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

Report No.: 50-348/94-09 and 50-364/94-09

Licensee: Southern Nuclear Operating Company, Inc.
600 North 18th Street
Birmingham, AL 35291-0400

Docket No.: 50-348 and 50-364 License No.: NPF-2 and NPF-8
Facility Name: Farley 1 and 2

Inspection Conducted: March 21 - 24, and March 28 - April 1, 1994

Inspector: _____ 4/29/94
N. Economos Date Signed

Approved by: _____ 4/29/94
J. J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in order to observe Eddy Current (ET) examination activities of Unit 1 steam generator (S/G) tubes including repairs as applicable. Other activities observed included inservice inspection (ISI) of selected components performed during this outage.

Results:

This inspection showed that the licensee is implementing the inspection plan for steam generator tubes in a satisfactory manner. The inspector found the ET activities including S/G tube examination, evaluation, disposition, and plans for repairs were consistent with technical specification requirements regulatory guidelines and commitments.

At the close of this inspection the licensee had completed eddy current examination activities and issued the following list of tubes for repairs:

	S/G "A"	S/G "B"	S/G "C"
Sleeving:			
Tube Support Plate	02	01	01
Top of Tubesheet	21	09	37
Roll Transition	01	03	07
Tubes Plugged	03	∅	04

One unresolved item was identified 348,364/94-09-01, Review of Personnel Qualifications and Equipment Calibration Records Prior to Work Start, paragraph 2.5.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

S. Casey, Supervisor, System Performance and Engineering
*R. Coleman, Manager Plant Modification
M. Dove, Senior Engineer, Maintenance Support Group
D. Hartline, ISI/ST Supervisor
R. Hill, Nuclear Plant General Manager
*R. Martin, Engineering Group Supervisor
*L. McClain, NDE Level III Examiner
*C. Nesbitt, Operations Manager
*J. Osterholtz, Assistant General Manager - Technical Support
T. Smith, NDE Level III Examiner
*M. Stinson, Assistant General Manager - Operations
*J. Thomas, Maintenance Manager
*B. Yance, Manager Systems Performance

Contractor Personnel

Westinghouse Nuclear Services Division (WNSD)
R. Bedard, QA Engineer
J. Bell, ISI Coordinator
S. Fore, Lead Technician, Eddy Current (ET)
P. Hawkins, Mechanical Engineer Laser Welding
R. Keck, Level III UT Examiner
J. Marburger, QA Engineer
*K. Patton, Site Services Manager
W. Stock, Level III ET Examiner
J. Zook, Shift Supervisor

Other licensee and contractor employees contacted during this inspection included engineers, technicians, and administrative personnel.

NRC Resident Inspectors

*T. Ross, Senior Resident Inspector
M. Morgan, Resident Inspector

*Attended exit interview

2. Inservice Inspection (ISI)

Background:

During the first week of this inspection, ET examination of tubes was in progress in all three steam generators (S/Gs). Other inservice inspection activities in progress at this time included preparation for and inspection of the girth weld in S/G "B." On the second week of this inspection, the inspector continued monitoring ET examination and tube repair activities, observed selected ongoing ISI examinations, reviewed inspection results, procedures and quality records as applicable. This

work effort was performed to ascertain whether ISI was being implemented in accordance with applicable code, procedures, regulatory requirements and licensee commitments. The applicable code for ISI activities is ASME Code Section XI, 1983 Edition with Summer 1983 Addenda. With regards to Unit 1, the current scheduled refueling outage was indicated as the second outage of the second 40 month period of the second ten (10) year interval.

2.1 Eddy Current Examination of S/G Tubes, (73753) Unit 1

As stated above, ET examination of S/G tubes for this outage was in progress when the inspector first arrived on site on March 21, 1994. Through discussions with cognizant licensee personnel and by review of related documents, the inspector ascertained that the ET examination program for this scheduled refueling outage, was being performed in accordance with Technical Specification (TS) Amendment submittals dated December 9, 1993 as supplemented on February 23, 1994. The proposed amendment specifies tube repair and leakage criteria for outside diameter stress corrosion cracking (ODSCC) at the tube support plate elevations/intersections and applies only to operating cycle 13. Provisions of the subject amendment were as follows:

- 100 percent bobbin probe examination of the hot and cold leg S/G tube support plate intersections in all three S/G(s).

