ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-483
License No.:	NPF-30
Report No.:	50-483/99-12
Licensee:	Union Electric Company
Facility:	Callaway Plant
Location:	Junction Highway CC and Highway O Fulton, Missouri
Dates:	October 4 to 8, 1999
Inspector:	Lawrence E. Ellershaw, Senior Reactor Inspector Engineering and Maintenance Branch
Accompanying Personnel:	David Kupperman, Argonne National Laboratory
Approved By:	Dr. Dale A. Powers, Chief Engineering and Maintenance Branch Division of Reactor Safety

ATTACHMENT: Supplemental Information

EXECUTIVE SUMMARY

Callaway Plant
NRC Inspection Report No. 50-483/99-12

This inspection consisted of a review of the licensee's inservice inspection examination program plan and the implementation of the program plan for the facility. In addition, a review was conducted of the eddy current examination program for the steam generator tubes and a sample of data acquisition and analysis activities.

Maintenance

- The licensee's second 10-year interval inservice inspection program plan, which included 17 requests for relief and 7 ASME code cases, met the requirements of the 1989 Edition of the ASME Code and had been appropriately implemented for the current Refueling Outage, RF10. Contractor inservice inspection personnel and steam generator tube eddy current quality data analysts were knowledgeable and properly certified. Observed examination, acquisition, and analysis activities were effectively controlled, with good overall contractor performance noted (Sections M1.1, M1.2, M4, and M5).

- The external material condition of the observed 125 Vdc batteries, auxiliary feedwater pumps, main feedwater valves, various piping runs, and component supports was good. The observed equipment was properly labeled (Section M2).

- The nondestructive examination procedures and eddy current examination technique specification sheets contained sufficient detail and inspection acceptance criteria to perform the intended examinations, and were in compliance with regulatory and ASME code requirements (Section M3).

Report Details

Summary of Plant Status

During this inspection, Refueling Outage RF10 was ongoing and the plant was in Mode 5.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Inservice Inspection (73753)

a. Inspection Scope

The inspectors performed a thorough review of the licensee's current inservice inspection program, "Callaway Plant 2nd Interval Inservice Inspection Plan," Revision 2. The plan became effective August 1, 1995, and was scheduled to be in effect through December 18, 2004, ± 12 months. The inspectors also reviewed applicable requests for relief, ASME code cases, and correspondence between the licensee and the NRC regarding the inservice inspection plan.

b. Observations and Findings

Section 1.2 of the second 10-year interval inservice inspection plan committed to the use of the 1989 Edition of the ASME Code, as referenced in paragraph 10 CFR 50.55a(b)(2). The plan currently included 17 requests for relief that had been approved or conditionally approved for use during the second 10-year interval.

Section 4.1, "Adoption of Code Cases," of the plan stated: "In all cases, the use and adoption of Code Cases will be in accordance with ASME Section XI, IWA-2440 and 10 CFR 50.55a. Code Cases that are listed... in Regulatory Guide 1.147... will be adopted for use during the second inservice inspection interval by listing them in Table 4.1." (Note: Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability - ASME Section XI Division 1," Revision 12, lists those code cases that are generally acceptable to the NRC staff for implementation in licensees' inservice inspection programs.) Table 4.1 identified seven code cases, five of which are listed in Regulatory Guide 1.147. The two code cases not listed in the regulatory guide (N-532 and N-533) had been approved by NRC letters dated March 19 and October 8, 1996, respectively.

Conclusions

The licensee's second 10-year interval inservice inspection plan, which included 17 requests for relief and 7 code cases, all appropriately approved, met the requirements of the 1989 Edition of the ASME Code. This plan had been appropriately implemented for the current Refueling Outage RF10.

M1.2 Review of Steam Generator Tube Examination Program Requirements (73753)

a. Inspection Scope

The inspectors reviewed the steam generator tube examination program requirements contained in: (1) Engineering Technical Procedure ETP-BB-01309, "Steam Generator Eddy Current Testing Acquisition and Analysis Guidelines," Revision 010; (2) Engineering Technical Procedure ETP-ZZ-01300, "Multi-Frequency Eddy Current Examination of Tubing," Revision 010, and (3) the site-specific performance demonstration requirements developed for Refueling Outage RF10.

