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

Report Nos.: 50-335/93-10 and 50-389/93-10

Licensee: Florida Power and Light Company
9250 West Flagler Street
Miami, FL 33102

Docket Nos.: 50-335 and 50-389 License Nos.: DPR-67 and NPF-16

Facility Name: St. Lucie 1 and 2

Inspection Conducted: April 19-23, 1993

Inspector: _____ 5/18/93
N. Economos Date Signed

Approved by: _____ 5/19/93
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 the areas of Inservice Inspection (ISI) activities, including eddy current (ET) examination of steam generator (S/G) tubes. Other on going activities inspected included modification of the pressurizer (Pzr) safety relief valve discharge line. Revisions of certain erosion corrosion and nondestructive examination (NDE) procedures were reviewed.

Results:

The work observation effort and the review of engineering documents and ISI procedures indicates that adequate management controls are in place. Personnel implementing the subject modification and ISI program were adequately trained and qualified to perform their assigned tasks. The licensee has addressed by revision(s) to, and through the issuance of applicable procedures, certain deviations from the EPRI CHECMATE recommendations.

Violations or deviations were not identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*G. Boissy, Plant General Manager
*C. Burton, Operations Manager
G. Boyers, Steam Generator Program Coordinator
*J. Dyer, QC Supervisor
*R. Englmeier, Site Quality Manager
*J. Geiger, Vice President Nuclear Assurance
N. Hallebeck, Welding Engineer
*J. Holt, Licensing Engineer
*A. Motley, Supervisor of Codes and Programs, Equipment Support Inspections (ESI)
*D. Mumper, ESI, Inservice Inspection (ISI) Supervisor
D. Nowakowski, ESI, ISI Coordinator
*J. Scarola, Engineering Manger
C. Ward, Pressurizer Discharge Pipe Modification, Project Manger

Other licensee employees contacted during this inspection included engineers, mechanics, security force members, technicians, and administrative personnel.

NRC Resident Inspectors

*S. Elrod, Senior Resident Inspector
M. Scott, Resident Inspector

*Attended exit interview

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

2. Inservice Inspection (ISI) Background

The inspector reviewed documents and records, and observed activities, as indicated below, to determine whether ISI was being conducted in accordance with applicable procedures, regulatory requirements, and licensee commitments. The applicable code for Unit 1 ISI, is the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code, Section XI, 1983 Edition with Addenda through Summer 1983 (83S83). Unit 1 is in the second outage of the second 40 month period of the second ten year ISI interval. Ebasco, under contract with the licensee, is conducting ISI examinations during this outage. Eddy Current (ET) examination of steam generator tubes was being conducted by Assea Brown Boveri, Combustion Engineering (ABB-CE). The ISI activities were being conducted under requirements of the licensee's QA Program.

3. Review of Nondestructive Examination (NDE) Procedures, Unit 1 (IP 73052)

The following procedures have been reviewed for technical adequacy, and consistency with applicable code and regulatory requirements, during previous inspections (e.g., Inspection Report 92-09). During the present inspection, the inspector reviewed the procedures for information and to ascertain whether the latest revisions had made substantive changes to the procedures.

Procedure	Rev.	Title
NDE-1.3	(R5)	Eddy Current Examination of Non Ferromagnetic Tubing with Multi-Frequency Techniques MIZ-18
NDE-2.2	(R4)	Magnetic Particle Examination
NDE-3.3	(R5)	Liquid Penetrant Examination Solvent Removable Visible Dye Technique
NDE-3.4	(R3)	Liquid Penetrant Examination Visible & Florescent Water Washable Technique
NDE-4.1	(R5)	Visual Examination VT-1 for Welds/Bolting/Bushings/Washers
NDE-4.2	(R3)	Visual Examination VT-2 Conducted During System Pressure Test
NDE-4.3	(R4)	Visual Examination VT-3/VT-4
NDE-5.1	(R6)	Ultrasonic Examination of Pressure Vessel Welds Except Reactor Vessel
NDE-5.2	(R5)	Ultrasonic Examination of Ferritic Piping Welds
NDE-5.3	(R4)	Ultrasonic Examination of Primary Coolant Piping Welds (PSL-1 & 2)
NDE-5.4	(R9)	Ultrasonic Examination of Austenitic Piping Welds
NDE-5.7	(R3)	Ultrasonic Examination of Reactor Pressure Vessel Studs and Reactor Coolant Pump Studs
NDE-5.11	(R4)	Ultrasonic Examination of Dissimilar Metal Welds

