night shift operators.

At 10:15 p.m., the night shift operating crew commenced lowering RCS level to 123'-5" per tygon hose indication. Around 2:20 a.m., December 4, while in midloop operation at approximately 123'-5", a plant operator noticed that a nitrogen bottle connected to a reactor vessel head vent was at a negative pressure. Subsequent investigation found that the reactor vessel head vent manual isolation valve was open as required, but it still had a nitrogen bottle (cylinder) and regulator connected to it with its nitrogen pressure depleted. This prevented venting of the RCS head during drain down, causing a negative pressure. The licensee stopped nozzle dam removal activities, removed the nitrogen cylinder and regulator, and slowly vented the head utilizing FNP-2-SOP-1.9. After equalizing pressure the ultrasonic level indicators came on scale, and all RCS level indicators were verified to be consistent. The RCS level was stabilized at 123'-4" and nozzle dam removal activities were recommenced.

The root cause for failing to ensure that the RCS was adequately vented appeared to be personnel error. Steps 4.19.3.1 and 4.19.3.2 of FNP-2-SOP-1.9 direct the operator to close the reactor vessel head vent valve, remove the nitrogen rig, and reopen the head vent valve prior to lowering RCS level below 128'-6" in accordance with FNP-2-UOP-4.3. These steps were erroneously signed off as not applicable. OR 2-96-372 was written to document this event, investigate, and initiate corrective actions.

Shift operators remained very attentive to plant conditions during the entire midloop drain down evolution and were very knowledgeable of plant status and ongoing activities, with one exception. The failure to remove the nitrogen bottle rig per FNP-2-SOP-1.9 was a violation of TS 6.8.1, which requires establishing and implementing written

procedures. The licensee-identified and corrected violation is identified as Non-cited Violation (NCV) 50-364/96-15-01, Failure To Establish RCS Vent Path During Midloop, consistent with Section VII.B.1 of the Enforcement Policy.

O1.3 Unit 2 RCS Filling and Venting (IP 71707)

On December 5th, a regional inspector observed portions of an infrequently performed evolution in accordance with FNP-2-SOP-1.3, Appendix 6, Rector Coolant System Filling and Venting Using the Vacuum Refill Method. This vacuum refill process was temporarily halted at 2:58 p.m. at which time the RCS vacuum was purposely broken to repair a body-to-bonnet leak on a critical seal injection isolation valve. After this repair, a vacuum was restored at 12:19 a.m. on December 6, and the RCS was successfully refilled without incident.

The inspector concluded that the filling and venting of the RCS was accomplished per procedure in a professional and competent manner.

O1.4 Unit 2 Rod Control Problems and Manual Reactor Trip (IP 71707)

On December 14, 1996, licensee management conservatively decided to manually trip Unit 2 after experiencing several rod control system malfunctions during startup physics testing. The rod control system had experienced several urgent failures prior to the manual trip, including erratic, unpredictable control rod movement, two blown fuses, and "double counting" by the digital step counters. Unit 2 reactor power was in the intermediate range of the nuclear instrumentation system (NIS), below the point of adding heat, when the reactor was tripped. All control rods inserted per design and reactor operators implemented appropriate emergency response procedures. The Unit 2 Operations Superintendent notified the senior resident inspector shortly after the reactor trip. Resident inspectors subsequently reviewed operator logs and OR 2-96-391, and interviewed responsible licensee personnel to verify operator actions and equipment response. Refer to paragraph M1.5 for details of the Rod Control system malfunction.

O1.5 Unit 2 Heatup, Initial Criticality, Startup and Power Ascension Following U2RF11

a. Inspection Scope (IP 71707 and 37551)

Resident inspectors observed portions of Unit 2 return to service. The inspectors monitored implementation, verified initial conditions, and reviewed signoffs of FNP-2-UOP-1.2, Startup of Unit From Hot Standby To Minimum Load, and FNP-0-ETP-3601, Zero Power Reactor Physics Test Procedures. An inspector monitored the approach to initial criticality and sustained critical operation for low power physics testing. The inspectors also observed power ascension activities in accordance with

FNP-2-UOP-3.1, Power Operation, and reviewed implementation of FNP-0-SOP-103, Return To Service Checklist.

b. Observations and Findings

On December 13, operators achieved initial criticality for Unit 2 fuel cycle 12. An inspector observed the approach to criticality and determined that the operators appropriately implemented approved plant procedures. The approach to criticality was smooth and well-controlled. The reactor went critical within 50 parts per million (ppm) of the estimated critical boron concentration.

After resolving rod control step counter problems, operators recommenced Unit 2 restart. Plant management conservatively decided to re-perform FNP-2-ETP-3601, including boron dilution to criticality rather than the normal method of pulling control rods to the critical position. Unit 2 re-entered Mode 2 and went critical without incident on December 17. The unit entered Mode 1 and was synchronized to the grid on December 18 and achieved full power on December 21.

