UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

February 3, 2006

Charles D. Naslund, Senior Vice
President and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT - NRC INTEGRATED REPORT 05000483/2005009

Dear Mr. Naslund:

On December 31, 2005, the NRC completed an inspection at your Callaway Plant. The enclosed report documents the inspection findings which were discussed on January 5, 2006, with you and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

This report documents one self-revealing finding that was evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has determined that a violation was associated with this issue. The NRC is treating this violation as a noncited violation consistent with Section VI.A.1 of the NRC Enforcement Policy because of the very low safety significance and because the finding was entered into your corrective action program. If you contest this noncited violation, you should provide a response within 30 days of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator Region IV; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Callaway Plant.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, and its enclosure, will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

William B. Jones, Chief
Project Branch B
Division of Reactor Projects

Docket: 50-483
License: NPF-30

Enclosure:
NRC Inspection Report
05000483/2005009
w/attachment: Supplemental Information

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SUNSI Review Completed: _wbj__ ADAMS: : Yes ☐ No Initials: __wbj__
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R:_REACTORS_CW\2005\CW2005-09RP-RAK.wpd

RIV:RI:DRP/B	SRI:DRP/B	PE:DRP/B	SPE:DRP/B	
DEDumbacher	MSPeck	CRStancilJr.	RAKopriva	
E - WBJones	***E-WBJones***	***/RA/***	***/RA/***	
1/30/06	1/30/06	1/31/06	1/27/06	

C:DRS/EB2	C:DRS/EB1	C:DRS/PSB	C:DRS/OB	C:DRP/B
LJSmith	JAClark	MPShannon	ATGody	WBJones
/RA/	***/RA/***	***/RA/***	***/RA/***	***/RA/***
2/2/06	2/3/06	1/31/06	1/31/06	2/3/06

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	50-483
License:	NPF-30
Report:	05000483/2005009
Licensee:	Union Electric Company
Facility:	Callaway Plant
Location:	Junction Highway CC and Highway O Fulton, Missouri
Dates:	October 1 through December 31, 2005
Inspectors:	R. Kopriva, Senior Project Engineer, Branch B C. Stancil, Project Engineer, Branch B M. Peck, Senior Resident Inspector D. Dumbacher, Resident Inspector B. Baca, Health Physicist, Plant Support Branch B. Tharakan, Health Physicist, Plant Support Branch C. Graves, Nuclear Safety Professional Development Program G. Guerra, Health Physicist, Plant Support Branch B. Henderson, Reactor Inspector, Engineering Branch 1 L. Ellershaw, Consultant
Approved By:	W. B. Jones, Chief, Project Branch B

SUMMARY OF FINDINGS

IR 05000483/2005009; 10/1/05 - 12/31/05; Callaway Plant; Integrated Resident and Regional Report of Steam Generator Replacement Activities; Access Control to Radiologically Significant Areas.

This report covered a 3-month inspection by region based reactor inspectors and resident inspectors. One Green, self-revealing, noncited violation was identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management's review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. NRC-Identified and Self Revealing Findings

Cornerstone: Occupational Radiation Safety

- Green. The inspectors reviewed a self-revealing, noncited violation of Technical Specification 5.7.2 because AmerenUE failed to control a high radiation area with dose rates greater than 1.0 rem per hour. Specifically, on September 26, 2005, the reactor vessel head was moved from the head stand and placed back on the reactor vessel without the proper radiological controls in place for a high radiation area with dose rates as high as 6.0 rem per hour. A loud noise created by the falling of a locking device on the reactor head alerted radiation protection personnel that the head lift had begun prematurely. AmerenUE's immediate corrective actions were to ensure that individuals were not present in the high radiation area and to place the reactor head in a safe condition on the reactor vessel. The finding was entered into AmerenUE's corrective action program as Callaway Action Request 200507546.

  The failure to control a high radiation area with dose rates greater than 1.0 rem per hour is a performance deficiency. The finding was greater than minor because it was associated with the Occupational Radiation Safety Cornerstone attribute of program and process and affected the cornerstone objective to ensure the adequate protection of a worker's health and safety from exposure to radiation. The finding involved the potential for a worker's unplanned or unintended dose resulting from actions contrary to Technical Specifications. When processed through the Occupational Radiation Safety Significance Determination Process, the finding was determined to be of very low safety significance because the finding did not involve ALARA planning or work controls, there was no overexposure or substantial potential for an overexposure, and the ability to assess dose was not compromised. In addition, this finding has crosscutting aspects associated with human performance because poor coordination and communication between the head lift crew and radiation protection personnel directly contributed to the finding (Section 2OS1).

REPORT DETAILS

Plant Status

The Callaway Plant was shut down for Refueling Outage 14 at the beginning of the inspection period. Outage work included steam generator replacement and a major turbine overhaul. AmerenUE completed the refueling outage and synchronized the generator to the grid on November 19, 2005. AmerenUE returned to full power operations on November 23, 2005. AmerenUE operated the plant at full power for the remainder of the inspection period.

1. REACTOR SAFETY
Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R08 Inservice Inspection Activities (71111.08)

Inspection Procedure 71111.08 requires a minimum sample size of four (as identified in Sections 02.01, 02.02, 02.03, and 02.04 of the procedure).

Section 02.01: Performance of Nondestructive Examination Activities Other Than Steam Generator Tube Inspections, Pressurized Water Reactor Vessel Upper Head Penetration Inspections, Boric Acid Corrosion Control

a. Inspection Scope

The inspection procedure requires the review of nondestructive examination (NDE) activities consisting of two or three different types (i.e., volumetric, surface, or visual). The inspectors witnessed the performance of 10 ultrasonic examinations (volumetric) and 3 radiographic examinations (volumetric) on seven welds. In addition, the inspectors reviewed 4 visual examination reports representing two VT-1 examinations and 2 VT-3 examinations. The table below identifies the above examinations, which were conducted using three methods and two examination types.