Procedure	Rev.	Title
NDE-5.12	(R3)	Ultrasonic Examination of Reactor Pressure Vessel Flange to Vessel Weld and Stud Hole Threads
NDE-5.13	(R4)	Ultrasonic Examination of Nozzle Inner Radius Areas
NDE-5.14	(R2)	Ultrasonic Examination of Reactor Vessel Welds
NDE-5.15	(R3)	Ultrasonic Examination of Reactor Coolant Pump Flywheels
NDE-5.16	(R4)	Ultrasonic Technique for Evaluation of Cracking in Steam Generator Feedwater Piping
NDE-5.18	(R3)	Ultrasonic Thickness Measurement
NDE-5.21	(R0)	Inplace Surface Examination Technique of Reactor Coolant Pump Flywheels Using Ultrasonics

These revisions addressed items of concern identified in Report 92-02 which included wearing of photosensitive eye glasses while performing fluorescent NDE examinations; performing fluorescent penetrant examinations following color contrast penetrant examinations; etc.

Within the areas inspected violations or deviations were not identified.

4. Observation of Work and Work activities, Unit 1 (IP-73753)

The inspector observed work activities, reviewed certification records of NDE equipment and materials; reviewed qualifications for personnel utilized for ISI examinations observed. The observations and reviews conducted by the inspector are documented below.

a. Volumetric & Surface Examinations

Category/Item	Weld	Exam	Procedure	Description
C-F-2/C.5.52	MS-28-FW1-LS-B	UT, MT	NDE-5.2,-2.2	Pipe Long Seam
C-F-2/C.5.52	MS-28-FW5-SW-1LSA	UT, MT	NDE-5.2,-2.2	Pipe Long Seam

Category/Item	Weld	Exam	Procedure	Description
C-F-2/C.5.51	MS-28-FW5A-LR	UT, MT	NDE-5.2,-2.2	Elbow Long Seam
C-F-2/C.5.51	MS-28-FN5A-SR	UT, MT	NDE-5.2,-2.2	Elbow Long Seam
C-F-2/C.5.51	MS-28-FN5-SW1	UT, MT	NDE-5.2,-2.2	Elbow to Pipe
B-A	Reactor Vessel, Closure Head-To-Flange Weld	UT, MT	NDE-5.14,-2.2	Stud hole #18 to 37

The inspector observed certain elements of these examinations i.e. calibration, verification of calibration, documentation and portions of the actual ultrasonic and magnetic particle examinations (UT/MT). The UT examination on the main steam line welds was limited to one weld due to operational difficulties experienced with the UT instrument. Examinations were rescheduled for a later time during this outage. Examinations of the closure head seam progressed without difficulty. The start of this examination experienced repeated delays resulting from inadequate weld preparation/cleaning. These examinations identified one recordable indication in the closure head-to-flange weld, which was evaluated at about 50% of the reference distance amplitude correction (DAC) curve. The location and appearance of the indication suggested that it was a weld fabrication, non-metallic inclusion, possibly slag.

By these observations, the inspector ascertained that the examinations were performed by personnel who were adequately trained to perform their assigned tasks. Indications were thoroughly investigated and adequately documented in accordance with procedural and code requirements.

Within the areas inspected violations or deviations were not identified.

5. Review and Evaluation of Data (IP-73755)

a. Personnel Qualifications

The inspector reviewed personnel qualification documentation as indicated below for examiners who performed the subject examinations. These documents were reviewed in the following areas: employers's name; person certified; activity qualified to perform; current period of certification; signature of employer's designated representative; basis used for certification; and, annual visual acuity, color vision examination, and periodic recertification.