The Operations Manager failed to make timely signoffs in SOP-103 to document his review of numerous line item prerequisites for most of the Mode and unit system condition transitions. This was discussed with the Operations Manager.

c. Conclusion

The Unit 2 approach to initial criticality, startup, and power ascension were conducted in a smooth, controlled and uneventful manner except for the rod control problems following initial criticality. Unlike the previous fuel cycle, secondary systems functioned well. Full power operation was achieved with no significant secondary side problems.

O2 Operational Status of Facilities and Equipment

O2.1 General Tours of Specific Safety-related Areas (IP 71707)

General tours of specific safety-related areas were performed by the resident inspectors to examine the physical conditions of plant equipment and structures, and to verify that safety systems appeared properly aligned. Limited walkdowns of a more detailed nature of the accessible portions of safety-related structures, systems and components were also performed in the following specific areas:

- Unit 1 and 2 Spent Fuel Pool (SFP), SFP cooling systems, and SFP ventilation systems
- Unit 2 containment
- Unit 1 and 2 new fuel storage areas
- Unit 1 and 2 piping penetration rooms (PPR) on 100 foot elevation
- Unit 1 and 2 PPRs on 121 foot elevation

- Unit 2 charging pump hallway and rooms
- Unit 1 and 2 Residual Heat Removal (RHR) heat exchanger (HX) rooms
- Unit 1 and 2 RHR pump rooms
- Unit 2 component cooling water (CCW) pump and HX area
- Unit 1 and 2 vital 4160 volt alternating current (VAC) switchgear and vital 600 VAC Load Center rooms, trains A and B
- Unit 2 Cable Spreading Room
- Emergency diesel generator (EDG) building
- Unit 1 and 2 EDG building to auxiliary building (AB) cable tunnels
- Unit 1 and 2 turbine building
- Unit 2 turbine-driven auxiliary feedwater (AFW) pump rooms
- Unit 2 motor-driven AFW pump rooms
- Unit 1 and 2 hot shutdown panels (HSDP)
- Unit 2 vital 125 volt direct current (VDC) switchgear, inverters, battery charger and battery rooms, trains A and B
- Unit 2 rod control power and logic cabinet room
- Unit 1 and 2 containment spray pump rooms
- Service water intake structure (SWIS), including service water system (SWS) pumps and switchgear

Overall material condition and housekeeping for both units were adequate. Plant areas were generally clear of trash and debris, but most painted surfaces of floors and equipment were chipped, stained and looked well worn. Licensee efforts to recover and improve the physical conditions of the Unit 2 CCW pump/HX area and 121 foot PPR were very successful. Cleanliness and physical appearances of these areas have improved. Overall, licensee personnel did a much better job recovering from U2RF11 than the previous Unit 1 and 2 outages. Plant management attention was quite evident. The minor equipment and housekeeping problems identified by the inspectors during their routine tours were reported to the responsible Shift Supervisor and/or maintenance department for resolution. Some of the more significant and/or repetitive discrepancies identified by the inspectors included:

- Numerous normal lighting problems in the Radiologically Controlled Area (RCA), also the majority of emergency lights in the EDG building to AB cable tunnels were inoperable;
- Several radioactive fluid leaks in the RCA without, or with inadequate, catches installed (e.g., 1B SFP HX, 2A and 2B RHR HXs, Unit 2 high head safety injection flow orifice);
- Oil spill on U1 SWIS traveling screen;
- Spare nitrogen bottles tied off to carbon steel piping within two feet of vital motor control centers in the SWIS; specifically, a 3/4-inch diameter air-to-transmitter line and 1-inch diameter air-to-traveling screen line,
- Excessive condensation blown onto vital 125 VDC switchgear;
- Housekeeping in the Unit 2 lower level equipment room and AFW pump skids was particularly poor.

The inspectors expressed concern to plant management that system operator (SO) tours may not be as effective as they could be in identifying similar discrepancies. Also, the program for identifying and replacing burned out lights was not being implemented in the RCA in a timely manner.

O2.2 Biweekly Inspections of Safety Systems (IP 71707)

Resident inspectors used IP 71707 to verify the operability of the following selected safety systems:

- Unit 2 Accumulators
- EDGs 1-2A, 1C, 1B, 2B, and 2C
- Unit 1 and 2 SFP ventilation

These systems appeared to be properly aligned and operable. The inspectors did not identify any significant findings.