Component	Identity	Examination Type	Examination Method
Safety injection system pipe-to-pipe weld	2-EP-02-3066C-WDC-001, FW 1	Volumetric	Ultrasonic (UT Reports UT-05-105 and -106)
Safety injection system pipe-to-pipe weld	2-EP-02-3066B-WDC-001-FW 1	Volumetric	Ultrasonic (UT Reports UT-05-089 and -090)
Residual heat removal system pipe-to-pipe weld	2-EJ-04-3066C-WDC-002-FW 2	Volumetric	Ultrasonic (UT Reports UT-05-109 and -110

Component	Identity	Examination Type	Examination Method
Residual heat removal system pipe-to-pipe weld	2-EJ-04-3066B-WDC-002-FW 2	Volumetric	Ultrasonic (UT Reports UT-05-091 and -092)
Residual heat removal system pipe-to-pipe weld	2-EJ-04-3066A-WDC-001-FW 1	Volumetric	Ultrasonic (UT Reports UT-05-072 and -073)
Safety injection system pipe-to-pipe weld	3066C-WDC-002-FW 2	Volumetric	Radiography
Main steam line system pipe-to-pipe weld	3080D-WDC-004-FW 4	Volumetric	Radiography
Pressurizer safety relief valve	BB 8010B	Visual	Visual VT-1 (Report 05040-05-006)
Bolting on residual heat removal system valve	EJVH 8701A	Visual	Visual VT-1 (Report 05040-05-005)
Essential service water pipe support	EF04C005/1312	Visual	Visual VT-3 (Report 05042-05-004)
Component cooling water pipe support	EG06H010113	Visual	Visual VT-3 (Report 05042-05-005)

For each of the NDE activities reviewed, the inspectors verified that the examinations were performed in accordance with the specific site procedures and the applicable American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements.

During review of each examination, the inspectors verified that appropriate NDE procedures were used, that examinations and conditions were as specified in the procedure, and that test instrumentation or equipment was properly calibrated and within the allowable calibration period. The inspectors also verified the NDE certifications of the personnel who performed the above ultrasonic and radiographic examinations. Finally, the inspectors observed that indications identified during the ultrasonic and radiographic examinations were dispositioned in accordance with the ASME qualified NDE procedures used to perform the examinations.

The inspection procedure required review of one or two examinations with recordable indications that were accepted for continued service, to ensure that the disposition was made in accordance with the ASME Code. The inspectors reviewed Corrective Action

Report 200403580, which documented the identification of flaws in cold leg inlet nozzle safe end-to-elbow Weld 2-BB-01-F302. The flaws were identified and documented on April 30, 2004, during the volumetric examinations conducted during Refueling Outage 13. AmerenUE contracted to have an analytical evaluation performed by Westinghouse and Structural Integrity Associates in accordance with ASME Code Section XI, IWB-3640, which provides the specific rules for the performance of such evaluations. The results of the evaluation supported continued unit operation for 3-years leaving the flaws as-is (i.e., no repairs required at this time).

The inspection procedure further required verification of one to three welds on Class 1 or 2 pressure boundary piping to ensure that the welding process and welding examinations were performed in accordance with the ASME Code. The inspectors observed portions of welding performed on the two weld joints identified in the table below.

Component and Class	Weld Identity	Welding Process
Reactor coolant system hot leg elbow to nozzle, Class 1	Steam Generator C, 3065C-WDC-001 FW 1	Gas tungsten arc welding (machine)
Reactor coolant system cold leg elbow to nozzle, Class 1	Steam Generator C, 3065C-WDC-002 FW 2	Gas tungsten arc welding (machine)

The inspectors verified, by review, that the welding procedure specifications and the welders had been properly qualified in accordance with ASME Code, Section IX, requirements. The inspectors also verified, through observation and record review, that essential variables for the gas tungsten arc welding process and the shielded metal arc welding process had been identified, recorded in the procedure qualification record, and formed the bases for qualification of the welding procedure specifications.

The inspectors also verified that weld filler materials were properly stored and controlled (there were two welding material issue areas) and that proper administrative controls were being implemented with respect to issuance and return of weld filler materials.

The inspectors completed one sample under this section.

b. Findings

No findings of significance were identified.

Section 02.02: Reactor Vessel Upper Head Penetration Inspection Activities

The inspection procedure requires this section to be performed after completion of Temporary Instruction TI 2515/150. The TI had not been completed at the time of this inspection, thus this section was not performed.

Section 02.03: Boric Acid Corrosion Control Inspection Activities (Pressurized Water Reactors)

a. Inspection Scope

The inspectors evaluated the implementation of AmerenUE's boric acid corrosion control program for monitoring degradation of those systems that could be deleteriously affected by boric acid corrosion.

The inspection procedure requires review of a sample of boric acid corrosion control walkdown visual examination activities through either direct observation or record review. The inspectors reviewed the documentation associated with AmerenUE's boric acid corrosion control walkdown as specified in Procedure EDP-ZZ-01004, "Boric Acid Corrosion Control Program," Revision 003. Visual records of the components and equipment were also reviewed by the inspectors.

Additionally, the inspectors independently performed examinations of piping containing boric acid during a walkdown of the containment building, the auxiliary building, and the safeguards pump rooms.

The inspection procedure requires verification that visual inspections emphasize locations where boric acid leaks can cause degradation of safety significant components. The inspectors verified through direct observation and program/record review that AmerenUE's boric acid corrosion control inspection efforts are directed toward locations where boric acid leaks can cause degradation of safety-related components.

The inspection procedure requires both a review of one to three engineering evaluations performed for boric acid leaks found on reactor coolant system piping and components and one to three corrective actions performed for identified boric acid leaks. The inspectors reviewed engineering evaluations associated with Corrective Action Reports 200506558, 200507149, 200507404, 200507416, and 200507245, which addressed boric acid leaks identified on residual heat removal system bolted connections, pumps, valve stems on three safety injection accumulator valves, and a safety injection accumulator check valve. The evaluations appropriately addressed the causes and corrective actions.