The inspectors also performed limited observations of the acquisition, analysis, and resolution processes, including review of a sample of eddy current data.

b. Observations and Findings

The current licensee data analysis guidelines were contained in Procedure ETP-BB-01309, which provided instructions for the acquisition and analysis of eddy current data, and specifically stated that all techniques used shall be qualified in accordance with Appendix H of the Electric Power Research Institute's (EPRI) PWR Steam Generator Examination Guidelines, Revision 5. The inspectors' review determined that the procedure was very comprehensive and adhered to the EPRI Guidelines; however, the examination techniques were qualified for tubing that was 0.875" outer diameter x 0.050" thick, which is different from the 0.688" outer diameter x 0.040" thick tubing used at the Callaway Plant. Licensee calculations, however, showed that the current densities (a function of wall thickness and eddy current frequency) were equivalent, and, while this was an approximation, the inspectors considered it valid and the techniques were justified.

The inspectors reviewed analyses of rotating coil data from the tubesheet. Specifically, data from 3-coil probes having a standard pancake, +Point, and high frequency shield coils were examined. This data was collected from the top of the tubesheet to detect axial and circumferential flaws. The process for dispositioning flaw signals from the tubesheet was also reviewed and found to be in accordance with Procedure ETP-BB-01309. The inspectors determined that two flaw cases, where two resolution analysts and the independent quality data analyst arrived at a consensus regarding the flaw signals, were appropriate.

The inspectors reviewed acquisition activities with respect to compliance with program requirements for: (1) verification of use of correct probe, (2) bobbin coil noise criteria, and (3) performance of ASME Code required 4-hour calibrations. No problems were identified during this review, and good compliance to program requirements was noted in contractor performance.

c. Conclusions

Refueling Outage RF10 eddy current examination acquisition and analysis activities appeared effectively controlled, with good overall contractor performance noted.

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope (73753)

While observing performance of nondestructive examinations on main steam system (Loop 4), main feedwater system, steam generator blowdown system, and reactor coolant system (pressurizer) piping located in various areas, the inspectors noted the external material condition of the systems' piping, pumps, and valves. Walkdowns of equipment, not associated with performance of nondestructive examinations, included the 125 Vdc battery rooms (new batteries were being installed), motor and turbine driven auxiliary feedwater pumps, component supports, and main steam line isolation valves.

b. Observations and Findings

The inspectors found that the observed batteries, valves, piping, and pumps were in good external material condition, in that, no loose bolts or nuts, frayed wires, visible oil or water leaks were noted. Piping systems and components were identified by tags that appropriately corresponded to the applicable piping and instrumentation drawings.

c. Conclusions

The external material condition of the observed 125 Vdc batteries, auxiliary feedwater pumps, main feedwater valves, various piping runs, and component supports was good. The observed equipment was properly labeled.

M3 Maintenance Procedures and Documentation

a. Inspection Scope (73753)

The inspectors reviewed the nondestructive examination procedures, eddy current examination procedures, and eddy current examination technique sheet specifications (ETSS) identified in the Attachment, to determine if they had been developed in accordance with regulatory and applicable ASME code requirements.

b. Observations and Findings

The nondestructive examination procedures were written by Nuclear Energy Services, Inc., while the eddy current procedures and examination technique specification sheets were written by Framatome Technologies, Inc., for use at the Callaway Plant. The procedures and technique sheets had been reviewed and approved by the appropriate licensee personnel. Further, the procedures had undergone a performance demonstration to the satisfaction of the authorized nuclear inservice inspector from Hartford Steam Boiler Inspection & Insurance Co.

The inspectors found that the reviewed nondestructive examination procedures contained sufficient detail and inspection criteria to perform the intended examinations and were in compliance with Sections V and XI of the ASME Code and regulatory

requirements.

The inspectors determined that the eddy current procedures and specification sheets had been developed based on well established and effective eddy current techniques to detect and characterize flaws in steam generator tubing.

c. Conclusions

The nondestructive examination procedures and eddy current examination technique specification sheets were in compliance with regulatory and ASME code requirements and were sufficient to perform the intended examinations.