O2.3 Unit 2 Containment Closeout Tour (IP 71707)

Resident inspectors conducted a closeout tour of the Unit 2 containment on December 11, 1996, after the licensee entered Mode 4. Overall, containment conditions looked very good. The inspectors found a few relatively insignificant equipment and material equipment condition problems, including several small leaks, which the licensee had already identified, and a negligible amount of trash and debris remaining in containment. Licensee efforts to cleanup containment following the outage were thorough and effective. The only significant problems identified by the inspectors were the deterioration of nonsweat insulation on CCW and SWS piping and a CCW relief valve tail pipe not reconnected to its support. OR 2-96-388 was initiated to address the deteriorating insulation; in particular, any possible adverse effect (i.e., blockage) upon the containment emergency core cooling system sumps (see Section O7.1 below). All deteriorated insulation was removed or repaired. OR 2-96-397 was initiated to address the unsupported discharge pipe off of the relief valve. The tail pipe was subsequently removed.

O2.4 Cold Weather Preparations

a. Inspection Scope (IP 71714)

Resident inspectors reviewed licensee preparations for cold weather using the guidance of IP 71714, Cold Weather Preparations. The inspectors reviewed FNP-0-AOP-21.0, Appendix I, Extreme Cold Weather Contingencies, Revision 10. The inspectors walked down selected heat tracing circuits prior to and during freezing conditions to verify that insulation was intact and that the heat tracing operated as required. The inspectors also verified that polyethylene wraps and heat lamps were

installed per AOP-21.0. Refer to section M1.7 for details of the maintenance of the Freeze Protection system.

b. Observations and Findings

On December 9, 1996, the inspectors confirmed that AOP-21.0, Appendix I, required actions were completed prior to subfreezing temperatures. The inspectors also performed a walkdown of selected Freeze Protection systems to verify that heat tracing circuits and insulation were intact, and that poly wraps were in place. However, the inspectors identified that heat tracing thermostats were not being calibrated on a periodic basis (refer to Section M1.6). On December 19, during subfreezing conditions, the inspectors walked down selected heat tracing circuits to verify that the circuits were energized. However, the power sensing lights for many circuits were discovered to be de-energized. These circuits were designed to energize when temperatures dropped below 40 degrees F. in which case the power sensing light would illuminate. The inspectors found that the power sensing lights on the following systems/components heat tracing circuits were not lit:

- Q1P16PDS621, pressure differential switch for B train Service Water (SW) flow to DG Bldg
- All circuits associated with the Unit 1 condensate storage tank (e.g., level instrument lines)
- Majority of Unit 1 Reactor Makeup Water Storage Tank circuits (e.g., level instrument lines)

The inspectors notified the Unit 1 shift supervisor that these heat tracing circuits appeared to be de-energized.

AOP-21.0, Appendix I, step 1.0, states, "Have System Operators check that monitor lights for Freeze Protection Systems are lit during their rounds." The AOP did not provide a list or detailed guidance as to the locations and number of circuits to be checked. This appeared to be a procedural deficiency. The inspectors also interviewed four SOs and determined that they had no formal training on the Freeze Protection system. The deficiencies of AOP-21.0 and subsequent ineffectiveness of the SO tours to ensure that freeze protection circuits were functioning properly was discussed with the Unit 2 Operations Superintendent.

The inspectors reviewed the licensee's corrective actions for the AOP-21.0 deficiency and the apparently de-energized circuits. Licensee troubleshooting revealed failed thermostats, a tripped circuit breaker, and failed indicating bulbs. These failures were promptly repaired. None of the lines protected by the failed heat tracing circuits were observed to be frozen.

The corrective action for AOP-21.0 consisted of a night order entry which included specific guidance for reviewing the Freeze Protection system requirements with the SOs and provided a list of required heat

tracing circuits. The licensee has begun revising AOP-21.0 to provide more detailed guidance. The inspectors concluded that these corrective actions were adequate.

The inspectors determined that AOP-21.0, Appendix I, was inadequate to ensure appropriate freeze protection for safety-related components, constituting a violation of 10 CFR 50, Appendix B, Criterion V, Procedures. This was considered a violation of minor significance and is being treated as a NCV, consistent with Section IV of the NRC Enforcement Policy.

c. Conclusions

The licensee effectively implemented a program to protect safety-related systems against extreme cold weather with the exception of certain heat tracing circuits. NCV 50-348, 364/96-15-02, Inadequate Procedural Guidance For Freeze Protection, was identified for inadequate guidance to ensure that heat tracing circuits were operable and energized during subfreezing temperature conditions.

07 Quality Assurance in Operations

07.1 Effectiveness of Licensee Control in Identifying, Resolving, and Preventing Problems (IP 71707 and 40500)

The resident inspectors briefly reviewed all newly initiated ORs and completed ORs approved by the Operations Manager during the inspection period to ensure that plant incidents which affect or could potentially affect safety were properly documented and processed in accordance with FNP-0-AP-30, Preparation and Processing of Incident Reports. Certain selected ORs were reviewed in detail as part of the routine inspection program.