The inspectors completed one sample.

b. Findings

No findings of significance were identified.

Section 02.04: Steam Generator Tube Inspection Activities

a. Inspection Scope

The inspection procedure requires this section to be performed on existing steam generators. However, AmerenUE replaced the four steam generators during this outage, and the inspections required by the inspection procedure were not performed.

Section 02.05: Identification and Resolution of Problems

a. Inspection scope

The inspection procedure requires review of a sample of problems associated with inservice inspections documented by AmerenUE in the corrective action program for appropriateness of the corrective actions.

The inspectors reviewed 12 corrective action reports which dealt with inservice inspection activities and found the corrective actions were appropriate. From this review the inspectors concluded that AmerenUE had an appropriate threshold for entering issues into the corrective action program and has procedures that direct a root cause evaluation when necessary. AmerenUE also had an effective program for applying industry operating experience.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation (71111.13)

a. Inspection Scope

The inspectors reviewed two risk evaluations and overall plant configuration controls for selected activities to verify compliance with Procedures EDP-ZZ-01129, “Callaway Plant Risk Assessment, Revision 8, and APA-ZZ-00150, “Outage Preparation and Execution, Revision 17. The inspectors discussed emergent work issues with work control personnel and reviewed the potential risk impact of these activities to verify that the work was adequately planned, controlled, and executed.

- October 3, 2005, evaluated controls and plans for the movement of heavy loads and equipment within containment during defueled operations (i.e., movement of old and new steam generators, and associated piping.)

- October 6, 2005, movement and controls of mobile crane in containment. supporting systems.

The inspectors completed 2 samples.

b. Findings

No findings of significance were identified.

1R17 Evaluation of Permanent Plant Modifications for Steam Generator Replacement (71111.17)

a. Inspection Scope

The procedure requires the review of a minimum of five permanent plant modifications. The inspectors reviewed 17 Engineering Change Notices associated with permanent plant modification Package 03-1011, Replacement Steam Generator Installation, Revision 0, including safety evaluation screenings, safety evaluations, and calculations, to verify that they were performed in accordance with plant procedures. The specific modifications reviewed are listed in the Attachment. The inspectors also reviewed the procedures governing plant modifications to evaluate the effectiveness of programs for implementing modifications to risk-significant systems, structures, and components, such that these changes did not adversely affect the design and licensing basis of the facility. As part of this review, the inspectors reviewed modification packages and safety evaluations associated with the steam generator replacement.

The inspectors interviewed the cognizant design and system engineers for the identified modifications as to their understanding of the modification packages.

The inspectors evaluated the effectiveness of AmerenUE's corrective action process to identify and correct problems concerning the performance of permanent plant modifications. In this effort, the inspectors reviewed two corrective action documents and the subsequent corrective actions pertaining to licensee-identified problems and errors in the performance of permanent plant modifications.

The inspectors completed one sample.

b. Findings

No findings of significance were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

The inspectors witnessed or reviewed the results of postmaintenance testing for two maintenance activities. In each case, the test procedures were reviewed to determine if the test adequately verified proper performance of the components affected by outage maintenance activities. The Updated Final Safety Analysis Report, Technical Specifications, and design-basis documents were also reviewed as applicable to determine the adequacy of the acceptance criteria listed in the test procedures.

- Motor-driven auxiliary feedwater Pump A full flow to the steam generators test. The inspectors reviewed the pump performance to verify the minimum and

maximum flow and vibration parameters met ASME code and regulatory requirements. This test was performed using Procedure OSP-AL-V0002 (Job 05511505 on November 13, 2005).

- Motor-driven auxiliary feedwater Pump B full flow to the steam generators test. The inspectors reviewed the pump performance to verify that the minimum and maximum flow and vibration parameters met ASME code and regulatory requirements. This test was performed using Procedure OSP-AL-V0002 (Job 05511504 on November 13, 2005).

The inspectors completed two samples.

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activities (71111.20)

a. Inspection Scope

The inspectors reviewed plant conditions and observed selected refueling outage activities associated with Refueling Outage 14 to verify that AmerenUE maintained the plant in a configuration consistent with the requirements of Technical Specifications and with the assumptions of the outage risk assessment. For this inspection, the inspectors reviewed the following activities as they related to entering conditions necessary for performing the steam generator replacement. Coverage of the full scope of Inspection Procedure 71111.20 is documented in NRC Inspection Report 05000483/2005005. The inspectors observed portions of the following activities:

- Clearance activities
- Refueling
- Monitoring of heatup and startup activities

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors evaluated the adequacy of periodic testing of the following important nuclear plant equipment. This review included aspects such as preconditioning, the adequacy of acceptance criteria, test frequency, procedure adherence, record keeping, the restoration of standby equipment, the effectiveness of AmerenUE's problem identification and resolution program, and test equipment accuracy, range, and calibration. The inspectors reviewed the following tests, which were performed after completing substantial replacement of reactor coolant system pressure boundary components:

- Steam generator narrow range level trip bistable calibrations for 12 channels per Jobs 05101243 and 05101244. These were performed using Procedures ISL-AF-0LPS1, -S2, -S3, and -S4, on October 4, 2005.

- Steam generator narrow- and wide-range transmitter calibrations (19 channels reviewed). These were performed using Procedures ISL-AE-0L501, 503, 504, 551, 552, 553, 554, 517, 518, 519, 527, 528, 529, 537, 538, 539, 547, 548, and 549 on November 10-11, 2005.

- Reactor coolant system (RCS) temperature average loop calibrations as required by Technical Specification Surveillance Requirements 3.3.1-6 and 3.3.1-7. These were performed per Procedures ISL-BB-0T421 and ISL-BB-0T411 (Jobs 04100394/910 performed on October 5, 2005, and 04100393/910 performed on October 6, 2005).