- Degradation attributed to ODSCC, within the bounds of the tube support plate, with bobbin probe voltage less than or equal to 2.0 volts will be allowed to remain in service.

- Degradation attributed to ODSCC, within the bounds of the tube support plate, with a bobbin probe voltage greater than 2.0 volts will be repaired or plugged except as noted below:

- Indications of potential degradation attributed to ODSCC within the bounds of the tube support plate, with a bobbin probe voltage greater than 2.0 volts but less than or equal to 3.6 volts may remain in service if a rotating pancake coil probe (RPC), inspection does not detect degradation. Indications of ODSCC degradation with a bobbin probe voltage greater than 3.6 volts will be plugged or repaired.

In addition to the above proposed TS changes, the licensee made the following proposals/commitments for implementing the interim plugging criteria (IPC):

100 percent crosswound probe examination of all sleeves

Rotating pancake coil (RPC), probe examination of:

- All hot leg (HL) top of tubesheet roll transitions.
- All bobbin probe flaws with voltages > 1.5 volts and < 2.0 volts
- All bobbin probe identified dents > 5 volts
- 100 percent of rows 1 and 2 U-bends

Augmented Examination Program:

- RPC a minimum sample of 100 tube support plate intersections which includes bobbin probe identified dent indications > 5.0 volts. The sample would also include other tube support plate intersections with artifact indications and intersections with unusual phase angles.
- All RPC flaw indications not found by the bobbin probe because of masking effects would be plugged or repaired.

Following completion of this inspection, NRR issued amendment 106 on the interim plugging criteria and its implementation discussed above. The subject amendment was issued on April 5, 1994.

2.2 ET Examination, Procedure and Results:

The examination, analysis and repair of tubes was being performed by WNSD, following applicable code and Technical Specifications requirements, industry guidelines and regulatory commitments. Some of the controlling documents reviewed were as follows:

MRS 2.4.2 APC-35 Rev 2,	Eddy Current Inspection of Preservice and Inservice Heat Exchanger Tubing
DAT-GYD-001 Rev 6,	Westinghouse Data Analysis Guidelines
Joseph M. Farley Nuclear Plant Eddy Current Guidelines of Steam Generator Inspections, February 23, 1994	Appendix A NDE Data Acquisition and Analysis Guidelines

Joseph M. Farley Nuclear
Plant-Unit 1 Technical
Specification Changes,
Associated with Steam Generator
Tube Support Plate Interim
Repair Criteria, December 9, 1993

Amendment No. 106 to NPF-2, April 5, 1994

ALA-1 Rev 3	Data Analysis Guidelines J. M. Farley Unit-1
ALA-2 Rev 2	Data Analysis Guidelines

Specific Analysis Guidelines, Farley Unit-1

Analysis of indications was performed by Westinghouse W who provided primary and secondary analysts. Primary analysis was performed onsite while the secondary was performed by W technical personnel in Pittsburgh, Pennsylvania. Independent analysis was performed by Conam whose facilities were located on site. Resolution of differences in analysis results was performed by level III Examiners from the two organizations. ET examinations were conducted with the MIZ-18 system and 0.720" diameter multifrequency bobbin differential coils. In some instances smaller diameter coils were utilized to accommodate examination of intersections, above installed sleeves at tube support plates or the tubesheet.

2.3 Work Observation:

The inspector observed bobbin and PRC probe examinations and analysis of the following tubes:

	Row(s)	Column	Probe	Reel/Disk	Location
S/G "A"	21-30	16	MRPC	26/6A	Top of Tubesheet Hot Leg
	10	43	Bobbin	39/13A	Support Plate
S/G "B"	6-23	34	MRPC	28/8A	Top of Tubesheet Hot Leg
	26-34	44	Bobbin	35/11A	Support Plate
S/G "C"	31-38	39	MRPC	30/8A	Top of Tubesheet Hot Leg

30-42	51	Bobbin	41/13A	Support Plate
14-15	52	Bobbin	analysis	

2.4 Tube Repairs

Following completion of this inspection, and at the request of the inspector, the licensee provided the following preliminary ET results including S/G tube repairs:

	S/G "A"	S/G "B"	S/G "C"
Sleeving at			
- Tube Support Plates	02	01	01
- Top of Tubesheet	21	09	37
- Roll Transition	01	03	07
Tubes Plugged	03	∅	04
Cumulative Plugging Percentage	4.74%	2.61%	3.70%

The total percentage of tubes plugged in the three S/G(s) following this outage, as calculated by the licensee was 3.69 percent.

