FORM NIS-1 OWNERS' DATA REPORT FOR INSERVICE INSPECTIONS

As required by the Provisions of the ASME Code Rules

1. Owner Union Electric Co., P.O. Box 149, St. Louis, MO 63166
(Name and Address of Owner)

2. Plant Callaway Plant, P.O. Box 620, Fulton, MO 65251
(Name and Address of Plant)

3. Plant Unit 1 4. Owner Certificate of Authorization (if required) N/A

5. Commercial Service Date 12/19/84 6. National Board Number for Unit N/A

7. Components Inspected

Component or Appurtenance	Manufacturer or Installer	Manufacturer or Installer Serial No.	State or Province No.	National Board No.
See the Callaway Refuel 5 Inservice Inspection Summary Report, the Owner's N-3 Report, the Installer's N-5 Report, and the N-5 Addenda 5 for the systems listed on sheet 2 of 2.				

Note: Supplemental sheets in form of lists, sketches, or drawings may be used provided (1) size is 8½ in. x 11 in., (2) information in items 1 through 6 on this data report is included on each sheet, and (3) each sheet is numbered and the number of sheets is recorded at the top of this form.

This form (900229) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

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7. Components Inspected

SYSTEM NAME	SYSTEM DESIGNATOR	N-5 SERIAL NO.
Main Steam	AB	0177-AB-F
Main Feedwater	AE	0179-AE-F
Auxiliary Feedwater	AL	0207-AL-F
Reactor Coolant	BB	0276-BB-F
Chemical and Volume Control	BG	0306-BG-F
Steam Generator Blowdown	BM	0221-BM-F
Borated Refueling Water Storage	BN	0144-BN-F
Fuel Pool Cooling and Cleanup	EC	0128-EC-F
Essential Service Water	EF	0285-EF-F
Component Cooling Water	EG	0256-EG-F
Residual Heat Removal	EJ	0229-EJ-F
High Pressure Coolant Injection	EM	0181-EM-F
Containment Spray	EN	0202-EN-F
Accumulator Safety Injection	EP	0203-EP-F
Auxiliary Feedwater Turbine	FC	0137-FC-F
Misc. Building HVAC	GF	0077-GF-F
Fuel Handling Building HVAC	GG	0078-GG-F
Control Building HVAC	GK	0080-GK-F
Auxiliary Building HVAC	GL	0103-GL-F
Containment Cooling	GN	0141-GN-F
Containment Hydrogen Control	GS	0131-GS-F
Decontamination	HD	0063-HD-F
Emergency Fuel Oil	JE	0129-JE-F
Compressed Air	KA	0151-KA-F

CALLAWAY REFUEL 5
INSERVICE INSPECTION
ABSTRACT

INTRODUCTION

Inservice Inspections (ISI) on ASME Class 1, 2, and 3 components and piping were performed prior to and during Refuel 5 at the Callaway Nuclear Plant. More specifically, this abstract covers ISI performed from November 11, 1991, to May 16, 1992. Refuel 5 is the first refueling outage in the third forty-month period of the first ten-year interval. The following topics are addressed in this abstract report:

- Organizations responsible for ISI work during Refuel 5.
- Inspection agency responsible for ISI at the Callaway Plant.
- Codes, Regulatory Guides, and NUREG's applicable to the Callaway ISI Program Plan.
- Final reports contained in the Callaway Refuel 5 Inservice Inspection Summary Report.

ORGANIZATIONS RESPONSIBLE FOR ISI

The Union Electric organizations and outside vendors involved with ISI examinations during Refuel 5 are listed below.

- NUCLEAR ENERGY SERVICES (NES): NES was responsible for development of the balance of plant (BOP) Callaway ISI Program Plan. In addition, NES was responsible for procedure development, procedure qualification, and performance of manual non-destructive examinations (NDE) and the Reactor Vessel 40-month visual examination.

- CONAM NUCLEAR: Conam Nuclear was responsible for procedure development, procedure qualification, and performance of eddy current examinations on Steam Generators C and D.