- RCS flow measurement and transmitter calibrations required by Technical Specification Surveillance Requirement 3.4.1.4. These were performed using Procedure ESB-BB-03015 on November 28, 2005.

The inspectors completed four samples.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety [OS]

2OS1 Access Control to Radiologically Significant Areas (71121.01)

a. Inspection Scope

This area was inspected to assess AmerenUE's performance in implementing physical and administrative controls for airborne radioactivity areas, radiation areas, high radiation areas, and worker adherence to these controls. The inspector used the requirements in 10 CFR Part 20, the Technical Specifications, and AmerenUE's procedures required by Technical Specifications as criteria for determining compliance. During the inspection, the inspector interviewed the radiation protection manager, radiation protection supervisors, and radiation workers. The inspector performed independent radiation dose rate measurements and reviewed the following items:

- Performance indicator events and associated documentation packages reported by AmerenUE in the Occupational Radiation Safety Cornerstone

- Controls (surveys, posting, and barricades) of radiation, high radiation, or airborne radioactivity areas

- Radiation work permit, procedure, and engineering controls, and air sampler locations

- Conformity of electronic personal dosimeter alarm setpoints with survey indications and plant policy; workers' knowledge of required actions when their electronic personnel dosimeter noticeably malfunctions or alarms

- Barrier integrity and performance of engineering controls in airborne radioactivity areas

- Physical and programmatic controls for highly activated or contaminated materials (nonfuel) stored within spent fuel and other storage pools

- Self-assessments, audits, licensee event reports, and special reports related to the access control program since the last inspection

- Corrective action documents related to access controls

- Licensee actions in cases of repetitive deficiencies or significant individual deficiencies

- Radiation work permit briefings and worker instructions

- Adequacy of radiological controls such as, required surveys, radiation protection job coverage, and contamination controls during job performance

- Dosimetry placement in high radiation work areas with significant dose rate gradients

- Controls for special areas that have the potential to become very high radiation areas during certain plant operations

- Posting and locking of entrances to all accessible high dose rate - high radiation areas and very high radiation areas

- Radiation worker and radiation protection technician performance with respect to radiation protection work requirements

Either because the conditions did not exist or an event had not occurred, no opportunities were available to review the following items:

- Adequacy of AmerenUE's internal dose assessment for any actual internal exposure greater than 50 millirem CEDE

- Changes in licensee procedural controls of high dose rate-high radiation areas and very high radiation areas

Therefore, the inspector completed 21 of the required 21 samples.

b. Findings

Introduction: The inspector reviewed a Green self-revealing noncited violation of Technical Specification 5.7.2 because AmerenUE failed to control a high radiation area with dose rates greater than 1.0 rem per hour.

Description: On September 26, 2005, AmerenUE moved the reactor vessel head from the head stand back to the reactor vessel without the proper radiological controls in place for a high radiation area with dose rates greater than 1.0 rem per hour. Radiation Protection personnel were in the process of establishing new radiological postings, barricades, and flashing lights when they were alerted to a premature lift of the reactor vessel head by a loud noise that was created by the locking device falling off the reactor head. After Radiation Protection personnel observed that the head lift had begun, they immediately proceeded to ensure that no individuals were in the high radiation area where general area dose rates were as high as 6.0 rem per hour. The lift continued and the head was moved safely to the reactor vessel. Upon review of the event, it was determined that the head lift crew notified radiation protection personnel that the head lift was going to begin and radiation protection personnel acknowledged this notification. However, radiation protection personnel covering the job did not understand that the head lift was going to begin immediately. Therefore, proper controls were not in place to ensure no individuals gained unauthorized access to the high radiation area.

Analysis: The failure to control a high radiation area with dose rates greater than 1.0 rem per hour is a performance deficiency. This finding is greater than minor because it affected the Occupational Radiation Safety Cornerstone objective to ensure adequate protection of the worker health and safety from exposure to radiation and is associated with the cornerstone attribute of program and process. The finding involved the potential for a worker's unplanned or unintended dose resulting from actions contrary to Technical Specifications. When the finding was processed through the Occupational Radiation Safety Significance Determination Process, it was determined to be a finding of very low safety significance (Green) because it was not associated with ALARA planning or work controls, there was no overexposure or substantial potential for an overexposure, and the ability to assess dose was not compromised.

Enforcement: Technical Specification 5.7.2, states, in part, that individual high radiation areas with radiation levels greater than or equal to 1.0 rem per hour accessible to personnel and located within large areas such as reactor containment where no enclosure exists for purposes of locking or being continuously guarded, shall be barricaded and conspicuously posted and a flashing light shall be activated as a warning device. On September 26, 2005, radiation workers had the potential to be exposed to a radiation field greater than 1.0 rem per hour because AmerenUE failed to post, barricade, and activate a clearly visible flashing light as a warning device in the area. Because the finding was of very low safety significance and has been entered into the corrective action program as Callaway Action Request 200507546, this violation is being treated as a noncited violation consistent with Section VI.A of the NRC Enforcement Policy: NCV 50-483/2005009-01, Failure to Control a High Radiation Area with Dose Rates Greater than 1.0 Rem per Hour.