2.5 Review of Quality Records and Personnel Certifications

Quality records including personnel certifications and equipment calibrations used in this activity were reviewed for completeness and accuracy - these were as follows:

Equipment		Serial Number
Remote Data Acquisition Units, (MIZ-18)		WEM-02787 WEM-05052 WEM-09082 WEM-05053 WEM-07427
Control Box SM 10		WEN-05179 WEN-03186
Calibration Standards	MRPC	MGT-005-94
	MRPC	MGT-006-94
	In-Process	IP-004-92
	Absolute Reference	AB-016-03 AB-013-93 AB-010-91
	AVB 4 Notch	AV-005-91 AV-007-88

Equipment		Serial Number
Calibration Standards (cont.)	Voltage Guide Table	V-007-88
		V-008-94
	EC Sleeve	S-001-92
	ASME Sleeve	S-005-92

The following compilation is a summary of the ET technicians and their qualifications whose records of qualification and visual examinations were reviewed for completeness and accuracy.

Company Affiliation	Qualification Levels I	II	IIA	III	IIIA
B&W			8		1
Conam			4	2	
Westinghouse	10	5	1	1	

Within these areas, on March 23, 1994, the inspector noted that two Westinghouse Level II ET examiners, observed taking data, did not appear on the approved list of certified ET personnel. At this time the inspector also found that two MIZ-18 units (WEM-05052 and WEM-05053) used for data acquisition did not appear on a similar list for equipment. A followup investigation by Westinghouse QA personnel revealed that the equipment calibration certification records were on site but had not been turned over to QA for review and disposition. Westinghouse retrieved the subject records and made them available for review prior to the end of business on March 23, 1994.

In Reference to the two ET examiners, Westinghouse QA indicated that both individuals were last minute substitutes and as such their certifications were not included in the original package forwarded to the site. Once Westinghouse was made aware of the problem, they transmitted the certifications to the site and made them available for review. A review of Farley's requirements, on Control of Special Processes under FSAR section 17.2.9, revealed that the plant supervisor assures that personnel performing special processes will be trained and qualified, that equipment used will be calibrated and certified and, that personnel qualifications were submitted for approval prior to work initiation. In order to implement a short term corrective measure to address the aforementioned personnel qualification problem, W issued Field Change, 001, to procedure MRS 2.4.2 APC-35 Rev. 2 Eddy Current Inspection of Preservice and Inservice Heat Exchanger Tubing. The field change stipulated that only certified personnel and equipment identified on the QA approved list will be used for ET data collection and analysis. In terms of long term corrective measures, the licensee was reviewing vendor contracts to assure that FSAR requirements, relative to all applicable special processes, have been addressed. To provide time for an adequate review and permit the licensee to determine to what

extent the aforementioned requirement has or has not been implemented the inspector identified this matter as unresolved item 348,364/94-09-01, Review of Personnel Qualifications and Equipment Calibration Records Prior to Work Start.

3. Steam Generator Tube Repair

3.1 Tube Sleeving

Steam generator tubes with indications exceeding acceptance criteria were either plugged or sleeved as determined appropriate by the licensee and Westinghouse. Sleeves used during this outage were made from Inconnel I-690 material, produced in accordance with ASME Code Section III, NB and Section XI 1986 Edition with Code Case N-20 (use of SB-163, 690 nickel - chromium - iron...seamless condenser tubing at 40.0 ksi yield strength...).