- UNION ELECTRIC QUALITY CONTROL (UEQC): UEQC was responsible for identification of components to be visually examined during Refuel 5, procedure development, procedure qualification, and performance of visual examinations (e.g., VT-1, VT-2, VT-3, and VT-4) identified in the Callaway ISI Program Plan. UEQC was also responsible for review of all visual examination data and results.

- UNION ELECTRIC SYSTEMS ENGINEERING: Union Electric Systems Engineering was responsible for identification of welds and components to be examined by NES, identification of steam generator tubes to be examined by CONAM, review of all vendor NDE procedures, field supervision of all vendor ISI activities, review of all NDE final data and results, development and supervision of the ASME Section XI Ten-Year Hydrostatic Test Program, and for development and supervision of the ASME Section XI Repair/Replacement Program.

- UNION ELECTRIC DESIGN CONTROL: Union Electric Design Control was responsible for disposition and final resolution of pipe and equipment supports not meeting the UEQC visual examination acceptance criteria.

INSPECTION AGENCY

The inspection agency responsible for ISI duties as outlined in ASME Section XI was Hartford Steam Boiler Inspection and Insurance Company (H. S. B. I. & I. Co.).

CODES, REGULATORY GUIDES, AND NUREG'S

ASME Section XI, 1980 Edition, Winter 1981 Addenda was the governing code for performance and selection of ISI examinations completed during Refuel 5. This code edition and addenda also governed the performance of augmented examinations required by the Callaway Final Safety Analysis Report. As specified in 10 CFR 50.55a, the 1974 Edition, Summer 1975 Addenda was used for component and weld selection for ASME Class 2 systems.

Specific regulations and/or NUREG's identified in the Callaway ISI Program Plan are listed below.

- NRC Standard Review Plan, Sections 3.6.1 and 6.6 (NUREG-0800-1981)
- NRC Regulatory Guide 1.14
- NRC Regulatory Guide 1.26
- NRC Regulatory Guide 1.83
- NRC Regulatory Guide 1.147

CALLAWAY REFUEL 5 ISI SUMMARY REPORT

The Callaway Refuel 5 ISI Summary Report is a compilation of a number of individual reports. These reports are listed below.

- Nondestructive Examinations Performed by SIES
- Visual Examinations Performed By Union Electric Quality Control
- Eddy Current Examination - Steam Generators B & C
- Repair, Replacement, and Modification Index (N-5 Addenda 5)

Each report or summary listed above identifies components and/or welds examined, date(s) of examination, and the results of the examination. In addition, each report presents the procedures, equipment and consumable material used, personnel certifications, and equipment calibration records, where applicable.

The "Owner's Data Report for Inservice Inspections" (Form NIS-1) presents the Section XI required information by referencing existing documents. These reference documents are the Callaway Refuel 5 ISI Summary Report, the Installers's N-5 Report, and the N-5 Addenda 5. Each of these documents are retained as a permanent record at the Callaway Nuclear Plant.

CALLAWAY REFUEL 5
INSERVICE INSPECTION
FINAL RESULTS

INTRODUCTION

This document presents an overview of general conditions observed during the performance of Inservice Inspections (ISI) at the Callaway Nuclear Plant during Refuel 5. For clarity, the ISI work has been subdivided into the following categories:

- Forty-month visual (VT-3) examination of the Reactor Vessel performed by Nuclear Energy Services and nondestructive examination (NDE) of the balance of plant systems, also performed by Nuclear Energy Services.
- Visual examinations (e.g., VT-1, VT-2, VT-3, and VT-4) on piping, components, and supports performed by Union Electric Quality Control.
- Steam generator tube eddy current examinations performed by Conam Nuclear.
- ASME Section XI repairs, replacements, and modifications performed by Union Electric.