M4 Maintenance Staff Knowledge and Performance

a. Inspection Scope (73753)

The inspectors assessed the knowledge and performance of licensee and contractor personnel by discussion, and observation of liquid penetrant examinations, ultrasonic examinations, and eddy current data acquisition and analysis. The inspectors also assessed the effectiveness of the licensee's controls as they related to inservice inspection activities (i.e., scheduling examinations, oversight of inservice inspection contractors, and control of ultrasonic calibration equipment).

b. Observations and Findings

b.1 Inservice Inspection Personnel Knowledge and Performance

The inspectors determined, through observations and discussions, that contractor inservice inspection personnel were knowledgeable of the nondestructive examination methods, procedures, and applicable ASME code requirements. The inspectors noted that the licensee had contracted with Nuclear Energy Services, Inc. (NES) to perform the inservice inspections during the current refueling outage. NES Procedure 80A9068, "Procedure For Certifying Nondestructive Examination Personnel," Revision 14, provided the requirements for certification of nondestructive examination personnel. This procedure was reviewed and approved by the licensee's Level III examiner on March 11, 1999. The inspectors verified that the NES procedure incorporated the more stringent ultrasonic examiners' certification requirements that were introduced in Appendix VIII of the 1989 Edition of Section XI of the ASME Code.

The inspectors observed the performance of 10 ultrasonic examinations and 8 liquid penetrant examinations. The examinations are identified in the Attachment. The ultrasonic examinations were performed by four examiners while the liquid penetrant examinations were performed by two examiners. The inspectors found that the performance of liquid penetrant examinations, ultrasonic examinations, and equipment calibrations (i.e., ultrasonic examination system) was conducted in accordance with

approved procedures.

b.2 Eddy Current Examination Personnel Knowledge and Performance

The inspectors, by discussion and observation of quality data analysts' work activities, determined that the analysts were well qualified, and were performing in accordance with the licensee-approved Framatome Technology, Inc. Procedure ETP-BB-01309. The inspectors reviewed eddy current data acquisition activities with respect to compliance with program requirements for: (1) verification of use of correct probe, (2) bobbin coil noise criteria, and (3) performance of ASME Code required 4-hour calibrations. No problems were noted during this review, and there was good compliance to program requirements noted in contractor performance.

b.3 Effectiveness of Licensee Control

The inspectors determined through observation that licensee personnel were effective in the day-to-day oversight and control of contractor inservice inspection and steam generator tube eddy current examination activities. Inspection prebriefs were appropriately conducted prior to the scheduling of daily inservice inspections.

c. Conclusions

Contractor inservice inspection personnel and steam generator tube eddy current quality data analysts were knowledgeable of and adhering to applicable examination procedures and ASME code requirements.

Licensee personnel were effective in oversight and control of contractor inservice inspection and steam generator tube eddy current examination activities.

M5 Maintenance Staff Training and Qualification

a. Inspection Scope (73753)

The inspectors reviewed the licensee's contractor nondestructive examination personnel certification records for one Level I examiner, four Level II examiners, and two Level III examiners.

The inspectors reviewed the training, testing, and certification process used for eddy current examination personnel. This included the primary analysts and the eddy current Level III examiner from Framatome Technology, Inc., and the secondary analysts from ABB Combustion Engineering, Inc.

b. Observations and Findings

The inspectors noted that contractor nondestructive examination personnel certification records were current and contained sufficient documentation (i.e., examination test results for each nondestructive examination method they were certified to perform, work

experience, education, and an annual visual acuity examination) to demonstrate personnel qualifications. The inspectors determined that personnel were properly qualified and certified in accordance with the 1984 supplement to SNT-TC-1A, "Requirements for the Qualification of Nondestructive Examination Personnel," as referenced in the ASME code.

The inspectors determined that the site-specific eddy current training was provided by Corestar, Inc. This training was considered an improvement over what was observed by NRC during the last refueling outage at Callaway Plant, where just written material and raw data were made available for the analysts to review. The current training included examples of flaws from Callaway insitu tubes that were caused by natural degradation mechanisms.

Personnel performing the data analysis were required to successfully complete a site-specific performance demonstration involving bobbin coil and motorized rotating pancake coil data prior to performing any data analysis. The inspectors reviewed the written examination and determined that it was adequate, in that it covered design, history, data acquisition, and analysis. The practical examination, which appropriately covered insitu Callaway tubes, and the motorized rotating coil pancake test were also reviewed and found to be adequate.

The eddy current personnel certifications were reviewed. For the 12 onsite resolution analysts, 3 were Level IIa quality data analysts, 7 were Level III quality data analysts, and 2 were Level IIIa quality data analysts. Therefore, a highly qualified group of resolution analysts were available. The inspectors were informed that offsite analysts were appropriately presented with the same training and examinations as the onsite analysts. The inspectors determined that training and certification was conducted in accordance with Procedure ETP-BB-01309.

c. Conclusions

The contractor nondestructive examination personnel were properly certified in accordance with ASME Code requirements, and the eddy current examination personnel were a highly qualified group of resolution analysts that had been provided with improved site specific training.

