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

Report Nos.: 50-348/89-24, 50-364/89-24

Licensee: Alabama Power Company

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

Facility Name: Farley Units 1 and 2

Inspection Conducted: September 18 - 22, 1989

Inspector: _____ 10/12/89
T. S. Mellen Date Signed
Operational Programs Section

Inspector: _____ 10/12/89
R. H. Bernhard Date Signed
Operational Programs Section

Approved by: _____ 10/12/89
P. J. Kellogg, Chief Date Signed
Operational Programs Section
Division of Reactor Safety

SUMMARY

Scope:

This special announced inspection was conducted to review the results of the initial SSSA on the Service Water System and the draft program for future SSSAs.

Results:

The general program and SSSA schedule were well organized and had sufficient dedicated resources to complete the program in a timely and accurate manner. The methodology used to evaluate and correct problems appeared effective.

REPORT DETAILS

1. Persons Contacted

Name		Title Work Group
*J. Garlington	APCo	General Manager Nuclear Support
R. Hill	Farley	Manager, Operations
*D. Jones	APCo - NEL	Manager, Engineering
*F. Kuester	SCS - Farley Project	Manager, Project Engineering
*D. Lloyd	SCS - Farley Project	Engineering Group Manager
*J. Love	Bechtel	Project Engineer
*J. McGowan	APCo	Manager SAER
*B. McKinney	APCo	Manager NEL
*L. Troutt	APCo - NEL	Project Engineer
*J. Woodard	APCo	Vice President, Nuclear

*Attended Exit Meeting

Acronyms used through out this report are listed in the last paragraph.

2. Preliminary Results of the Service Water Flow Analysis

The inspectors reviewed the preliminary results of the flow analysis of the licensee's Self-initiated Safety System Assessment (SSSA) of the Service Water System. The assessment was conducted in eight parts:

a. Normal Operation
b. LOCA Coincident with a Seismic Event
c. LOCA Coincident with a Seismic Event, Two CCW HXs on Train B
d. LOCA Coincident with a Seismic Event, One CCW HX on Train B
e. Seismic Event Without LOSP, Two CCW HXs on Train A
f. Seismic Event Without LOSP, One CCW HXs on Train A
g. Seismic Event Without LOSP, Two CCW HXs on Train A, Miniflow Valves Isolated
h. Seismic Event Without LOSP, One CCW HXs on Train A, Miniflow Valves Isolated

The preliminary results indicated that case e is the most restrictive case. The specifics of this case model, a seismic event which causes a simultaneous line break in the turbine building service water supply line to each unit and an instantaneous loss of the plant compressed air system. Leakage from the line breaks was assumed to be not greater that 17,000 GPM per train in each unit. (Automatic isolation occurs with flow rates greater than 17,000 GPM, the isolation controls and the isolation valves are both seismic and redundant). A Safety Injection Signal is not considered because the Turbine Building Isolation Valves automatically isolate on a SI. To add additional conservatism to the calculation, the flow to the containment coolers was augmented by opening the 10-inch main supply line in addition to the 6-inch bypass line, which further reduced the modeled flow to the more critical components.

Two service water pump header miniflow lines per unit were aligned to train A with their AOVs failed instantaneously in the open position. System exit flow was to the river with the circulating water canal fill lines closed. Each unit had four service water pumps and two service water trains in operation. Two CCW heat exchangers per unit were aligned to train A with their flow control AOVs failed open.

There were two areas of low service water flow that resulted from this scenario:

a. Cooling water to the diesel generators.

The Service water cools the turbine lubricating oil, jacket water cooling, and cools the combustion air after it exits from the turbocharger compressor. The first two of the cooling flows affect the diesel generators mechanical integrity, the third affects Diesel Generator performance.

Mechanical Integrity - 75 percent of the cooling flow for 10 minutes should not damage the diesel engine. This was confirmed by the manufacturer.