REACTOR VESSEL VISUAL AND NDE ON BALANCE OF PLANT SYSTEMS

Nondestructive examinations (NDE) were performed on 401 Class 1 and 2 safety related welds and/or components during Refuel 5. A total of 298 ultrasonic (UT), 188 liquid penetrant (PT), and 108 magnetic particle (MT) examinations were completed. In addition, the areas of the Reactor Pressure Vessel (RPV) interior made accessible with upper internals removed were visually examined. Over 70% of all NDE (not including the ten-year ISI of the Reactor Vessel) required by the Callaway ISI Program Plan for the third forty-month period of the first ten-year interval were completed during Refuel 5. A brief description of the scope of NDE performed on each system and/or component and the results are listed below.

REACTOR PRESSURE VESSEL INTERIOR:

A small remotely operated submarine (mini-sub) outfitted with a video camera was used to visually examine the accessible areas of the Reactor Vessel interior. All areas accessible with the core barrel in place and upper internals removed were visually examined. No sign of degradation, abnormal wear, or loss of integrity was detected as a result of this visual examination.

REACTOR PRESSURE VESSEL STUDS AND NUTS:

A total of 48 Reactor Pressure Vessel (RPV) stud and nut sets were examined using ultrasonic and magnetic particle methods. These examinations complete all RPV stud and nut ISI examinations required for the first ten-year interval. In addition, Preservice Inspection (PSI) was performed on 13 spare studs and 12 spare nuts. These examinations were performed to preclude unplanned PSI, if new replacement studs or nuts are needed in the future. No rejectable indications were detected as a result of these examinations.

PRESSURIZER:

The Pressurizer lower shell longitudinal weld, C spray nozzle inner radius area, and C spray nozzle-to-head weld were examined by the ultrasonic method. The surge nozzle-to-safe end weld and C spray nozzle-to-safe end weld were examined using ultrasonic and liquid penetrant methods. In

addition, seismic support lugs A and D were examined using the liquid penetrant method. No rejectable indications were detected as a result of these examinations.

STEAM GENERATOR B:

The Steam Generator B upper shell-to-top head weld and Main Steam nozzle inner radius area were examined by the ultrasonic method. In addition, the Main Steam nozzle-to-top head weld was examined by ultrasonic and magnetic particle methods. No rejectable indications were detected as a result of these examinations.

REACTOR COOLANT PUMP FLYWHEELS:

Ultrasonic examinations were performed from the outer circumference on the flywheels of Reactor Coolant Pumps A, B, C, and D. These examinations focused on the high stress areas at the flywheel bore and keyways. No rejectable indications were detected as a result of these examinations.

REACTOR COOLANT:

The Pressurizer safety nozzle C discharge piping, Pressurizer spray line, Reactor Coolant System loop 1 radwaste drain line, and Reactor Coolant Pumps A, B, and C seal water injection piping were examined by ultrasonic and liquid penetrant methods. A total of 32 ultrasonic and 22 liquid penetrant examinations were performed on these systems. No rejectable indications were detected. ISI was not performed on the Reactor Coolant System loop welds during Refuel 5.

ACCUMULATOR SAFETY INJECTION:

Accumulator Safety Injection (ASI) loops 2, 3, and 4 were examined using ultrasonic and liquid penetrant methods. A total of 23 ultrasonic and 27 liquid penetrant examinations were performed. No rejectable indications were detected as a result of these examinations. In addition, three welds on the ASI-to-cold leg loop 4, not selected in the ISI Program Plan, were examined by ultrasonic and liquid penetrant methods. These three welds were selected for augmented ISI, due to potential thermal stratification induced stresses resulting from seat leakage at the first check valve which isolates the ASI from the loop 4 cold leg. No evidence of thermal stratification induced cracking or any other service related indication was detected as a result of this augmented ISI.

HIGH PRESSURE COOLANT INJECTION:

The High Pressure Coolant Injection (HPCI) pump suction and HPCI Boron Injection Tank (BIT) header piping were examined by ultrasonic and liquid penetrant methods. A total of 11 ultrasonic and 19 liquid penetrant examinations were performed. No rejectable indications were detected as a result of these examinations.