Tubing material for the sleeves was purchased from Sandvik Tube Inc under purchase orders MA-80083-M and MA-71482-M. The material was produced under Heat Numbers 764336 and 764371 respectively. Sleeves produced from heat 764336 measured 0.740" OD x 0.040" x 12.0" long, and were used for tube repairs at support plate elevations; sleeves from Ht #764371 measured 0.74" OD x .040" x 30.0" long were used for tube repairs at top of the tubesheet locations. The W Quality Release form was used as the on-site controlling QA document. Attributes listed on the form as having been reviewed and approved by W QA/QC included material certifications, heat treatment records, NDE results, dimensional checks, hydros and certificates of conformance. Hydro requirements provided for a test pressure of 3125 ±25 psi over a period of 10 seconds minimum. Mechanical properties for both heats were in the range of 103/106 kips ultimate, 48/53 kips yield and 48/49 percent elongation.

Through TV monitors used to observe S/G tube inspection and repair activities, the inspector observed sleeving operations in S/G "C." These operations included tube cleaning, honing sleeve insertion and expansion. Tubes where these activities were monitored on March 31, 1994,were as follows:

S/G "C"	Row	Column	Location
	22	31	3H
	22	31	TSH
	16	31	TSH
	09	30	TSH
	08	27	TSH

The applicable procedure used to perform the above operation was STD-FP-1990-5149 Rev. 6, Sleeve/Mandrel Insertion and Expansion System... .

The quality records reviewed on materials were in order. Through discussions and record reviews the inspector found personnel performing this activity were knowledgeable and adequately trained to perform their assigned tasks.

3.2 Sleeve Welding

Following the sleeving operation, discussed earlier in this report, sleeves were laser welded following the same welding process and techniques discussed in earlier reports, 92-11 and 93-25. Because the applicable welding procedure specifications had been revised, the inspector reviewed the revisions and associated procedure qualification records for conformance to the applicable code identified earlier in this report. Welding procedure specifications reviewed were as follows:

Welding Specification	
WPS - 74362 Rev. 6	Welding of Lower Tubesheet Joints in Sleeves.
WPS - 74370 Rev. 4	Welding of Free Span Joints in Sleeves.

In addition, the inspector reviewed for technical content and adequacy procedure, STD-FP-1990-5150 Rev. 6, Laser Welded Sleeving 0.875" OD x 0.050" wall, Steam Generator Tubes. On April 1, 1994, the inspector observed laser welding of sleeves in the following steam generator tubes

S/G "B"	Row	Column	Location
	16	52	Tube Sheet Upper
	26	56	Tube Sheet Upper
	26	57	Tube Sheet Upper
	27	58	Tube Sheet Upper
	25	62	Tube Sheet Upper
	20	63	Tube Sheet Upper

Sleeve welding was performed and controlled remotely through computer programming. The activity was monitored with the aid of TV monitors. Parameters monitored included laser power, gas flow, weld head speed (rotation), pulse frequency and position.

Within the areas inspected the inspector found technical personnel to be knowledgeable and well trained to perform their assigned tasks. The licensee's technical support group closely monitored the activity and moved to resolve field problems in a timely manner. Following the close of this inspection, the inspector ascertained that all sleeve welds were fabricated satisfactorily except for four welds which required repair.

Within the areas inspected violations or deviations were not identified.

4. Inservice Inspection Unit 1 (73753)

4.1 Reactor Vessel Outlet Nozzle to Vessel Weld Re-Examination for Indications Exceeding Code Allowable Standards.

Through discussions with cognizant licensee personnel and by review of NDE Indication Evaluation Report No. 030, dated April 24, 1988, the inspector ascertained the following:

During the April 1988 reactor vessel inservice inspection (interval 2, period 1) two indications were identified that exceeded the 50% DAC recording level and the acceptance standards of the ASME Code Section XI 1983 Edition, up to and including the Summer 1983 Addenda. These indications were located in the outlet nozzle-to-shell weld #21. They were found using the Westinghouse Remote Inservice Inspection Tool and a zero degree (0°) 2.25 MHz 1/2" ∅ longitudinal wave transducer from the nozzle bore.

The two indications were identified as 3A and 22A. Indication 3A is located at approximately 124 degrees clockwise from the top center of the nozzle when viewed from the reactor vessel centerline. It achieved a maximum amplitude response of 100% DAC and the through-wall (2a) dimension, using 50% DAC sizing techniques, measured 1.32 inches. Its length (l) dimension, using 50% DAC sizing techniques measured 0.74 inches.