Examiner Records Examined

Method	Level	Employer	Number
UT	II	Ebasco	2
	I	Ebasco	1
	II	Ebasco	1
	III	Ebasco	1
MT	II	Ebasco	1
	I	Ebasco	1

b. Equipment Certification Records:

Certification records for equipment used in the inspections detailed in the previous paragraphs, were reviewed to ensure compliance with applicable requirements.

Equipment Type	Equipment Identification
MT	
Parker Probe	S/N 1580, B-300
Mag. Foil# EL0110, Yoke	S/N 30
Power (Magnaflux 8A Rod)	Batch #91E057
MT Calibration Weight	S/N MT-B008 10 lbs.,6 oz.
UT - Scopes	
Sonic #136	S/N-502G
Staley	S/N-171A
	-876K
	-590G
UT - Transducers	
Megasonic 60° ½" x 1"	S/N-C0277
Megasonic 60° ½" Ø	-B1007
Megasonic 45° ½" x 1"	-81060
Megasonic 45° ½" Ø	-004
Aerotech 0° 1" Ø	-J01202
UT - Couplant	
Ultragel II	-091011
Calibration block	UT-3A
Thermometer	93-010

c. Results

In the areas inspected, no violations or deviations were identified. In general, a good ISI program was in place with good implementation. Examination procedures, meeting code requirements

were being used and inspections were being performed with adequate conservatism by qualified personnel, providing a reasonable assurance of continued weld integrity consistent with acceptance standards.

6. Eddy Current (ET), Examination of Steam Generator Tubes (IP73753)

a. Background

The two S/Gs at St. Lucie Unit-1 (PSL-1) are Combustion Engineering (CE), Series 67, with 8519 tubes per SG. The tubing material is mill annealed Inconel 600, with ¾ OD x 0.048" nominal wall thickness. A review of previous examination results showed the majority of intergranular stress corrosion cracking damage/degradation was located at the hot leg egg crate supports followed by the hot leg sludge pile region of the S/G. Circumferential tube damage i.e., cracklike indications, has been present at the top of the hot leg tube sheet. This degradation has been shown to be OD initiated and located within the expansion transition region of the tubes in the tube sheet.

The total number of tubes removed from service prior to this outage totaled 1013 (11.9%), in S/G"A" and 675 (7.9%) in S/G"B". Eddy Current Examination planned for the present outage was outlined in document ESI-ET-93-01. Accordingly, the population of tubes to be examined, with differential bobbin coil, included all non-plugged tubes with previously identified degradation measuring ≥20% of tube wall thickness. Also a sample of tubes with no history of degradation would be examined with bobbin coil at this time. Additionally, the licensee scheduled for examination, with the motorized rotating pancake coil (MRPC), the expansion transition region of the tubes at the top of the tube sheet. This examination will include 100% of hot leg tubes and a 3% sample of cold leg tubes. These MRPC examinations will look at the tubes from approximately 2" above to about 1" below the expansion transition region. Also, MRPC examinations were scheduled for 20% of dented hot leg tube support intersections. The sample for this examination, included dents measuring ≥ 5 volts as determined by bobbin coil and were biased towards the largest dents. At PSL-1 denting has been detected primarily at the 9th and 10th supports and to a lesser extent at the egg crates.

Applicable documents governing the subject activity were as follows:

1. St. Lucie Unit-1 Plant Technical Specifications License No. NPF-16.

2. ASME Boiler and Pressure Vessel Code Section XI 1983 Edition with Addenda through the Summer of 1983, including the

provisions of Code Case 401-1 (Digital Equipment) and N-356 (5 years certification for Level III personnel).

3. USNRC Regulatory Guide 1.83, "In-service Inspection of Pressurized Water Reactor Steam Generator Tubes", Rev. 1, July 1985.