RESIDUAL HEAT REMOVAL:

Piping on Residual Heat Removal (RHR) train A, RHR train B, RHR to Refueling Water Storage Tank, and RHR to Safety Injection was examined by ultrasonic and liquid penetrant methods. A total of 24 ultrasonic and 49 liquid penetrant examinations were performed. No rejectable indications were detected as a result of these examinations.

The RHR B Heat Exchanger inlet and outlet nozzle-to-shell weld, bonnet flange-to-channel weld, and channel-to-head weld were examined by the ultrasonic method. Recordable indications were detected in the inlet and outlet nozzles. In-depth investigation and comparison to PSI data revealed these indications to be of a geometric origin and therefore acceptable. Recordable indications were also detected in the flange-to-channel and channel-to-head welds. Subsequent evaluation determined

these indications to be acceptable to the standards of ASME Section XI. No rejectable indications were detected in these welds and no further action is required as a result of these examinations. The RHR support skirt weld was examined by the liquid penetrant method. No rejectable indications were detected in the skirt weld.

CHEMICAL VOLUME AND CONTROL:

Chemical and Volume Control normal charging, alternate charging, and pressurizer auxiliary spray lines were examined by ultrasonic and liquid penetrant methods. A total of 12 ultrasonic and 6 liquid penetrant examinations were performed. No rejectable indications were detected as a result of these examinations.

CONTAINMENT SPRAY:

Containment Spray train A and B piping was examined by ultrasonic and liquid penetrant methods. A total of 19 ultrasonic and 19 liquid penetrant examinations were performed. No rejectable indications were detected as a result of these examinations.

STEAM GENERATOR BLOWDOWN:

Steam Generator B and C blowdown piping was examined by the ultrasonic method. A total of 11 ultrasonic examinations were performed. No rejectable indications were detected as a result of these examinations.

MAIN STEAM, MAIN FEEDWATER, AND TURBINE DRIVEN AUXILIARY FEEDWATER PUMP:

Main Steam loops 3 and 4, Main Feedwater loops 3 and 4, and the Auxiliary Feedwater turbine pump steam supply piping was examined by ultrasonic, liquid penetrant, and magnetic particle methods. A total of 48 ultrasonic, 36 liquid penetrant, and 10 magnetic particle examinations were performed on these systems. In addition, the loop 1 Main Steam isolation valve body-to-bonnet bolting was examined by the ultrasonic method. No rejectable indications were detected as a result of these examinations.

VISUAL EXAMINATIONS OF PIPING, COMPONENTS, AND SUPPORTS

SYSTEM LEAKAGE, INSERVICE, AND FUNCTIONAL PRESSURE TESTS:

ASME Class 1 system piping and components were visually examined (VT-2) for leakage while at normal operating temperature and pressure. No pressure retaining boundary leakage was identified.

Approximately 50% of the required Period 3 system inservice and/or functional pressure tests on Class 2 and 3 piping and components were complete at the conclusion of Refuel 5. No rejectable pressure boundary leakage was identified as a result of the visual examinations for leakage during these pressure tests. Minor "non-pressure boundary" leakage was documented, and subsequently either evaluated to be acceptable or corrected.

TEN-YEAR ISI HYDROSTATIC PRESSURE TESTS:

Callaway intends to invoke the new rules as approved by the NRC in Code Case N-498 (reference Regulatory Guide 1.147, Revision 9). These new rules allow a VT-2 examination for leakage during an inservice or functional test in lieu of the ten-year ISI hydrostatic test. Based on

this, no ten-year ISI hydrostatic tests were performed on Class 1 or 2 systems during Refuel 5. A total of 45 hydrostatic pressure tests were completed on ASME Class 3 piping and components by the end of Refuel 5. Period 3 (third forty-month period in the first ten-year interval) visual examinations for leakage (VT-2) during inservice or functional pressure tests will not be performed on those systems hydrostatically tested. Listed below are the Class 3 systems hydrostatically tested during Refuel 5 and the total percentage of each system tested. The paragraphs which follow detail the conditions found during visual examinations for leakage during these hydrostatic tests.