2OS2 ALARA Planning and Controls (71121.02)

a. Inspection Scope

The inspector assessed licensee performance with respect to maintaining individual and collective radiation exposures ALARA with respect to the steam generator replacement activities. The inspector used the requirements in 10 CFR Part 20 and AmerenUE's procedures required by Technical Specifications as criteria for determining compliance. The inspector interviewed licensee personnel and reviewed:

- Eight outage work activities scheduled during the inspection period and associated work activity exposure estimates which were likely to result in the highest personnel collective exposures
- Site-specific ALARA procedures
- ALARA work activity evaluations, exposure estimates, and exposure mitigation requirements
- Intended versus actual work activity doses and the reasons for any inconsistencies
- Interfacing between operations, radiation protection, maintenance, maintenance planning, scheduling, and engineering groups
- Person-hour estimates provided by maintenance planning and other groups to the radiation protection group with the actual work activity time requirements
- Dose rate reduction activities in work planning
- Assumptions and basis for the current annual collective exposure estimate, the methodology for estimating work activity exposures, the intended dose outcome, and the accuracy of dose rate and man-hour estimates
- Method for adjusting exposure estimates, or replanning work, when unexpected changes in scope or emergent work were encountered
- Use of engineering controls to achieve dose reductions and dose reduction benefits afforded by shielding
- Exposures of individuals from selected work groups
- Corrective action documents related to the ALARA program and follow-up activities such as initial problem identification, characterization, and tracking
- Effectiveness of self-assessment activities with respect to identifying and addressing repetitive deficiencies or significant individual deficiencies

The sample size for this inspection was counted in NRC Inspection Report 05000483/2005005.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA1 Performance Indicator Verification

a. Inspection Scope

The inspector sampled licensee submittals for the performance indicators listed below for the period from March 2004 through September 2005. To verify the accuracy of the performance indicator data reported during that period, performance indicator definitions and guidance contained in NEI 99-02, "Regulatory Assessment Indicator Guideline," Revision 2, were used to verify the basis in reporting for each data element.

Occupational Radiation Safety Cornerstone

Occupational Exposure Control Effectiveness Performance Indicators

Licensee records reviewed included corrective action documentation that identified occurrences in high radiation areas with dose rates greater than 1,000 millirem per hour at 30 centimeters (as defined in Technical Specifications), very high radiation areas (as defined in 10 CFR 20.1003), and unplanned personnel exposures (as defined in NEI 99-02). Additional records reviewed included ALARA records and whole body counts of selected individual exposures. The inspector interviewed licensee personnel that were accountable for collecting and evaluating the performance indicator data. In addition, the inspector toured plant areas to verify that high radiation and very high radiation areas were properly controlled.

Public Radiation Safety Cornerstone

Radiological Effluent Technical Specification/Offsite Dose Calculation Manual Radiological Effluent Occurrences

Licensee records reviewed included corrective action documentation that identified occurrences for liquid or gaseous effluent releases that exceeded performance indicator thresholds and those reported to the NRC. The inspector interviewed licensee personnel that were accountable for collecting and evaluating the performance indicator data.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

1. Welding and NDE Inspection (71111.08)

a. Inspection Scope

The inspectors reviewed inservice inspection-related condition reports issued during the past year and verified that AmerenUE identified, evaluated, corrected, and trended problems. In this effort, the inspectors evaluated the effectiveness of AmerenUE's corrective action process, including the adequacy of the technical resolutions.

The inspectors reviewed the corrective action documents issued during the current outage and reviewed in detail a sample of four condition reports on the steam generator welding and nondestructive testing activities. The inspectors verified that AmerenUE identified, evaluated, corrected, and trended in accordance with the program requirements in place at the Callaway Plant.

b. Findings

No findings of significance were identified.

2. Steam Generator Replacement Outage Inspection (50001)

a. Inspection Scope

The inspectors reviewed the daily condition report summaries and nonconformance reports issued during the replacement project for risk-significant issues to see that AmerenUE was properly implementing the corrective action program. The inspectors verified that AmerenUE identified, evaluated, corrected, and trended in accordance with the program requirements in place at the Callaway Plant.

b. Findings

No findings of significance were identified.

3. Heavy Load Drop Significant Investigation Review (50001)

a. Inspection Scope

The inspectors selected Callaway Action Request 200507699, Strand Wires dropped from Temporary Lifting Device, for a detailed review. The inspectors' assessment of this event is documented in Section 4OA5. The report was reviewed to ensure that the full extent of any issues were identified, an appropriate evaluation was performed, and appropriate corrective actions were specified, prioritized, and implemented.

b. Observations and Findings

There were no findings identified associated with the root cause analysis or corrective actions specified and implemented. The inspectors observed that immediate corrective action taken by AmerenUE was to suspend all heavy load lifts in containment until adequate review could be accomplished to identify and correct the cause of this event. Further, the inspectors observed that adequate corrective actions were implemented for subsequent heavy load lifts to preclude repetition of the event; therefore, no violation of regulatory requirements or findings were identified.

4OA5 Other Activities (IP 50001, Steam Generator Replacement Inspection)

1. Steam Generator Removal and Replacement Inspections

Part a. in Section 02.03, "Steam Generator Removal and Replacement Inspections," of IP 50001 requires review and inspection of the following four welding and NDE activities:

Section 02.03.a.1: Where applicable, special procedures for welding and NDE

Section 02.03.a.2: Training and qualifications for personnel performing welding and NDE

Section 02.03.a.3: NDE including radiography results and work packages for selected welds

Section 02.03.a.4: Completion of pre-service NDE requirements for welds and completion of baseline eddy-current examination of new steam generator tubes

a. Inspection Scope

For each of the welding and NDE activities observed and reviewed, the inspectors verified that the specific welding procedure specifications and NDE procedures met the applicable ASME Code requirements.

The inspectors verified, by review, that the welding procedure specifications and the welders had been properly qualified in accordance with ASME Code, Section IX, requirements. The inspectors also verified, through observation and record review, that essential variables for the gas tungsten arc welding process (machine and manual) and the shielded metal arc welding process had been identified, recorded in the procedure qualification record, and formed the bases for qualification of the welding procedure specifications

During review of each NDE, the inspectors verified that appropriate NDE procedures were used, examinations and conditions were as specified in the procedure, and test instrumentation or equipment was properly calibrated and within the allowable calibration period. The inspectors also verified the NDE certifications of the personnel who performed the observed NDEs.