Overall, the inspectors concluded that the licensee's program for identifying and resolving problems remained effective and was being accomplished in accordance with AP-30. Plant personnel and management exhibited an appropriate threshold for identifying problems, initiating ORs, and assigning formal root cause teams. Each new OR received prompt attention and was regularly discussed in the morning status/plan of the day meeting.

The following ORs were reviewed for accuracy, completeness, and reportability; and adequacy of corrective actions was confirmed or verified:

- 2-96-390; 1BD Rod Control Power Cabinet Failure
- 2-96-309; Discrepancies between drawing and actual Solid State Protection System wiring
- 2-96-288; Containment thermal insulation damage

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

Inspectors observed and reviewed portions of various licensee corrective and preventive maintenance activities, and witnessed routine surveillance testing to determine conformance with plant procedures, work instructions, industry codes and standards, TSs, and regulatory requirements.

a. Inspection Scope (IP 61726 and 62707)

The resident inspectors and a regional inspector observed all or portions of the following maintenance and surveillance activities, as identified by their associated work order (WO), work authorization, or Surveillance Test Procedure (STP):

- FNP-2-STP-29.2; Shutdown Margin Calculation
- FNP-1-STP-114.1; Moderator Temperature Coefficient Determination For Boron Concentration Less than 300 ppm
- FNP-2-STP-228.4; NIS Intermediate Range Channel N36 Calibration and Functional Test
- FNP-1-STP-9.0; RCS Leakage Test
- FNP-2-STP-73.6; Verification of Reactor Head Vent Valve Operation From the Hot Shutdown Panel
- FNP-2-STP-152.3; 2B Main Feed Pump Turbine Overspeed Test
- FNP-2-STP-45.7; Main Steam Isolation Valves and Bypass Valves Cold Shutdown Valves Inservice Test
- FNP-2-STP-228.3A; NIS IR Channel N35 Calibration and Functional Test
- FNP-2-FSP-207.2; Cable Tunnel Fire Hose Inspection

b. Observations, Findings and Conclusions

All of the surveillance testing observed by the inspectors was performed in accordance with work instructions, procedures, and applicable clearance controls. No adverse findings were identified. Safety-related maintenance and surveillance testing evolutions were well planned and executed. Responsible personnel demonstrated familiarity with administrative and radiological controls. Surveillance tests of safety-related equipment were consistently performed in a deliberate step-by-step manner by personnel in close communication with the MCR. Overall, operators and technicians appeared knowledgeable, experienced, and well trained for the tasks they performed.

M1.2 Unit 2 Hot Shutdown Panel Testing (IP 61726)

Testing of Unit 2 HSDP components that could not be tested at power were completed during U2RF11 with the successful conduct of FNP-2-STP-73.6; Verification of Reactor Head Vent Valve Operation From the Hot Shutdown Panel. All tested components operated properly from the HSDP, with the exception of the RCS power operated relief valve (PORV) 444B, PORV isolation motor operated valve (MOV) 8000B, and CCW to miscellaneous header isolation, MOV 3047, which failed to transfer to local control. The common cause failure was a blown fuse. Subsequent investigation by the licensee concluded that the fuse must have blown during the Unit 2 outage, and concluded that these components were operable during the fuel cycle. The fuse was replaced and all three components tested satisfactorily. This successfully completed testing of all remaining Unit 2 HSDP components.

M1.3 2B EDG Surveillance Test Non-valid Failure (IP 61726)

On December 16, 1996, the 2B EDG failed its routine monthly surveillance test in accordance with FNP-2-STP-80.1, 2B DG Operability Test. The diesel failed to maintain electrical load due to a faulty TSRX relay. The relay was replaced and the EDG subsequently retested satisfactorily. Plant management then decided to increase the 2B EDG surveillance frequency to weekly. The 2B EDG failure was initially determined to be a valid failure, making it the first in the last twenty and second in the last 100. However, further review concluded that it was a failure of a nonessential component. A similar failure occurred on January 2, 1995 on the 1B EDG. A resident inspector discussed the circumstances surrounding the 2B EDG failure with responsible Operations personnel and interviewed the Unit 1 Operations Superintendent regarding classification of the 2B EDG failure pursuant to Regulatory Guide (RG) 1.108. The resident also met with the Maintenance Manager about similarities between the 1B and 2B EDG failures, and any possible TSRX relay reliability problem. The licensee was continuing to explore these issues.

M1.4 Rod Control System Malfunction

a. Inspection Scope (IP 62707)

The inspector observed Rod Control and step counter troubleshooting efforts and repairs conducted by the licensee and vendor personnel.

b. Observations and Findings

On December 14, 1996, Unit 2 was manually tripped after experiencing a Rod Control system malfunction during startup physics testing. The system had experienced several failures prior to the manual trip including control rods stepping in when selected to move out, two blown fuses, and the digital step counters "double counting." Troubleshooting

efforts by Farley and Westinghouse personnel discovered a negative 100 VDC source on the Rod Control system neutral bus. On December 15, 1996, a root cause team was assembled to determine the source of the negative voltage on the neutral bus and its effect on rod control. The team included a representative of Science Applications International Corporation (SAIC), the manufacturer of the Group Rod Indicator Display (GRID) units which had been used to replace the original mechanical group step counters on both units about four years ago.