SYSTEM DESCRIPTION	SYSTEM ID	PERCENTAGE COMPLETE
Fuel Pool Cooling and Cleanup	EC	100%
Essential Service Water	EF	90%
Component Cooling Water	EG	95%
Auxiliary Feedwater Turbine	FC	100%
Misc. Building HVAC	GF	100%
Fuel Handling Building HVAC	GG	100%
Control Building HVAC	GL	100%
Auxiliary Building HVAC	GL	100%
Containment Cooling	GN	100%
Compressed Air	KA	100%
Standby Diesel Engine	KJ	30%
Floor and Equipment Drains	LF	100%

A small pin-hole leak was discovered at a 6" to 8" reducer in the Essential Service Water to the B Motor Driven Auxiliary Feederwater Pump. Root cause was determined to be raw water corrosion aggravated by weld porosity. The weld was repaired in accordance with the Callaway Repair/Replacement Program and subsequently passed a repair/replacement hydrostatic test.

A small pin-hole leak was discovered in a 3" by 4" reducing elbow in the Essential Service Water return line from the A Class IE Electrical Equipment A/C unit. Root cause was determined to be raw water corrosion. The defective area was repaired in accordance with the Callaway Repair/Replacement Program and subsequently passed a repair/replacement hydrostatic test.

Small pin hole leaks in two tubes were discovered in the A Component Cooling Water room cooler. Root cause of the failure was determined to be microbiologically induced corrosion. Both tubes were plugged in accordance with the Callaway Repair/Replacement Program.

A small tube leak was discovered in the A Centrifugal Charging Pump room cooler. Root cause of the failure was determined to be pitting under a cupric oxide film (tubes are a copper-nickel alloy). This single tube was plugged in accordance with the Callaway Repair/Replacement Program.

Leaks were discovered in several tubes of the A Containment Cooler. The entire tube bundle was replaced in accordance with the Callaway Repair/Replacement Program.

Other than the 5 cases discussed above, no other rejectable pressure boundary leakage was identified as a result of the visual examinations for leakage during these hydrostatic pressure tests. Minor "non-pressure boundary" leakage was documented, and subsequently either evaluated to be acceptable or corrected.

The leaks discovered during Refuel 5 hydrostatic testing were all a result of raw water induced corrosion. To reduce corrosion rates, Callaway has implemented an improved biocide (bromification)

water treatment program and a new biopenetrant water treatment program. In addition, a new program has been implemented to inspect and clean room cooler coils once every three years to reduce pitting caused by cupric oxide film. Lastly, Callaway has an ongoing "Raw Water Corrosion Monitoring Program" to detect corrosion and take timely corrective action prior to pressure boundary failure which could adversely effect system operation.

PIPE SUPPORTS AND COMPONENT SUPPORTS:

The selection of piping and component supports for visual examination (VT-3 and/or VT-4) is in accordance with the Statistical Sampling Plan delineated in the Callaway ISI Program Plan. Listed below is a breakdown of 91 supports scheduled for examination in the third forty-month period and completed during Refuel 5. The paragraphs which follow detail the conditions found during visual examination of these supports.

SYSTEM DESCRIPTION	SYSTEM ID	NUMBER OF EXAMS
Main Steam	AB	2
Auxiliary Feedwater	AL	2
Reactor Coolant	BB	26
Chemical and Volume Control	BG	16
Steam Generator Blowdown	BM	4
Refueling Water Storage	BN	1
Fuel Pool Cooling and Cleanup	EC	1
Essential Service Water	EF	6
Component Cooling Water	EG	8
Residual Heat Removal	EJ	2
High Pressure Coolant Injection	EM	9
Containment Spray	EN	7
Accumulator Safety Injection	EP	3
Control Building HVAC	GK	1
Containment Cooling	GN	2
Emergency Fuel Oil	JE	1
Standby Diesel Generator	KJ	4

