



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064**

June 8, 2001

EA-00-208

Garry L. Randolph, Senior Vice
President and Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, Missouri 65251

**SUBJECT: CALLAWAY PLANT - NRC SUPPLEMENTAL INSPECTION
REPORT NO. 50-483/01-08**

Dear Mr. Randolph:

On May 10, 2001, the NRC completed a supplemental inspection at your Callaway Plant. The enclosed report documents the inspection findings which were discussed with you and other members of your staff. Additionally, the results of this inspection were discussed at a Regulatory Performance Meeting, which was held at the Callaway Plant on June 7, 2001.

The NRC determined that Refueling Outage 10 job doses were not as low as is reasonably achievable (ALARA) and documented three White findings in Inspection Report 50-483/2000-17. This supplemental inspection was conducted to provide assurance that the root causes and contributing causes of the three White findings are understood, to independently assess the extent of the condition, and to provide assurance that the corrective actions to risk significant performance issues are sufficient to address the root causes and contributing causes, and to prevent recurrence. To accomplish these objectives, the inspectors reviewed your root cause analysis and evaluation of extent of condition and conducted an independent inspection to verify or refute your conclusions.

On the basis of the results of our inspection, we concluded that your staff performed a thorough evaluation of the causes of job doses that were not ALARA and correctly identified the extent of the condition. Additionally, we determined that appropriate corrective actions were identified by your staff to address the root causes. Some of the corrective actions were not completed before the start of Refueling Outage 11. While this could result in recurring problems, there was no evidence of this. The unimplemented corrective actions were lower priority actions, intended to address the less significant root causes. The inspectors verified that the completed corrective actions were effective in addressing the associated root causes. However, many of the corrective actions were not institutionalized (e.g., not governed by plant procedures) to prevent recurrence of the problems during outages following Refueling Outage 11. Members of your staff acknowledged this potential problem and entered it into your corrective action

program to ensure that it is reviewed and resolved. The NRC will review your actions to address this matter during a future inspection.

Based on the results of this inspection, the inspectors identified an issue of very low safety significance (Green) that was determined to involve a violation of NRC requirements. However, because of its very low safety significance and because it has been entered into your corrective action program, the NRC is treating this issue as a non-cited violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this non-cited violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Callaway Plant facility.

In accordance with 10 CFR 2.790 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 (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Arthur T. Howell III, Director
Division of Reactor Safety

Docket: 50-483
License: NPF-30

Enclosure:
NRC Inspection Report No.
50-483/00-07

cc w/enclosure:
Professional Nuclear Consulting, Inc.
19041 Raines Drive
Derwood, Maryland 20855

John O'Neill, Esq.
Shaw, Pittman, Potts & Trowbridge
2300 N. Street, N.W.
Washington, D.C. 20037

Union Electric Company

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Mark A. Reidmeyer, Regional
Regulatory Affairs Supervisor
Quality Assurance
Union Electric Company
P.O. Box 620
Fulton, Missouri 65251

Manager - Electric Department
Missouri Public Service Commission
301 W. High
P.O. Box 360
Jefferson City, Missouri 65102

Ronald A. Kucera, Director
of Intergovernmental Cooperation
P.O. Box 176
Jefferson City, Missouri 65102

Otto L. Maynard, President and
Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, Kansas 66839

Dan I. Bolef, President
Kay Drey, Representative
Board of Directors Coalition
for the Environment
6267 Delmar Boulevard
University City, Missouri 63130

Lee Fritz, Presiding Commissioner
Callaway County Courthouse
10 East Fifth Street
Fulton, Missouri 65251

Alan C. Passwater, Manager
Licensing and Fuels
AmerenUE
One Ameren Plaza
1901 Chouteau Avenue
P.O. Box 66149
St. Louis, Missouri 63166-6149

Union Electric Company

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J. V. Laux, Manager
Quality Assurance
Union Electric Company
P.O. Box 620
Fulton, Missouri 65251

Jerry Uhlmann, Director
State Emergency Management Agency
P.O. Box 116
Jefferson City, Missouri 65101

Electronic distribution from ADAMS by RIV:

Regional Administrator (**EWM**)

DRP Director (**KEB**)

DRS Director (**ATH**)

Senior Resident Inspector (**VGG**)

Branch Chief, DRP/B (**WDJ**)