In addition to the two observed welds identified in Section 1R08, the inspectors observed portions of welding on the following eight welds:

Feedwater system pipe-to-pipe welds, Class 2	Steam Generators A and B, 3085A/B-WDC-004-FW 4	Shielded metal arc welding
Main steam line system pipe-to-pipe welds, Class 2	Steam Generators A, B, and C, 3080A/B/C-WDC-002-FW 2	Shielded metal arc welding
Main steam line system pipe-to-pipe welds, Class 2	Steam Generators A, B, and C, 3080A/B/C- WDC-004-FW 4	Gas tungsten arc welding (root pass - manual) and shielded metal arc welding (balance)

In addition to the NDE identified in Section 1R08 above, the following NDE (including radiography and baseline preservice examinations) were observed by the inspectors:

Reactor coolant system hot leg elbow-to-nozzle weld	Steam Generator D, 3065D-WDC-001-FW 1	Radiography
Reactor coolant system cold leg elbow-to-nozzle weld	Steam Generator D, 3065D-WDC-002-FW 2	Radiography
Main steam line system pipe-to-pipe weld	3080D-WDC-002-FW 2	Radiography
Main steam line system pipe-to-pipe weld	3080D-WDC-004-FW 4	Radiography and ultrasonic
Reactor coolant system cold leg elbow-to-nozzle weld	Steam Generator A, 3065A-WDC-002-FW 2	Radiography
Reactor coolant system hot leg elbow-to-nozzle weld	Steam Generator A, 3065A-WDC-001-FW 1	Radiography
Feedwater system pipe-to-elbow weld	3085D-WDC-006-FW 6	Radiography and ultrasonic

Finally, the inspectors reviewed the baseline eddy current report "Callaway Plant Replacement Steam Generators," dated March 2005, performed by AREVA in Chalon, France, on Steam Generators A (294), B (296), C (295), and D (297). With the exception of a single tube previously plugged in Steam Generator A, the eddy current inspection scope was identical in all steam generators (i.e., full length bobbin coil examination of all 5,872 tubes, a rotating coil examination of all top-of-tubesheet/ expansion transitions (both inlet and outlet sides for a total of 11,744 tests), and a rotating coil examination of the U-bend region of all tubes of the lowest 20 rows (13240 tests).

The inspectors also reviewed Engineering Information Record 51-5062980-00, "Technical Summary of Callaway Plant Replacement Steam Generator Preservice Eddy Current Inspection," dated June 13, 2005. Included in the review was AREVA's Eddy Current Procedure 54-ISI-407-00 and the Procedure Qualification Record 54-PQ-407, dated January 3, 2005. The inspectors, for consistency, also reviewed the essential variables identified in three examination technique specification sheets summarized in Section 20, "Technique Qualification," of the procedure qualification and compared them to the Electric Power Research Institute's, Appendix H, guidelines for procedure qualification and three licensee site-specific examination technique specification sheets (Numbers 1, 2, and 3).

b. Findings

No findings of significance were identified.

2. PostInstallation Verification and Testing

Part a. in Section 02.04, "Post-Installation Verification and Testing Inspections," of Inspection Procedure 50001 requires review and inspection of the following activities:

Section 02.04.1: Containment testing, as applicable

Section 02.04.2: The licensee's postinstallation inspections and verifications program and its implementation

Section 02.04.3: The conduct of RCS leakage testing and review that test results

Section 02.04.4: The conduct of the steam generator secondary side leakage testing and review the test results

Section 02.04.5: Calibration and testing of instrumentation affected by steam generator replacement

Section 02.04.6: The procedures for equipment performance testing required to confirm the design and to establish baseline measurements and the conduct of testing

a. Inspection Scope

The inspectors performed a review of AmerenUE's postinstallation verification and testing program to verify that modifications were completed in accordance with the design; that drawings, procedures, and training have been updated as appropriate; that postinstallation walkdowns and inspections were performed to ensure equipment was restored and temporary services were removed; that equipment cleanliness has been verified; and that changes in performance of the steam generators and associated parameters, such as flow rates, pressures, and temperatures were appropriately included in design documents and plant procedures. The inspectors used Inspection Procedures 71111.19 and 71111.22 to verify proper postmaintenance and surveillance activities. The results of the inspection are documented in Sections 1R19 and 1R22.

No temporary containment opening was established for the Callaway steam generator replacement. Containment testing, as applicable, was satisfactory.

Review of the Callaway primary and secondary leakage tests were conducted in accordance with Procedure OSP-BB-00009 and satisfied ASME code and regulatory requirements.

The inspectors reviewed for completeness, accuracy, and impact on plant operations the following calibrations, tests, licensing commitments and procedure changes.

- Callaway Action Request (CAR) 200500109 which implemented and tracked licensing Request OL 1248 and subsequent licensing Amendment 168. The CAR specifically identified and tracked to completion each of Callaway's departments procedure revisions needed for the replacement steam generators. The CAR was closed on November 1, 2005. The inspectors verified actual emergency operating procedures and abnormal procedures addressing setpoints and steps for both normal and adverse containment narrow- and wide-range level.

- Volian Enterprises Procedure Program (VE PROM) management tool for emergency procedure updates based on setpoint security codes on December 16, 2005.

- CWY 73/19T RSG's - "Water Hammer Prevention Analysis" by Framatome ANP

b. Findings

No findings of significance were identified.

3. Lifting of Heavy Loads

a. Inspection Scope

Part b. in Section 02.03, "Steam Generator Removal and Replacement Inspections," of Inspection Procedure 50001 requires review and inspection of the following activities:

- Review activities associated with lifting and rigging, including preparations and procedures for rigging and heavy lifting and any required crane and rigging inspections, testing, equipment modifications, lay-down area preparations, and training.

Observation:

On September 29, 2005, the Mommoet operator satisfactorily performed functional checks of the strand jack assembly of the temporary lifting device (TLD) outside of the containment prior to its placement inside the containment. The hydraulic power units were not on the TLD platform and the hydraulic hoses were removed prior to moving the TLD into the containment.