A loose pipe clamp on a strut assembly for the CVCS normal charging line was identified during visual examination. This rejectable condition was attributed to a potential water transient that occurred on October 1, 1990. As required by the Callaway ISI Program Plan, the adjacent (upstream and downstream) supports and a random sample of 22 out of a population of 46 supports within the potential water transient boundary were visually examined. All supports examined were found to be satisfactory. The cause of the water transient was assessed and found to be due to the manner in which the lines were filled and vented. To prevent recurrence, the site operating procedure (OTN-BG-00001) for filling and venting the subject lines was revised. This failure is the result of a known cause and, therefore, is an "application induced failure" rather than a "service-induced" failure. Based on this and in accordance with the Callaway ISI Program Plan, no further action or additional examinations are required.

A bent threaded rod on a snubber assembly for the C Containment Cooler supply line was identified during visual examination. As required by the Callaway ISI Program Plan, the adjacent (upstream) support and a random sample of 25 out of a population of 81 supports within the potential water hammer boundary were visually examined. Out of these 25 additional examinations, a bent paddle on a snubber assembly for the C Containment Cooler return line was found. As a result of this second unsatisfactory condition, and in accordance with the Callaway ISI Program Plan, the

remaining supports within the water hammer boundary were visually examined. A dislodged and cracked bushing was discovered on the A Containment Cooler return line in this last examination sample.

The cause of the water hammer on the Containment Cooling System was investigated and found to be a result of pressure surges that occurred during ESFAS testing. To minimize these pressure surges, ESFAS test procedures for train A and B (ISP-SA-2413A and ISP-SA-2413B) will be revised prior to Refuel 6. In addition, a modification to mitigate or eliminate the detrimental effect of the water hammer will be implemented during Refuel 6 and prior to the next ESFAS test. These failures are the result of a known cause and, therefore, are "application induced" failures rather than "service induced" failures. The three unsatisfactory supports were repaired in accordance with the Callaway Repair/Replacement Program. Based on this and in accordance with the Callaway ISI Program Plan, these supports will be visually examined again during the next forty-month inspection period.

With the exception of the two cases discussed above, only minor indications were noted and no other rejectable conditions were identified on the pipe and component supports visually examined during Refuel 5.

EQUIPMENT SUPPORTS:

A total of 25 visual examinations (VT-3's) were performed on equipment supports during Refuel 5. Listed in the table below are the equipment supports visually examined, a brief description of the support, and the number of examinations on each support. The paragraphs which follow detail the conditions found during visual examination of these equipment supports.

EQUIPMENT	SUPPORT DESCRIPTION	NUMBER OF EXAMS
Steam Generator B	Lower support legs	2
	Upper support ring	1
RHR Heat Exchanger A	Lower support struts	4
	Upper support strut	1
	Support skirt	1
Motor Driven Auxiliary Feedwater Pump A	Support pad	1
Turbine Driven Auxiliary Feedwater Pump	Lube oil heat exchanger saddle	1
	Pump support pad	1
Reactor Coolant Pump A	Support struts	2
	Support leg	1
Reactor Vessel	Support pads	4
Pressurizer	Support lugs	4
Essential Service Water Pump A	Upper and lower seismic restraints	2

Two bolts on Pressurizer support lug number 4 and one bolt on lug number 2 were found to be loose during visual examination. The bolting was re-torqued to specification. In accordance with the

Callaway ISI Program Plan, and to ensure rework activities were sufficient to prevent recurrence, the Pressurizer support lugs will be visually examined again in the next forty-month inspection period.

Loose and broken bolts were discovered on the Reactor Vessel cold leg support number 1 and number 3. These bolts retain the keeper plates in place and their failure does not impact or compromise the function of the cold leg Reactor Vessel supports. The bolts were replaced and re-torqued, as necessary. In accordance with the Callaway ISI Program Plan, and to ensure rework activities were sufficient to prevent recurrence, the Reactor Vessel supports will be visually examined again in the next forty-month inspection period.