The root cause team found that the voltage was caused by a short between the uninsulated input to the Shutdown Bank B, Group 2 GRID audible clicker coil and the GRID's case as mounted on the MCB. The defective GRID was a Revision (Rev.) C unit as supplied by SAIC. All of the Rev. C units installed on Farley Unit 2 were inspected and found to have virtually no clearance between the clicker coil solder tab and the case. Also, the lead to the clicker coil was uninsulated. To correct this problem, the SAIC representative modified all of the Farley Unit 2 Rev. C GRID units by bending the solder tab to provide more clearance from the case and adding an insulating sleeve over the clicker coil input lead. Farley also had a few Rev. D GRID units. The Rev. D GRID units are not subject to a short of the clicker coil lead because the clicker coil is mounted with more clearance and the input lead is insulated.

Farley personnel identified two other problems with their Rev. C GRID units. Many of the inservice units were set up to operate at 24 VDC instead of 100 VDC. The lower voltage setting is for use in the Training Simulator whereas the higher setting is for use in the control room. Furthermore, one of the Rev. C units had a broken tie-wrap which could have allowed a capacitor to contact the case. The Rev. D units were not susceptible to the capacitor problem.

The effect of the electrical short on the Unit 2 Rod Control system was substantial. This short caused a negative 100 VDC to exist on the Rod Control system neutral bus, which was designed to be a floating ground. The excessive negative voltage on the neutral bus corrupted the integrated circuits of several cards and potentially damaged all 43 cards in the Rod Control system Logic Cabinets. The licensee replaced all 43 cards as a precautionary measure.

c. Conclusions

Licensee troubleshooting was thorough and conducted by well-trained and knowledgeable personnel. Management decisions were conservative.

M1.5 Reactor Vessel Head Lift (IP 62707)

The inspectors observed a reactor vessel head lift on November 25, 1996. The lift was conducted in accordance with FNP-2-MP-1.0, Maintenance Refueling Procedure. The evolution was performed smoothly. No problems were identified.

M1.6 Freeze Protection System

a. Inspection Scope (IP 71714)

The inspectors reviewed FNP-1,2-EMP-1383.01, Freeze Protection Inspections, the completed WOs from when they were last performed, interviewed technicians and supervisors, and walked down heat tracing circuits.

b. Observations and Findings

EMP-1383.01 for both units was last performed from October 19-31, 1996. The inspectors reviewed the completed WOs (461417 and 461145) and interviewed licensee staff who performed the inspections. The inspectors concluded that the EMP was performed satisfactorily and had identified the system deficiencies which existed at that time.

Two weaknesses were identified with the Freeze Protection system which could affect its ability to perform the design function. The inspectors determined that heat tracing thermostats were only calibrated prior to initial installation. The thermostats were not included in a periodic calibration program as were other thermostats which control temperatures in areas containing safety-related equipment. An SO had also identified that there were two circuits on the Unit 1 RWST in which thermostats inside the shield wall controlled heat tracing outside the structure. These weaknesses were turned over to plant management for corrective action.

c. Conclusions

The Freeze Protection maintenance program was adequate. However, two deficiencies were identified in the program. Thermostats were not periodically calibrated and two external heat tracing circuits on the Unit 1 RWST were controlled by thermostats inside the structure. The inspectors concluded that these weaknesses could adversely affect elements of the freeze protection system.

M3 Maintenance Procedures and Documentation

M3.1 EDG Test Data Log (IP 61726)

A resident inspector reviewed the EDG test data log and applicable guidance of FNP-0-SOP-0.7, General Instructions For Filling Out D/G Test

Data Log. The inspector also interviewed an Operations shift foreman responsible for maintaining the log, and concluded that the shift foremen were doing a consistent job filling out the data log in accordance with SOP-0.7. Since the inspector's last detailed review of this log, the entire log had been redrafted to eliminate past illegibility concerns.

M3.2 Steam Generator (SG) Inspection Results, Unit 2

a. Inspection Scope (IP 73753)

The inspector reviewed the inspection records for the Unit 2 SG tubing. The review included discussions with licensee personnel; review of eddy current and ultrasonic test results; and a review of the licensee's "Startup Report" (and supporting documentation) for the Unit 2 SGs.

b. Observations and Findings

Farley 2 is a Westinghouse 3-loop unit with series 51 SGs. Each SG contains 3388 U-bend tubes made of Inconel 600. The nominal tube outside diameter is 0.875 inch with a nominal wall thickness of 0.050 inch; the tubes were expanded into the tubesheet using a mechanical hardroll process. Unit 2 reached initial criticality in May 1981, and this was the eleventh (11th) refueling outage (U2R11).