Senior Project Engineer, DRP/B (**RAK1**)

Section Chief, DRP/TSS (**PHH**)

RITS Coordinator (**NBH**)

DRS PSB Branch Chief (**GMG**)

DRS Inspector (**LTR**)

Only inspection reports to the following:

Scott Morris (**SAM1**)

NRR Event Tracking System (**IPAS**)

CWY Site Secretary (**DVY**)

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket No(s).: 50-483
License No(s).: NPF-30
Licensee: Union Electric Company
Facility: Callaway Plant
Report No: 50-483/01-08
Location: Junction Highway CC and Highway O
Fulton, Missouri
Date: April 23 through May 10, 2001
Inspectors: Larry Ricketson, P.E., Senior Health Physicist
Plant Support Branch

Michael P. Shannon, Senior Health Physicist
Plant Support Branch

Paul C. Gage, Senior Operations Engineer
Operations Branch

Approved by: Gail M. Good, Chief, Plant Support Branch
Division of Reactor Safety

SUMMARY OF FINDINGS

Callaway Plant
NRC Inspection Report No. 50-483/00-16

IR 05000483-00-16; on 04/23/2001-04/27/2001; Union Electric Co; Callaway Plant.
Supplemental Inspection Report - degraded cornerstone

Cornerstone: Occupational Radiation Safety

This supplemental inspection was performed by the NRC to assess the licensee's evaluation of Refueling Outage 10 job doses that were not as low as is reasonably achievable (ALARA). Three findings were previously characterized as having low to moderate safety significance (White) in NRC Inspection Report 50-483/00-17. During this supplemental inspection performed in accordance with Inspection Procedure 95002, the inspectors determined that the licensee performed a thorough evaluation of the causes of radiation doses that were not ALARA and correctly identified the extent of the conditions that led to the doses. The doses were identified by the licensee during post-job reviews following Refueling Outage 10. The licensee's evaluation identified the primary root causes of the performance issues to be: (1) management's failure to establish expectations for keeping doses ALARA, (2) management's failure to communicate a priority for keeping doses ALARA, (3) a culture that did not support the ALARA concept, and (4) administrative controls that did not assure documented ALARA concerns would receive proper priority, appropriate consideration, and comprehensive resolution. With regard to the extent of condition, the licensee found that only the fourth root cause extended beyond the radiation protection department. The licensee specified appropriate corrective actions to address the root causes and had implemented most actions by the start of Refueling Outage 11. However, many of the corrective actions were not institutionalized to prevent recurrence of the problems during outages following Refueling Outage 11. The licensee acknowledged this potential problem and entered it into the corrective action program. The licensee was working on separate, broader corrective actions for the fourth root cause. In addition, the licensee intends to conduct effectiveness evaluations of the corrective actions to ensure their effectiveness.

Because of the licensee's acceptable performance in addressing job doses that were not ALARA, the White findings associated with this issue will only be considered in assessing plant performance for a total of four quarters, in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program." Implementation of the licensee's corrective actions will be reviewed further during a future inspection.

During the independent review, the inspectors identified that temporary shielding had been moved without a review by health physics supervision, in violation of Procedure HTP-ZZ-01101 and Technical Specification 5.4.1. Moving lead shielding without health physics supervision review has a credible impact on safety because unshielded contact dose rates were as high as 450 millirem per hour and the general area dose rate was 80 millirem per hour, and the occurrence could have involved a worker's unplanned, unintended dose or potential of such a dose which could have been significantly greater if radiation levels were higher. However, since there was no overexposure or substantial potential for an overexposure and the ability to assess dose was not compromised, the finding is considered to be of very low safety significance. Because of the very low safety significance of the item and because the licensee

has included this item in its corrective action program (as CARS 200102390), this procedure violation is being treated as a non-cited violation consistent with Section VI.A.1 of the NRC Enforcement Policy.

Report Details

01 Inspection Scope

This supplemental inspection was performed by the NRC to assess the licensee's evaluation associated with Refueling Outage 10 job doses that were not ALARA. Three performance issues were previously characterized as "White" in NRC Inspection Report 50-483/2000-17 and are related to the occupational radiation safety cornerstone in the radiation safety strategic performance area.

02 Evaluation of Inspection Requirements

02.01 Problem Identification

- a. Determine that the evaluation identifies who (i.e., licensee, self revealing, or NRC), and under what conditions the issue was identified.