Excessive corrosion was noted again on the Essential Service Water (ESW) Pump A upper and lower seismic restraints located in the pump bay. This corrosion problem was first discovered during Refuel 4 and was attributed to galvanic corrosion between the stainless steel weld material and the carbon steel embed plates. To eliminate the galvanic corrosion, a modification was implemented which replaced the carbon steel embed plates and anchor bolts with stainless steel during Refuel 5. In accordance with the Callaway ISI Program Plan, these modified seismic restraints will be examined again during the next forty-month inspection period.

With the exception of the three cases discussed above, only minor indications were noted and no other rejectable conditions were identified on the equipment supports visually examined.

INTEGRAL ATTACHMENTS:

A total of 26 visual examinations (VT-3's) were performed on pressure boundary integral attachments during Refuel 5. The integral attachments for the systems and/or equipment visually examined are listed below. No rejectable conditions were identified.

EQUIPMENT/SYSTEM	DESCRIPTION	NUMBER OF EXAMS
Component Cooling Water	Pipe lugs	7
A RHR Heat Exchanger	Shell support lugs	5
A Containment Cooler	Supply and return header support lugs	8
Essential Service Water	Pipe lugs	6

VALVE BODY AND FLANGE BOLTING:

The internal surfaces of the loop 1 hot leg safety injection check valve and the Residual Heat Removal pumps to loop 4 cold leg check valve were visually examined. A total of 13 valve or flange bolting visual examinations were performed on the Accumulator Safety Injection, High Pressure Coolant Injection, Chemical and Volume Control, and Reactor Coolant System. In addition, Steam Generator D manway bolting was examined. No rejectable conditions were identified as a result of these examinations.

EDDY CURRENT TESTING OF STEAM GENERATOR TUBES

Steam generator tube eddy current testing was performed in accordance with Callaway Technical Specification 4.4.5. One hundred percent of the unplugged tubes in Steam Generators B and C were examined full length using a bobbin coil probe. In addition, the tube U-bends in row 1 and 2 of Steam Generator C and the hot leg expansion transition in approximately 600 tubes in Steam Generator B were examined using a Rotating Pancake Coil (RPC) probe. Eddy current analysis incorporated a special

"turbo" mix program, developed by Zetec, on all bobbin coil examination results to enhance the ability to detect Primary Water Stress Corrosion Cracking (PWSCC).

The primary damage mechanism identified as a result of eddy current examinations was Anti-Vibration Bar (AVB) wear. No evidence of PWSCC was detected. A total of 188 tubes with AVB indications were found, of which 113 had at least one indication of 20% or greater. Fifteen tubes in S/G B and twelve tubes in S/G C were plugged due to AVB wear. A Single Axial Indication (SAI) in one tube and an Undefined Defect Indication (UDI) in another tube were detected in Steam Generator C. Both of these tubes were plugged. The tube with the UDI was plugged as a precaution only.

REPAIRS, REPLACEMENTS, AND MODIFICATIONS

Approximately 231 ASME Section XI repairs, replacements, or modifications were completed on ASME Class 1, 2, or 3 components, parts, and appurtenances during the time period beginning with Refuel 4 breaker closure (November 19, 1990) and ending with Refuel 5 breaker closure (May 18, 1992).

Every repair or replacement completed in accordance with ASME Code requirements at Callaway has been reported on Callaway's Form NIS-2 report, to document the extent of work performed and to provide traceability of new parts and/or materials. The NIS-2 is not required by the governing code, however, this method of reporting is employed to ensure code compliance.

CONCLUSION

Approximately 595 nondestructive examinations, 295 visual examinations, and 76 pressure tests were completed on ASME Class 1, 2, and 3 components and welds during Refuel 5 (this total does not include eddy current examinations on steam generator tubes). As a result of the ASME Section XI examinations and tests performed and of the conditions observed, there is no general safety concern for the pressure retaining integrity of the safety related systems at the Callaway Nuclear Plant.