The SG tube inspections during U2R11 consisted of the following planned inspections:

- 100% full length bobbin inspection of all unsleeved portions of tubes in service, except for small radius U-bends.
- Cecco-5 examination of all sleeved tube sections.
- 100% rotating probe (+Point) examination of hot leg hard roll transition zone (Top of tubesheet ±3 inches), and 20% samples of cold leg hard roll expansion transition zone.
- Small radius U-bend examination using +Point: 100% Row 1 in SG B; 100% Row 2 in SG C.
- Augmented +Point examinations of tube support plate (TSP) intersections as required by Alternate Plugging Criteria.
- +Point examination of all bobbin free span indications.

In addition to the planned inspections, the licensee conducted the following inspections in order to quantify SG degradation mechanisms:

- Slow speed +Point rotating probe examination of tubes regarded as potential candidates for in-situ leak/pressure testing or tube pulling operations.

- Ultrasonic testing of in-situ leak/pressure test and tube pull candidates.

- In-situ leak/pressure testing of selected tubes (6 from SG A, 13 from SG B, and 20 from SG C) to support tube integrity evaluations.

- Cecco-5 examination of all tubes repaired by sleeving.

- Removal of 5 tubes in support of TSP Outside Diameter Stress Corrosion Cracking (ODSCC) interim plugging criteria, tube integrity evaluations, and development of alternate repair criteria for transition zone Primary Water Stress Corrosion Cracking (PWSCC).

On October 30, 1996, the Unit 2 SG inspection results were classified as Category C-3 in accordance with TS 4.4.6.5.c. A voluntary Emergency Notification System report of the C-3 inspection classification was made on November 8, 1996.

The inspector reviewed the Eddy Current (EC) results for U2R11 SG tube inspections. The review included the tabulated EC results for the five tubes that were pulled (removed); the 39 tubes that were in-situ leak/pressure tested; the tubes that were repaired or plugged; and the tubes which had recordable indications which met the acceptance criteria for continued service without repair. The inspector also reviewed the licensee's "Startup Report for Unit 2 Steam Generators," which provided the licensee's 10 CFR 50.59 review and safety evaluation for declaring the SGs operational after the inspection.

Table 3.1 of the licensee's "Startup Report" provided the data for the following table:

Degradation Category	Steam Generator					
	A		B		C	
	HL	CL	HL	CL	HL	CL
Support Plate (TSP) Indications						
TSP ODSCC	78	14	108	36	253	35
Expansion Zone Cracking (TSH±0.5")						
Axial PWSCC	406	0	97	1*	154	0
Circ. PWSCC	67	0	40	0	85	0
Inside Tubesheet						
Below BRT (above F*)	5	1	20	0	28	0
Below F* (-1.72")	66	0	49	1	172	3
Bobbin from TEH	40	0	25	0	278	0
Above Tubesheet (ATS) (≥0.5" above TS)						
Sludge Zone (>0.5" ATS)	6	1	4	0	15	0
Free Span ODSCC	2	1	6	0	1	0
AVB Wear	34	-	28	-	15	-

ATS: Above Tubesheet
TSH: Top of the hot leg tubesheet
*: Volumetric OD indication just below top of the tubesheet
BRT: Bottom of Roll Transition
F*: 1.72 inches below the top of the tubesheet or BRT (whichever is lower)
AVB: Anti-vibration Bar
TEH: Tube end on the hot leg side

The inspector also reviewed the results of the in-situ leak/pressure testing. The data for the in-situ tests were provided in a Westinghouse proprietary report. The in-situ data showed no measurable leakage from any of the thirty-nine tubes listed (six tubes from SG A, thirteen tubes from SG B, and twenty tubes from SG C).

c. Conclusions

The licensee's use of ultrasonic examinations, in-situ leak/pressure testing, and tube pulls appeared to be a conservative effort to obtain as much information as possible about the degradation mechanisms occurring in the U2 SGs.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Engineering Support (ES) of Zero Power Reactor Physics Testing (IP 37551)

Resident inspectors observed significant portions of initial criticality and zero power physics testing conducted by ES personnel. An inspector observed the approach to criticality and determined that ES personnel appropriately implemented FNP-0-ETP-3601, Zero Power Reactor Physics Test Procedures, and provided good support and direction to the operating crews. The approach to criticality and the conduct of ETP-3601 testing was monitored and directed by experienced and knowledgeable engineers. The ES personnel consistently interfaced very well with the operations staff.