4. JPN-QI 2.14 (latest revision), Nuclear Engineering Quality Instruction for "ASME Section XI In-service Inspection".

5. Examination Procedure NDE 1.3, (latest revision), "Eddy Current Examination of Nonferromagnetic Tubing with Multi-frequency Techniques-MIZ-18".

6. ECT Data Analysis Guidelines, April 1993 St. Lucie #1.

At the time of this inspection, standard bobbin examinations were approaching completion in both S/Gs and by the end of the inspection almost all results had been analyzed including those acquired with MRPC. Preliminary results provided by the licensee and verified by record review were as follows:

Tubes to be Plugged

S/G"A"	S/G"B"
75	50

A sample of tubes which had been examined and the results reviewed by the primary and secondary analysts and had been flagged for resolution were selected for data review. The tubes and inspection results are presented below for information.

Steam Generator "B" Cold Leg Bobbin Coil Examination

Row	Line	Volts	Phase Angle	Percent (%) Throughwall	Location
4	46	1.67	140	21	1 02H
4	46	0.51	139	22	1 04H
4	46	0.47	129	32	1 05H
3	47	0.57	90	001	1 01H
5	47	0.71	141	20	1 03H
5	47	0.48	133	28	1 03H
7	47	0.44	135	26	1 01H
7	47	0.88	138	23	1 02H
1	47	2.05	130	31	1 03H

The inspector performed a historical data review and evaluation on tube 1-47 above, to compare results from the present, 1991 and 1990 outage examinations. This effort was in response to differing evaluations reported, on percent of throughwall degradation, between the analysts and resolution. By comparison the inspector noted only minor changes had taken place in terms of voltage, phase angle and percent throughwall, over the last three outages. Therefore it would appear that tube integrity is relatively stable.

Additional work performed in this area included review of personnel certifications for 18 ET examiners and analysts, dent code calibration standards and MRPC dual guide tube standards, data acquisition and analysis equipment.

Within the areas inspected violations or deviations were not identified.

7. Pressurizer Safety Relief Valve Discharge Piping Modifications (Unit 1) (IP-37700)

a. Scope

The purpose of the subject modification was to minimize seat leakage by optimizing support type and applied forces to reduce end loads on the outlet flanges of the pressurizer safety relief valves (PSRVs) V1200, V1201 and V1202. This would be accomplished by replacing two variable support springs, RC-005-12C and RC-005-34C, with constant support springs, on the PSRV discharge piping.

b. Engineering and Safety Analysis Aspects

Ebasco, under contract from the licensee, performed the necessary engineering work and safety analysis. Results of this work effort was issued, with licensee approval, as a safety related Plant Change Modification (P/CM), number 008-193 Rev.0, 3/13/93 and Rev.1, 4/7/93.

By review of the subject documents/engineering packages (EPs), and through discussions with cognizant licensee personnel the inspector ascertained that, a pipe stress analysis has been performed and affected supports/restraints modified; NUREG 0737 submittal has been reviewed and found not to have been affected. Results of the safety evaluation showed the modification did not constitute an unreviewed safety question and as such prior NRC approval would not be required for implementation. Also changes to Plant Technical specifications would not be required.

Associated piping in this modification was designed to the original code of record, NSAS B31.1, 1967 Edition. Fabrication and installation requirements would be controlled by site procedures and the licensee's Welding Control Manual which identifies ANSI B31.1, 1983 Edition as the applicable code for non-safety related piping fabrication, installation and testing. Because there is a potential for cold spring in the PSRV

piping, the subject P/CM provides specific guidelines for removing existing cold spring.

c. Observation of Work Activities

At the time of this inspection, replacement spool fabrication was complete but welding of field joints was in progress. The inspector observed field activities around the Pzr i.e., process control, material control, cleanliness around work area, weld appearance and posting of fire watch. Records/travelers of completed welds reviewed for content, completeness and accuracy were as follows:

Weld#	Line	Size	Description
601, 603 601, 606	827	6" x 0.280"	Pipe to Elbow
602	828	6" x 0.280	Pipe to Elbow
604	828	1.25" x 0.422	Pipe to Coupling
601, 603 604, 606	829	6" x 0.280"	Pipe to Elbow
608	829	1.25" x 0.422	Pipe to Coupling

In addition to review of these fabrication records, the inspector reviewed the following material certifications and personnel qualifications.