On October 1, 2005, the TLD was assembled on the cavity deck and lifted up to the polar crane girders with the main girder, support legs, work platform, and strand jack with the associated hoses attached and the strand wires installed. The hydraulic hoses to the strand jack and electrical power were then connected to the power pack (controls). This was the first time that the TLD was fully assembled and powered up at the Callaway site as a complete unit. At this point, Mammoet and the Steam Generating Team personnel cleared the cavity deck in preparation for the functional test (TLD had not been declared operable). The Mammoet operator continued the set up of the strand jack assembly which required him to short stroke the wires through the strand jack. During this first evolution all of the strand wires slipped out of the jack and fell approximately 100 feet to the Reactor cavity deck.

AmerenUE performed an event team review and identified several contributing causes to the event. These included: the hydraulic hoses had been reversed (top to bottom); the power pack was not capable of checking for reverse connection of the hydraulic hoses; the procedures were not specific for connecting the hydraulic hoses; and the hoses were not uniquely fitted for their application. These contributing causes were communicated to other facilities utilizing this TLD.

b. Findings

No findings of significance were identified.

4. Security Considerations and Adverse Impact

a. Inspection Scope

The inspectors checked for potential adverse impacts to the Callaway Plant site caused by outage activities, equipment configurations, etc., in accordance with Inspection Procedure 50001. The inspectors made frequent observations of security practices to verify that AmerenUE provided appropriate support for affected vital and protected area barriers during outage activities.

b. Findings

No findings of significance were identified.

5. Outage Operating Conditions

The inspectors used Inspection Procedure 71111.20 to verify proper outage conditions. The results of the inspection are documented in Section 1R20.

6. Radiation Protection Controls

An inspection to review radiation protection controls was performed during the steam generator replacement outage by regional office-based specialist inspectors. The results of the inspection are documented in Sections 2OS1 and 2OS2.

7. Foreign Materials Control

The inspectors performed frequent observations of the steam generator replacement activities to verify AmerenUE was implementing proper foreign materials controls. In particular, the inspectors observed controls related to reactor coolant system and secondary side openings.

b. Findings

No findings of significance were identified.

8. Temporary Services

The inspectors reviewed the work package and drawings, then observed the installation, use, and removal of temporary services in the containment building during the outage. Instructions for the use and controls for construction power, acetylene, oxygen, and argon were reviewed, and the actual installation of each system was compared to the approved system sketches.

b. Findings

No findings of significance were identified.

9. Storage of Removed Steam Generators

The inspectors observed the transport and storage of the steam generators to the onsite storage facility. The radiological safety plans were reviewed.

b. Findings

No findings of significance were identified.

4OA6 Management Meetings

Exit Meeting Summary

On October 21, 2005, the inspector presented the access control to radiological significant areas inspection results to Mr. Charles Naslund, Senior Vice President and Chief Nuclear Officer, and other members of his staff, who acknowledged the findings.

On October 28, 2005, the inspectors presented the results of the inservice inspection to Mr. Naslund, Senior Vice President and Chief Nuclear Officer, and other members of licensee management. Licensee management acknowledged the inspection findings.

On December 14, 2005, the inspector presented the ALARA inspection results with respect to the steam generator replacement outage activities to Mr. A. Heflin, Vice President, and other members of his staff who acknowledged the findings.

On January 5, 2006, the inspector presented the inspection results to Mr. Charles Naslund, Senior Vice President and Chief Nuclear Officer, and other members of his staff, who acknowledged the findings.

AmerenUE confirmed that the inspectors retained no proprietary information.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

F. Barton, Shift Assistant Operations Manager, Operations
P. Cryderman, Major Projects Superintendent, Engineering
F. Diya, Manager, Engineering Services
J. Doughty, Boric Acid Corrosion Control Engineer
M. Evans, Manager, Business Operations
R. Farnham, Superintendent-Night Shift, Radiation Protection
H. Floyd, Superintendent, Maintenance Instrument and Control
J. Geyer, Superintendent-Day Shift, Radiation Protection
K. Gilliam, ALARA Coordinator, Radiation Protection
A. Heflin, Vice President
E. Henson, Specialist, Regulatory Affairs
T. Herrmann, Vice President, Engineering
D. Hollabaugh, Superintendent, Employee Concerns Program
B. Huhmann, Supervisor, Engineering
G. Hurla, Supervisor, Radiation Protection
L. Kunuckel, Manager, Quality Assurance
R. Lamb, Manager, Maintenance
P. LeRoy, Engineering Manager, SGT Engineering
S. Maglio, NESY Superintendent, Engineering
P. McKenna, Assistant Superintendent Operations
R. Miller, Supervisor, Performance Impact
B. Montgomery, Inservice Inspection Engineer
T. Moser, Manager, Plant Engineering
C. Naslund, Sr. Vice President and CNO
D. Neterer, Manager, Operations
E. Olson, Superintendent, Performance Impact
J. Patterson, On-Sift Manager, Outages
S. Petzel, Engineer, Regional Regulatory Affairs
S. Reed, Supervisor, Engineering
M. Reidmeyer, Supervisor, Regional Regulatory Affairs
R. Rice, Major Projects Supervisor, Engineering
S. Sandbothe, Superintendent, Programs
J. Small, Superintendent, Chemistry
T. Steele, Department Performance Coordinator, Radiation Protection/Chemistry
K. Young, Manager, Regulatory Affairs

NRC Personnel

M. Peck, Senior Resident Inspector
D. Dumbacher, Resident Inspector
W. Jones, Chief, Project Branch B, Division of Reactor Projects

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

50-483/2005009-01	NCV	Failure to Control a High Radiation Area with Dose Rates Greater than 1.0 Rem per Hour (Section 2OS1).