Engine performance - 75 percent of the cooling flow will impact the temperature of the combustion air and hence the generator power output. Due to the reduced generator loading during the first 10 minutes without a Safety Injection Signal, the overall effect on Sequenced loads should be negligible. This was confirmed by the manufacturer.

Discussions with the Assistant General Manager for Operations at Farley indicated that the Turbine Building service supply line could be isolated from the control room, and that during the entry into the most time consuming applicable EOPs or AOPs, the service water valves would be closed within 10 minutes. This would restore full flow to the Diesel Generators and to the CCW heat exchangers.

Furthermore, the flow through the most limiting Diesel generator would be at about 75 percent. Colt Industries, the diesel generator manufacturer, indicated that the diesel could run without flow for at least 3 minutes without any damage. APCo contacted Colt and requested an analysis to confirm the extent of the effect of reduced flow on diesel engine performance.

b. Service Water to the Component Cooling Water Heat Exchangers

The design service water flow to the CCW HXs is 3400 gpm. The preliminary calculations indicated that approximately 3225 gpm would be provided to the CCW HX prior to closure of the turbine building service water inlet valves. The licensee calculated the maximum effect of the reduced flow prior to the implementation of corrective actions.

The increase was approximately 1 degree F. The calculation had the same conservatism as the diesel generator cooling water calculations. The net change to the CCW system, prior to the implementation of corrective actions, appears to be negligible.

Additionally, the preliminary results indicated that in cases b-h most of the equipment could not meet the flow requirements delineated in FSAR Table 9.2-3. Additionally, some of the case a equipment did not meet the flow requirements. This appears to be the result of difficulty representing throttling in the modeling process. The inspectors discussed this with the Manager of Operations at Farley and the designer responsible for the modeling program. The flows will be validated in the field and the model will be adjusted to compensate for the actual field flow measurements.

No violations or deviations were identified.

3. Licensee Actions in Response to SSSA Findings on Service Water System

The inspectors reviewed FNP-1-ESP-0.1, Reactor Trip Response, with TCN 9D incorporated. Steps directing the operator action of closing the service water to turbine building isolation valves had been incorporated. The action is performed for all cases involving loss of offsite power whether or not indications of an SI or indications of a Turbine Building Service Water pipe rupture are present. This eliminates lost time to make decisions and eliminates complicated flowpaths for the procedure. References to FNP-1-AOP-10.0 are also made for seismic event response.

FNP-1-AOP-10.0, Loss of Train A or B service water, Revision 4 was reviewed. This revision had the turbine building isolation steps incorporated.

In addition, FNP-2-AOP-5.0, loss of electrical train A and/or B, Revision seven was reviewed. Steps to isolate the SW flow to the Turbine Building were present. In addition, steps to unisolate the Turbine Building flows upon restoration of instrument air were incorporated in the procedure.

No violations or deviations were identified.

4. SSSA Program Review

A review was performed of the current SSSA initiative for Farley. The program is in the development stage. A final program will be in place after review of the efforts of the first three SSSAs. The current depth of the review and concept of functional system descriptions appeared to be appropriate for a plant the age of Farley.

The current program allows the normal plant procedures to act upon operability issues as they are discovered. This is a strength in the current program. The inspectors reviewed the process for both service water issues and closed cooling water issues. The SSSAs identified the level of response appeared to be appropriate.

The inspectors noted that the current list of systems and the priority for completion did not have Probabilistic Risk Assessment Data input into the decision making process, but were based current NRC and plant issues. A final list was not available for review.

No violations or deviations were identified.

5. Service Water Pump Performance

To verify the degree of conservation of the assumed pump flows in the Service Water flow balance model being developed by Southern Services, copies of Inservice Surveillance Testing for the service water pumps were obtained. The ISTs (FNP-1-STP-24.1) are performed with two pumps running due to system operability requirements. Total flows at rated pressure measured by the ISTs performed from June 20, 1989, to September 14, 1989, range from a low flow of 19159 gpm for two pump flow to a high of 21623 gpm for two pump flow.