Filler Metal:

ER-308	HT-63391	⅛" x 36"	QC-#0346
ER-308	HT-8E5483	3/32" x 36"	QC#-0448

Replacement Material:

Pipe	A-312	6" x Sch. 40s	PO #C93732-90663
Pipe	A-312	10" x Sch. 20	PO #C93732-90663
Flange	A-182	6", 300 lb.	PO #C93732-90663
Elbow, 90°	A-403	6" x Sch. 40s	PO #C93732-90663
Elbow, 45°	A-403	6" Sch 40s	PO #C937312-90663
Coupling	A-182	1¼" 3000#	PO #C93732-90663

Welding Procedure Specification:

WPS-43-Rev.3	GTA-Manual	Open butt	P8 to P8

Applicable procedure qualification records included PQR-8.8-3, -8.8-4 and N140. The procedure was qualified to weld material ranging from 1/16" to 8" thickness with SFA 5.9 stainless steel filler metal.

In addition, the inspector reviewed qualification records for the welder observed fabricating one of the field welds in the 6" discharge lines. His stencil number was identified as TFGF and his qualification record appeared to be in order.

Within the area inspected violations or deviations were not identified.

8. Followup (IP92701) Erosion Corrosion Monitoring Program

The licensee's erosion corrosion program was reviewed and the results documented in Region II Report No. 92-09. The report indicated that, at the time, the licensee's program deviated from the Electric Power Research Institute (EPRI) computer code program recommendations in three different areas which are summarized below:

a. EPRI recommends that inspection data be collected at intersections of a standard grid pattern which allows for reinspection of identical points during subsequent inspections. The inspector of record reported that the licensee's method of marking grid lines did not assure a parallel pattern and that subsequent reinspections were not likely to be at identical points. Through discussions with cognizant licensee personnel, the inspector determined the licensee issued procedure JI-CPS 2.3-6 Rev 0, 2/17/93 entitled Marking and Gridding for Erosion/Corrosion. Section 5.3 Permanent Marking, addresses the above observation in a satisfactory manner.

b. EPRI recommends that inspections cover an area from two inspection grids up stream of a component, to two diameters down stream of the component. The inspector of record, reported that the licensee did not examine two grids upstream of the component as recommended. Through discussions with cognizant licensee personnel the inspector ascertained that the licensee, based on engineering judgement, currently grids upstream piping for expanders and orifices, but does not find it necessary to grid upstream of each component tested.

c. EPRI recommends the use of T_{DAT} data to enhance correlation between field conditions and the electronic model. The inspector of record, reported that the licensee did not use T_{DAT} data. Approved procedure JI-CPS 2.3-4 Rev. 0, 2/12/93 Evaluation of Examination Data, Section 5.5 Checmate Line Specific Mode, addresses the use of T_{DAT} and provides specific guidelines for its application.

This review indicates the licensee has taken appropriate action to address the aforementioned comments on the use of EPRI's recommendations. The action taken demonstrates managements active involvement and interest in improving programs which could impact safe plant operation.

9. Exit Interview

The inspection scope and results were summarized on April 23, 1993, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail inspection results. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

10. Acronyms and Initialisms

ABB-CE	Assea Brown Boveri, Combustion Engineering
ASME	American Society of Mechanical Engineers
B&PV	Boiler and Pressure Vessel
CE	Combustion Engineering
DAC	distance amplitude correction
EP	engineering packages
EPRI	Electric Power Research Institute
ESI	Equipment Support Inspections
ET	eddy current
ISI	Inservice Inspection
MRPC	motorized rotating pancake coil
MT	magnetic particle examination
NDE	Nondestructive Examination
P/CM	Plant Change Modification
PSRV	pressurizer safety relief valves
Pzr	pressurizer
S/G	steam generator
UT	ultrasonic examination