IV. Plant Support

R2 Status of RP&C Facilities and Equipment

R2.1 Tours of the Unit 1 and 2 Radiologically Controlled Areas (IP 71750)

During the course of the inspection period, the resident inspectors conducted numerous tours of the AB RCA for Units 1 and 2. In general, Health Physics control over the RCA, and the work activities conducted within it, were good. Material condition and housekeeping in the Unit 1 and 2 RCA, considering ongoing outage activities, were much better than in the past (see Section O2.1).

The physical appearance of the Unit 2 Piping Penetration Room (PPR) at the 121 foot elevation following U2RF11 was considerably improved. Management attention to this area was evident. The accumulation of tools and equipment, and storage of solid radioactive waste, in the decontamination room and 155 foot elevation RCA spaces and hallways (including the new fuel storage areas) following the outage, were much better controlled than during previous outages. Efforts to improve labelling of radioactive materials and to limit the volume of materials left in the RCA were obvious and effective.

P1 Conduct of Emergency Preparedness Activities

P1.1 Annual Emergency Plan Exercise (71750)

The inspectors participated in the Emergency Plan exercise conducted on December 11, 1996. This was a full participation exercise for the NRC and included participation by personnel from the Federal Emergency Management Agency, State of Alabama, State of Georgia, Houston County Emergency Management Agency, and the Blakely-Early County Emergency Management Agency. Details of the exercise were reported in Inspection Report 50-348, 364/96-14.

S1 Conduct of Security and Safeguards Activities

S1.1 Routine Observations of Plant Security Measures (IP 71750)

During routine inspection activities, resident inspectors verified that portions of site security program plans were being properly implemented. This was evidenced by: proper display of picture badges by plant personnel; appropriate key carding of vital area doors; adequate stationing/tours of security personnel; proper searching of packages/personnel at the primary access point and Service Water Intake Structure (SWIS) and adequacy of compensatory measures (i.e., posting of guards) during disablement of vital area barriers. Security activities observed during the inspection period were performed well and were adequate to ensure physical protection of the plant. Guards were observed to be alert and attentive while stationed at disabled doors and access covers to critical underground equipment (e.g., SW system valve boxes).

F2 Status of Fire Protection Facilities and Equipment

F2.1 Unit 1 Containment Fire Detection System Inoperable (IP 71750)

Fire detection system 1A-22 failed shortly after the Unit 1 restart following U1RF13 during Fall of 1995. The containment smoke detection system was repaired and returned to service during Unit 1 midcycle outage of May 1996. However, 1A-22 failed again on November 2, 1996 and, except for a few periods of operability for less than an hour, has remained inoperable. While 1A-22 remains inoperable, operators implement the compensatory measures prescribed by the Updated Final Safety Analysis Report (UFSAR) Fire Protection Program, monitoring containment air temperature on a regular basis. A resident inspector confirmed operator implementation of the compensatory measures, and discussed longterm corrective actions with plant management. The inspector was concerned that these compensatory measures have become the defacto normal mode of operation and may be less effective than an operable fire detection system.

F2.2 (Closed) EEI 50-348/96-09-06: Failure to Install Required One-Hour Fire Barriers
(Closed) EEI 50-348, 364/96-09-07: Inadequate Kaowool Inspection Program

An Enforcement Conference (EA 96-410) was held in the Region II office on November 18, 1996 to discuss the issues identified in Escalated Enforcement Items (EEIs) 50-348/96-09-06, Failure to Install Required One-Hour Fire Barriers, and 50-348, 364/96-09-07, Inadequate Kaowool Inspection Program. (Refer to Section F2.1 of IRs 50-348,364/96-09 for both EEIs.) As a result of the conference, the EEIs were closed and two violations were identified: VIO 50-348/96-410-01013, Failure to Assure that Electrical Cables Associated with Systems Necessary to Achieve and Maintain Hot Shutdown Conditions Were Enclosed in a One-Hour Fire Barrier, as Required by FSAR, and VIO 50-348, 364/96-410-02014, Inadequate Periodic Inspection Program for Kaowool One-Hour Fire Barriers. The Notices of Violation were issued as Enclosure 1 to the NRC letter of December 4, 1996 summarizing the proceedings of the meeting.

V. Management Meetings and Other Areas

X1 Review of UFSAR Commitments

A recent discovery of a licensee operating its facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the UFSAR descriptions. While performing the inspections discussed in this report, the inspectors reviewed the applicable portions of the UFSAR that related to the areas inspected. The inspectors verified that the UFSAR wording was consistent with the observed plant practices, procedures and/or parameters.

X2 Exit Meeting Summary

The resident inspectors presented the inspection results to members of licensee management on January 9, 1997, after the end of the inspection period. The licensee acknowledged the findings presented.