Indication 22A is located at approximately 10 degrees clockwise from the top center of the nozzle when viewed from the reactor vessel centerline. It had a maximum amplitude response of 100% DAC and a through-wall (2a) dimension, using 50% DAC sizing techniques, of 1.44 inches. Its length (l), using the ASME Code specified 50% DAC sizing techniques, measured 0.64 inches. As with indication 3A, indication 22A appeared to be located along the nozzle fusion line of the weld, but closer to the center of the weld.

Using the flaw indication evaluation rules of IWA-3000 and the acceptance standards for flaw indications of IWB-3000 (specifically table IWB-3512-1) it was determined that indication 3A had an actual a/t value of 7.3% compared to an allowable a/t of 6.5%, and indication 22A has an actual a/t value of 8.0% compared to an allowable a/t of 6.5%. Both indications exceeded code allowable standards.

In an effort to determine the NDE history of these indications, results of previous inspections were reviewed by Westinghouse. The review included the preservice inspection performed in February 1977, the first interval inservice inspection in 1984, and the second interval inservice inspection in 1988.

Results of these reviews and comparison of data was discussed in detail in the subject report. In addition, the subject report disclosed that the two indications were subjected to fracture analysis using the rules of IWB-3600 and Appendix A Guidelines, from the ASME Code Section XI,

1983 with Addenda up to and including the 1983 Summer Addenda. Results of this analysis indicated the nozzle was acceptable for continued service. However, under the rules of IWB-2420 (B) and (C), the subject indications required re-examination over the next three consecutive inspection periods.

Accordingly W prepared for the upcoming examination of the nozzle section, by performing a demonstration test using contact and immersion ultrasonic techniques to compare detection and sizing capabilities between the two methods. The demonstration was performed at the Waltz Mill facility using the W Mini-Tool. The demonstration was performed on a nozzle block containing real and artificial flaws. The report indicated that the examination was performed using the same search units/transducers that will be used on the nozzle. By review of test results and through discussions with licensee and W Level III UT examiners the inspector ascertained that the contact method, using a focused 0° search unit, will increase data reliability and provide a closer estimate of true flaw size.

Because the main loop could not be drained down sufficiently to permit UT examination, during the time-frame of this inspection, the inspector did not observe the ultrasonic examination of the subject nozzle weld. However, the inspector was able to observe UT system calibration and review applicable procedure, FNP-0-157.20 Rev. 0, Remote Inservice Inspection of Reactor Vessel Nozzles Using Reactor Vessel Mini-Tool. The examination would be performed using the following transducers:

30°L	30 x 20 mm	2 MHz	S/N 93-609
10°L	30 mm diam.	2 MHz	S/N 93-611
0°L	1.0" diam.	2 MHz	S/N 93-407
0° focused	3" x 3"	2 Mhz	S/N B05305

Flaw evaluation would be performed using the ultrasonic data recording and processing system. Personnel certification of four UT examiners assigned to perform the examination and to interpret the data were reviewed and found in order. Quality records of equipment including the aforementioned transducers were reviewed and were found to be in order.

Following completion of this inspection, the licensee forwarded examination results and evaluations to the inspector for review. Through a review of the submitted data, the inspector concurred with the licensee's conclusion that the subject indications have remained essentially unchanged since the previous examination. Furthermore, through the use of code allowable alternative techniques, results of the focused 0° transducer examination demonstrated that both indications were code allowable.

4.2 Magnetic Particle Examination

The ISI plan for this outage included surface examination of reactor vessel head nuts as required by ASME Code Section XI. The examination was performed under requirements of procedure FNP-0-NDE-157.11 Rev. 3

Magnetic Particle Examination 1983 Code. The procedure was written to accommodate the use of wet particles under black light conditions. Consumables and equipment used included Prepared Bath, Batch No. 91B03k by Magnaflux; Yoke, S/N WO-3345; Coil Ring, S/N WO-4673, type L-10; Black Light, S/N W10760; and Black Light Meter WEM-03845, S/N 33087. The inspector witnessed examination of the following nuts 21, 22, 23, 24, 25, 32, 33 and 36. Adequacy of the technique used was checked and verified prior to the examination with the use of equipment calibration, and personnel qualifications were reviewed and found to be in order. All of the nuts tested were found acceptable.