Test curves developed for the pumps at the manufacturer show actual pump performance ranging from 9100 gpm to 9400 gpm at rated pressure. Two pump combined flow at this pressure would be expected to be in the range of 18,200 to 18,800 gpm when the pumps were new. In a degraded condition flows would be expected to be lower.

The licensee indicated the pumps and impellers were of the same design as when new. The pump impellers that had been replaced were changed in material only, not in size or design. The two units have pumps from different manufacturers and had their original factory tests preformed several years apart. At the time of the inspection, the licensee could not provide an explanation for the significant difference in expected IST results.

This discrepancy in expected IST results will be tracked as Inspector Follow-up Item 89-24-01, Service Water Pump IST flow results anomaly.

The licensee indicated that if corrected IST flow measurements indicated that actual pump performance was more conservative than the assumed flows the Service Water flow balance with the more conservative flows plus the assumed degradation would be used.

No violations or deviations were identified.

6. Service Water Initial Flow Balance

The inspectors performed a review of the preliminary service water flow balance model created in response to the SSSA concerns. The program was a standard Personal Computer based program for calculating design pressure drops and flows for piping systems. Data input consisted of information extracted from isometric sketches of the systems piping used for seismic and restraint analysis and orthographic drawings. Component pressure drops were based upon Crane Company Technical paper 410 for pipes fittings, design data and specification sheets for equipment and the Hazen - Williams empirical formula for piping pressure loss. Piping roughness for input into the Hazen-Williams formula was assumed to be the design number for 10 years old welded steel pipe. Pump head characteristics were based upon a three point fit of data extracted from the original factory pump head curves. The inspectors performed a check of a sample of the data used or input. A few minor discrepancies were roted. A review of efforts performed to put the calculation in final form showed all inputs were being rechecked by Southern Services, and the discrepancies the inspectors noted would have been resolved with the check. System testing was planned to gather actual data to validate the improved model. Adjustments will be made to roughness assumption and component resistances based upon the test data, if required.

No violations or deviations were identified.

7. CCW RHR pump seal cooler relief valve

APCo identified a concern during the performance of an SSSA on the Component Cooling Water that the RHR pump seal cooler relief valves lift resulting in the potential loss of both trains of CCW. This scenario required the RHR pump seal cooler CCW pressure control valve to fail open on loss of instrument air. Initially, the licensee believed that the resulting increase in pressure would cause the RHR pump seal cooler relief valve to lift and decrease the CCW surge tank level to the point of the pump trip. The licensee took immediate compensatory actions, by modifying procedures to rapidly turn on the CCW to the RHR system to reduce system pressure.

Subsequently, the licensee performed a detailed analysis to determine the actual maximum system pressure. The licensee determined that the maximum pressure at the relief valve was actually 84.7 psi. The set point of the relief valve was 100 psi. The results from the detailed analysis indicated that the compensatory measures taken by the licensee had not been necessary. However, the licensee acted responsibly by taking the compensatory measures at the moment a potential problem was identified. The inspector reviewed the detailed analysis and confirmed the calculation was both accurate and conservative.

No violations or deviations were identified.

8. EXIT INTERVIEW

The inspection scope and findings were summarized on September 21, 1989, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. Dissenting comments were not received from the licensee.

Item Number	Description and Reference
348,364/89-24-01	IFI - Service Water Pump Flow Anomaly

9. Acronyms

AOV - Air Operated Valve
APCo - Alabama Power Company
CCW - Component Cooling Water
EOP - Emergency Operating Procedures
FSAR - Final Safety Analysis Report
GPM - Gallons per Minute
HX - Heat Exchanger
IST - Inservice Testing
LOSP - Loss of Offsite Power
psi - Pounds per Square Inch
RHR - Residual Heat Removal
SCS - Southern Company Services
SI - Safety Injection
SSSA - Self-initiated Safety System Assessment
SW - Service Water