The resident inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

W. Bayne, Chemistry/Environmental Superintendent
R. Coleman, Maintenance Manager
S. Fulmer, Technical Manager
D. Grissette, Operations Manager
R. Hill, General Manager - Farley Nuclear Plant
R. Martin, Superintendent Operations Support
M. Mitchell, Health Physics Superintendent
R. Monk, Engineering Support Supervisor - Equipment Evaluation
C. Nesbit, Assistant General Manager - Support
J. Odom, Superintendent Unit 1 Operations
J. Powell, Superintendent Unit 2 Operations
L. Stinson, Assistant General Manager - Plant Operations
J. Thomas, Engineering Support Manager
B. Yance, Plant Modifications and Maintenance Support Manager
W. Warren, Engineering Support Supervisor - Performance Review
G. Waymire, Safety Audit and Engineering Review Site Supervisor

NRC

J. Zimmerman, Project Manager - Farley Nuclear Plant

INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering
IP 40500: Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61726: Surveillance Observations
IP 62707: Maintenance Observations
IP 71707: Plant Operations
IP 71714: Cold Weather Preparations
IP 71750: Plant Support Activities
IP 73753: Inservice Inspection

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

Type	Item Number	Status	Description and Reference
NCV	50-364/96-15-01	Open	Failure To Establish RCS Vent Path During Midloop (Section O1.2)
NCV	50-348, 364/96-15-02	Open	Inadequate Procedural Guidance For Freeze Protection (Section O2.4)

VIO	50-348/96-410-01013	Open	Failure to Assure that Electrical Cables Associated with Systems Necessary to Achieve and Maintain Hot Shutdown Conditions Were Enclosed in a One-Hour Fire Barrier, as Required by FSAR (Section F2.2)
VIO	50-348,364/96-410-02014	Open	Inadequate Periodic Inspection Program for Kaowool One-Hour Fire Barriers (Section F2.2)

Closed

Type	Item Number	Status	Description and Reference
NCV	50-364/96-15-01	Closed	Failure To Establish RCS Vent Path During Midloop (Section O1.2)
NCV	50-348, 364/96-15-02	Closed	Inadequate Procedure Guidance For Freeze Protection (Section O2.4)
EEI	50-348/96-09-06	Closed	Failure to Install Required One-Hour Fire Barriers (Section F2.2)
EEI	50-348, 364/96-09-07	Closed	Inadequate Kaowool Inspection Program (Section F2.2)

LIST OF ACRONYMS USED

AB	Auxiliary Building
AFW	Auxiliary Feedwater
ATS	Above Tubesheet
AOP	Abnormal Operating Procedure
AVB	Anti-vibration Bar
BRT	Bottom of Rolled Transition
CCW	Component Cooling Water
CFR	Code of Federal Regulations
CL	Cold Leg
EC	Eddy Current
DG	Diesel Generator
EDG	Emergency Diesel Generator
EEI	Escalated Enforcement Item
EMP	Electrical Maintenance Procedure
ES	Engineering Support
ETP	Engineering Test Procedure
F*	1.72 inches below the top of the tubesheet or BRT (whichever is lower)
FNP	Farley Nuclear Plant
FSAR	Final Safety Analysis Report

FSP	Fire Surveillance Procedure
GRID	Group Rod Indicator Display
HL	Hot Leg
HSDP	Hot Shutdown Panel
HX	Heat Exchanger
IP	Inspection Procedure
IR	Inspection Report
LCO	Limiting Condition of Operation
LI	Level Indicator
MCB	Main Control Board
MCR	Main Control Room
MOV	Motor Operated Valve
NCV	Non-cited Violation
NIS	Nuclear Instrumentation system
NRC	U.S. Nuclear Regulatory Commission
OD	Outside Diameter
ODSCC	Outside Diameter Stress Corrosion Cracking
OR	Occurrence Report
PORV	Power Operated Relief Valve
ppm	parts per million
PPR	Piping Penetration Room
PWSCC	Primary Water Stress Corrosion Cracking
RCA	Radiologically Controlled Area
RCS	Reactor Coolant System
Rev	Revision
RG	Regulatory Guide
RHR	Residual Heat Removal
RP&C	Radiological Protection and Chemistry
RWST	Refueling Water Storage Tank
SAIC	Science Applications International Corporation
SFP	Spent Fuel Pool
SG	Steam Generator
SO	System Operator
SOP	System Operating Procedure
STP	Surveillance Test Procedure
SW	Service Water
SWIS	Service Water Intake Structure
SWS	Service Water System
TEH	Tube End Hotleg (Bottom of tubesheet)
TS	Technical Specifications
TSH	Top of the hot leg tubesheet
TSP	Tube Support Plate
U2RF11	Unit 2 eleventh refueling outage
UFSAR	Updated Final Safety Analysis Report
UOP	Unit Operating Procedure
VAC	Volt Alternating Current
VDC	Volt Direct Current
VIO	Violation
WO	Work Order