Audits and Self-Assessments

Quality Assurance Audit of Radiation Protection AP05-001, March 11, 2005

Quality Assurance Audit of Radiation Protection AP05-010, October 5, 2005

Simple Surveillance Report SP05-046, October 4, 2005

Simple Surveillance Report SP05-046, October 15, 2005

Radiation Work Permits

P541360	Manual Cleaning of the Reactor Vessel Head Flange and Installation of the Reactor Vessel Head after Core Offload
P726347500	Final Headset Preparations, Reactor Vessel Head Set, Insert Protective Tygon Tube, Reconnect Thermocouples, and Putting Up South Cavity Handrails
W237643	Inspect and Clean the Bottom of the Reactor Vessel in the Incore Tunnel
732000SGT11	Reactor Coolant System (RCS) Cutting and Welding for Steam Generator Replacement
732000SGT13	Pipe End Decontamination & HRA TOPO for Steam Generator Replacement
732000SGT22	Radiography for Steam Generator Replacement

Procedures

Number	Title	Revision
APA-ZZ-01000	Callaway Plant Radiation Protection Program	19
APA-ZZ-01004	Radiological Work Standards	0
HDP-ZZ-01200	Radiation Work Permits	6
HDP-ZZ-01500	Radiological Postings	18

HTP-ZZ-01203	Radiological Area Access Control	30
HTP-ZZ-06001	High Radiation Area/Very High Radiation Area Access	22
HTP-ZZ-06028	Radiological Controls for Pools that Contain or Store Spent Fuel	4
HTP-ZZ-06042	Industrial Radiography	3
RRA-ZZ-00001	NRC Performance Indicator Program	1
EDP-ZZ-01004	Boric Acid Corrosion Control	3
54-ISI-407-00	PreService Eddy Current Inspection of Callaway Steam Generator Tubing	0
AUE-UT-98-1	Manual Ultrasonic Examination of Ferritic Piping Welds	0
AUE-UT-98-2	Manual Ultrasonic Examination of Austenitic Piping Welds	0
QEP 20.05	Welding Material Control	5
APA-ZZ-00143	10CFR50.59 Reviews	0
APA -ZZ-00600	Design Change Control	24
EDP-ZZ-04005	Design Development	40

Welding Procedure Specification/Revision	Procedure Qualification Record/Revision
SM/1.1-1/2	GT-SM/1.1-Q6/1, UE-47/3
SM/1.1-2/0	GT-SM/1.1-Q6/1
SM/1.8-1/0	GT-SM/1.8-Q4/3
GT/1.1-1/2	GT-SM/1.1-Q6/1
GT/1/1-2/0	GT-SM/1.1-Q6/1
GT/1.8-1/1	GT-SM/1.8-Q4/3
GTM/1.1-1/0	GT-SM/1.1-Q6/1
GTM/1.3-1/0	55-PQ7186-01/1
GTM/8.8-1/1	55-PQ7032-02/2

Miscellaneous

Training and testing qualification/certification packages for NDE personnel

Document 51-5062980-00, Technical Summary of Callaway Plant Replacement Steam Generator Preservice Eddy Current Inspection, March 2005

Callaway Plant Inservice Inspection Program Plan, October 12, 1994

Operating Instruction 55-010053-01, Narrow Groove Gas Tungsten Arc Welding - Heavy Wall Stainless Steel Piping, July 6, 2005

ASME Code Case N-460, Alternative Examination Coverage for Class I and Class 2 Welds, Section XI, Division 1

Calculations:

Number	Title	Revision
86-5028109-03	Callaway-1 RSG Structural Design Loading Specification	3

Corrective Action Reports:

CAR 200400797	CAR 200504565	CAR 200507877
CAR 200403520	CAR 200504940	CAR 200507918
CAR 200403555	CAR 200505005	CAR 200507925
CAR 200403617	CAR 200506254	CAR 200507926
CAR 200403644	CAR 200506605	CAR 200507959
CAR 200403655	CAR 200506824	CAR 200507985
CAR 200403789	CAR 200506860	CAR 200507985
CAR 200403912	CAR 200507001	CAR 200508000
CAR 200404050	CAR 200507007	CAR 200508001
CAR 200404515	CAR 200507037	CAR 200508080
CAR 200404867	CAR 200507061	CAR 200508086
CAR 200406269	CAR 200507139	CAR 200508145
CAR 200406758	CAR 200507193	CAR 200508192
CAR 200407668	CAR 200507260	CAR 200508220
CAR 200501358	CAR 200507264	CAR 200508241
CAR 200502666	CAR 200507285	CAR 200508399
CAR 200502914	CAR 200507329	CAR 200508459
CAR 200502962	CAR 200507541	CAR 200508507
CAR 200502978	CAR 200507546	CAR 200508509
CAR 200503115	CAR 200507597	CAR 200508719
CAR 200503447	CAR 200507619	CAR 200508844
CAR 200503494	CAR 200507663	CAR 200508873
CAR 200503524	CAR 200507673	CAR 200508875
CAR 200503646	CAR 200507688	CAR 200508876
CAR 200503893	CAR 200507761	CAR 200508877
CAR 200503895	CAR 200507798	CAR 200508878
CAR 200504334	CAR 200507868	CAR 200508879
CAR 200504545	CAR 200507877	CAR 200509137

Engineering Change Requests:

Number	Date	Number	Date	Number	Date
120	04/21/05	170	07/06/05	192	08/10/05
136	05/04/05	171	07/11/05	194	08/12/05
138	06/09/05	178	07/29/05	202	08/11/05
141	05/10/05	183	08/02/05	205	08/15/05
149	05/19/05	184	08/02/05	215	08/17/05
154	07/19/05	186	08/03/06		

Safety Evaluations:

Number	Title	Revision
MP 00-1013-1	RSG Component Modification	0

Safety Screenings:

Number	Title	Revision
MP 03-1011-1	Modification for Replacement Steam Generator Installation - Primary Piping and SG Supports	0

LIST OF ACRONYMS

ALARA	as low as is reasonably achievable
ASME Code	American Society of Mechanical Engineers Boiler and Pressure Vessel Code
CAR	Callaway action request
CFR	*Code of Federal Regulations*
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
RCS	reactor coolant system
TLD	temporary lifting device