V. Management Meetings

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on October 8, 1999. The licensee representatives acknowledged the findings presented.

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

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Affolter, Plant Manager
G. Forster, Level III Examiner, Nondestructive Examination
B. Montgomery, Inservice Inspection Engineer
T. Moser, Superintendent, Systems Engineering
T. Pettus, Senior Engineer
G. Randolph, Vice President and Chief Nuclear Officer
M. Reidmeyer, Senior Engineer, Quality Assurance Regulatory Support
J. Schnack, Supervising Engineer, Quality Assurance Regulatory Support
T. Sharkey, Supervisor, Engineering
M. Taylor, Manager, Nuclear Engineering
E. Thornton, Quality Assurance Engineering Evaluator

NRC

J. Hanna, Resident Inspector
D. Powers, Chief, Engineering and Maintenance Branch

INSPECTION PROCEDURES USED

73753	Inservice Inspection

ITEMS OPENED, CLOSED AND DISCUSSED

Open

None

Closed

None

DOCUMENTS REVIEWED

Inservice Inspection Program Documents

Inservice Inspection Program, "Callaway Plant 2nd Interval Inservice Inspection Plan," Revision 2.

Procedures

Procedure 83A6106, "Liquid Penetrant Examination Procedure," Revision 0

Procedure 73TI-9ZZ09, "Ultrasonic Examination Procedure For Ferritic Piping Welds and Vessels ≤ 2 Inches Thickness," Revision 5

Procedure 80A9068, "Procedure For Certifying Nondestructive Examination Personnel," Revision 14

Procedure ETP-BB-01309, "Steam Generator Eddy Current Testing Acquisition and Analysis Document," Revision 010

Procedure ETP-22-01300, "Multi-Frequency Eddy Current Examination of Tubing," Revision 010

Observed Examinations

Type of Examination	Weld Number	System
Ultrasonic	2-AB-01-F077	Main Steam
Ultrasonic	2-AE-04-F021	Feedwater
Ultrasonic	2-AE-04-F022	Feedwater
Ultrasonic	2-AE-04-F023	Feedwater
Ultrasonic	2-AE-04-FW2	Feedwater
Ultrasonic	2-AE-04-S014-A	Feedwater
Ultrasonic	2-BM-02-F004	Steam Generator Blowdown
Ultrasonic	2-BM-02-F019AR1	Steam Generator Blowdown
Ultrasonic	2-BM-02-F020	Steam Generator Blowdown
Ultrasonic	2-BM-02-F021	Steam Generator Blowdown
Liquid Penetrant	2-BB-02-F001	Pressurizer Relief Line
Liquid Penetrant	2-BB-02-F005	Pressurizer Relief Line
Liquid Penetrant	2-BB-02-F006	Pressurizer Relief Line
Liquid Penetrant	2-BB-02-S001-J	Pressurizer Relief Line
Liquid Penetrant	2-BB-02-S006-E	Pressurizer Relief Line
Liquid Penetrant	2-BB-02-S007-J	Pressurizer Relief Line
Liquid Penetrant	2-TBB03-3-C-W	Safety Nozzle to Safe-End Weld
Liquid Penetrant	2-TBB03-4-W	Relief Nozzle to Safe-End Weld

Examination Technique Specification Sheets (ETSS)

ETSS-1, "Bobbin"

ETSS-2, "Plus Point"

ETSS-3, "Plus Point"

ETSS-4, "Plus Point"

ETSS-5, "Delta 3-Coil"

ETSS-6, "Plus Point/Standard Pancake"

ETSS 96701, "Primary Side Stress Corrosion Cracking"

ETSS 96702, "Primary Side Stress Corrosion Cracking"

ETSS 96703, "Primary Side Stress Corrosion Cracking"

ETSS 96704, "Primary Side Stress Corrosion Cracking"

ETSS 98-400, "Ultrasonic Techniques"

ETSS 98-401, "Ultrasonic Techniques"

ETSS 98-402, "Ultrasonic Techniques"

ETSS 98-403, "Ultrasonic Techniques"

ETSS 98-404, "Ultrasonic Techniques"