The evaluation identified that the licensee found, during post-job reviews conducted after Refueling Outage 10, that job doses exceeded expectations significantly. The licensee initiated Callaway Action Requestion System (CARS) 200000377 to document the finding and track corrective actions.

- b. Determine that the evaluation documents how long the issue existed, and prior opportunities for identification.

The failure to maintain doses ALARA started with Refueling Outage 10 (October and November 1999). Licensee personnel acknowledged that the Refueling Outage 10 dose (305 person-rem) and the 1997-1999 3-year rolling average, collective dose (178 person-rem) were outliers when compared with other pressurized water reactors. However, the licensee determined that one of the root causes, a culture that did not support the ALARA concept, may have existed since 1980.

- c. Determine that the evaluation documents the plant specific risk consequences (as applicable) and compliance concerns associated with the issue(s) both individually and collectively.

A plant specific probabilistic risk assessment is not applicable to ALARA findings. A linear relationship, without threshold, exists between dose and the probability of stochastic health effects (radiological risk), regardless of plant specific details.

The licensee did not believe that compliance concerns were an issue (See Callaway Letter ULNRC-4368, "Reply to Notice of Violation," dated February 15, 2001.) and did not specifically address this aspect. The inspectors determined that the licensee's position did not affect the quality of its evaluation.

02.02 Root Cause and Extent of Condition Evaluation

- a. Determine that the problem was evaluated using a systematic method(s) to identify root cause(s) and contributing cause(s).

The inspectors concluded that the root cause analysis was performed in a systematic manner which correctly and completely determined the root causes and contributing factors. The evaluation team performed the root cause analysis using an industry accepted methodology which employed the following techniques: records review, personnel interviews, events and causal factor charting, barrier analysis, and change analysis. The licensee employed a four person root cause evaluation team led by a trained member of the licensee's staff.

- b. Determine that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

The inspectors concluded that the licensee's analysis was performed to a level of detail commensurate with the significance of the ALARA performance problems. The licensee's root cause evaluation identified 12 root causes. The primary root causes were: (1) management's failure to establish expectations for keeping doses ALARA, (2) management's failure to communicate a priority for keeping doses ALARA, (3) a culture that did not support the ALARA concept, and (4) administrative controls that did not assure documented ALARA concerns would receive proper priority, appropriate consideration, and comprehensive resolution.

- c. Determine that the root cause evaluation included a consideration of prior occurrences of the problem and knowledge of prior operating experience.

The inspectors concluded that the root cause analysis adequately considered historical information associated with the problem of keeping radiation doses ALARA. The licensee's evaluation included a review of previous corrective action documents to determine if there had been similar problems in which doses were not ALARA. The licensee determined that similar problems may have existed since 1993; however, the majority of the corrective action documents were initiated in 1999 and 2000.

- d. Determine that the root cause evaluation included consideration of potential common cause(s) and extent of condition of the problem.

The licensee's evaluation considered the potential for common causes. The licensee determined that problems with all six jobs in which doses were not ALARA, as discussed in Inspection Report 50-483/2000-17, were traceable to common root causes (listed previously).

In bounding the extent of condition, the licensee found that only one of the root causes - administrative controls did not assure that ALARA concerns would receive proper priority, appropriate consideration, and comprehensive resolution - extended beyond the radiation protection department. Similar problems were identified in the nuclear engineering, operations, maintenance, and emergency preparedness departments. This broader problem was being addressed separately through CARS 199902042.

02.03 Corrective Actions

- a. Determine that appropriate corrective action(s) are specified for each root/contributing cause or that there is an evaluation that no actions are necessary.

The inspectors concluded that the corrective actions appropriately addressed the corresponding root causes. The inspectors found that licensee representatives had identified specific corrective actions to address each of the documented 12 root causes. The inspectors discussed the proposed corrective actions with licensee representatives and verified that each of the recommended corrective actions identified through the root cause analysis were tracked in the facility's corrective action program in accordance with administrative procedure APA-ZZ-00500, "Corrective Action Program."

- b. Determine that the corrective actions have been prioritized with consideration of the risk significance and regulatory compliance.

The inspectors concluded that the corrective actions were properly prioritized. The licensee prioritized its corrective actions so that the primary root causes were addressed first. A completion date and responsible person were assigned for each corrective action.