4.3 Visual Examination

Reactor vessel head washers were examined visually as required by ASME Code Section XI during this outage. The examination was performed under requirements of procedure FNP-0-NDE-157-3 Rev. 3 which was written to comply with requirements of the applicable code. Washers numbered 20 through 38 were examined and their examination was witnessed by the inspector. All of the washers examined were found acceptable. Personnel who performed the examination had been properly qualified and adequately trained to perform their assigned task.

4.4 Ultrasonic Examination

Reactor vessel head studs were scheduled for ultrasonic examination during this outage. The applicable procedure for the examination was FNP-0-NDE-157.18 Rev. 5, Ultrasonic Examination of Studs and Bolts from Bore Hole, 1983 Code. The examination was performed with a Harisonic Laboratories bore probe using two 70° shear wave 5MHz transducers and a 90° surface wave 5MHz transducer. The inspector witnessed system calibration performed with calibration block No. ALA-036 and the examination of selected studs. Equipment and personnel certification records were reviewed and found to be in order. All inspected studs were found acceptable for continued service.

5. Data Review and Evaluation of Inservice Inspection Records (73755)

Records of completed nondestructive examination(s) were selected and reviewed to ascertain whether: the method(s), technique, and extent of the examination complied with the ISI plan and applicable NDE procedures; findings were properly recorded and evaluated by qualified personnel; programmatic deviations were recorded as required; personnel, instruments, calibration blocks, and NDE material (penetrants, couplants) were designed. Records selected for this review are listed below.

Weld	Component	Equipment	Results
ALA2-32005	S/G/ B Upper Shell To Transition Weld	UT-0°, 45°, 60°	Two Reflectors, ID geometry and 2" Square Pads on IDI
ALA1-2100-3, 7, 11, 12, and 13	Pressurizer	UT-0°, 45°, 60°	No recordable Indications, (NI)
ALA1-1300-S20 Through S38	Reactor Vessel Closure Head Studs	UT-90°, 70°	Restriction due to inability to remove plug in bottom of Studs
ALA1-2100-11, 12, 13 and 14	Pressurizer	Magnetic Particle (MT)	NI
ALA1-4203-12, 13, 14 and 15	Reactor Coolant Loop to Safety Injection	Liquid Penetrant (PT)	NI
ALA1-4205-35	Spray Line, Reactor Coolant Loop 2	PT	NI
ALA2-3560-3 and 4	Regenerative Heat Exchanger	UT-45°, 60°	NI
ALA2-3560-3, and 4	Regenerative Heat Exchanger	PT	NI
ALA2-3100-8	S/G "A", Feedwater Nozzle to Shell Weld	UT-0°, 45°, 60°	NI
ALA2-3200-2 and 3	S/G "B", Stud Barrel to Upper Tubesheet and Lower Shell to Lower Stud Barrel respectively	UT-0°, 45°, 60°	Weld No. 2, 97%, Weld No. 98% of volume examined-Restriction Name Plate Weld pad

Quality Records - Equipment and Consumables

Certifications/calibration records of UT equipment, standards, and materials were reviewed to ascertain whether they were complete, accurate and consistent with applicable industry standards and regulatory requirements. These records were for the following items:

Ultrasonic

Instrument	Transducers	Couplant	Thermometer
Sonic, S/N 136-904k	0°-S/N 14032	Sonotrace 40-	S/N-10098
Tektronix, S/N WEM-04329	45°-S/N H25005	#9091 #92094	-10071
Sonic 136-911k	-S/N 18262 60°-S/N 18264 -S/N H30049		

Liquid Penetrant

Material	Type	S/N
Cleaner	SKC-NF	91K11K
Penetrant	SKL-HF/S	91H02K
Developer	SKD-NF	89H09K

Within the areas inspected violations or deviations were not identified.

6. Exit Interview

The inspection scope and results were summarized on April 1, 1994, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.