- c. Determine that a schedule has been established for implementing and completing the corrective actions.

The licensee established due dates for its corrective actions and most of the corrective actions were completed prior to start of the outage. The inspectors found that the incomplete corrective actions were either relatively low priority items or effectiveness reviews intended to be completed after the refueling outage.

The inspectors noted that many of the corrective actions were informally implemented and not institutionalized in any manner. That is, nothing within the plant administrative controls ensured the future implementation of many of the actions beyond Refueling Outage 11. This meant that there was no assurance that corrective actions would be effective to prevent recurrence of the problems. Examples of corrective actions implemented informally included:

- Scaffolding task team action plan items
- Scheduling of work when steam generator secondary sides are filled
- Use of a 24-hour work delay inside the bioshield after RCS cleanup
- Exclusion of bioshield work during mid-loop operations
- Use of mock-up training, such as for reactor coolant pump seal work
- Contractor notification of communications expectations

Licensee representatives acknowledged the inspectors' observation and initiated CARS 200102520 to document the issue and track corrective actions.

- d. Determine that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

The licensee's Refueling Outage 11 job doses were quantitative measures of success. Dose projections provided quantitative reference points that enabled the licensee to monitor the effectiveness of ALARA controls. The inspectors noted that the outage dose was reviewed and trended daily. Aside from individual job dose projections, the licensee established outage dose goals that were linked to inducements and incentives for outage workers. The licensee's corrective actions included a number of evaluations to be conducted after Refueling Outage 11 to assess the adequacy of the corrective actions qualitatively. The inspectors noted that actions requiring these evaluations were tracked in the licensee's corrective action program and were scheduled to be completed in the fall of 2001.

02.04 Independent Assessment of the Extent of Condition

The inspectors interviewed outage workers and health physics personnel and observed outage work to determine if the conditions (root causes) that led to the licensee's previous ALARA performance problems were still present or were responsible for problems in other areas. During conversations at the job site, workers generally conveyed an appreciation for the ALARA concept and were knowledgeable of management expectations that doses be kept ALARA. Health physics personnel were knowledgeable of scheduled work activities that would require their support and they provided acceptable job coverage of work in high dose areas. From review of work activities, such as steam generator eddy current testing, the inspectors determined that tasks were scheduled and conducted optimally with regard to changing radiological conditions. The inspectors reviewed corrective action documents, but did not identify evidence that the root causes identified by the licensee were responsible for problems outside the ALARA program.

The inspectors discussed the problem and associated root causes with other resident, regional, or headquarters personnel associated with the facility to assess whether other similar problems or root causes for dissimilar problems have occurred at the facility that should have been considered. After these discussions and an independent review, the inspectors did not identify continued problems in the ALARA program or similar problems in other programs. Therefore, the inspectors concluded that the licensee's evaluation correctly identified the extent of the conditions that caused the three White findings.

During the independent review, the inspectors identified a non-cited violation with very low safety significance (Green) involving the movement of temporary shielding.

On April 24, 2001, during a tour of the reactor building, the inspectors observed unsecured temporary lead shielding on Loop C in the chemical and volume control system letdown valve cubical. Licensee representatives investigated this finding and discovered that someone had unsecured the temporary shielding and modified the original configuration without health physics supervision's knowledge or review. Moving lead shielding without health physics supervision review has a credible impact on safety

because unshielded contact dose rates were as high as 450 millirem per hour and the general area dose rate was 80 millirem per hour, and the occurrence could have involved a worker's unplanned, unintended dose or potential of such a dose which could have been significantly greater if radiation levels were higher. However, since there was no overexposure or substantial potential for an overexposure and the ability to assess dose was not compromised, the finding is considered to be of very low safety significance (Green).

Technical Specification 5.4.1.a requires procedures listed in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, be established, implemented, and maintained. Regulatory Guide 1.33, Appendix A, Item 7.e (9), lists procedures for the implementation of the ALARA program. Procedure HTP-ZZ-01101, "Administrative Controls for Radiation Shielding," Revision 9, Section 12.1, states that temporary shielding may be modified after installation, but the modification requires a review by health physics supervision. However, because of the very low safety significance of the item and because the licensee has included this item in its corrective action program (as CARS 200102390), this procedure violation is being treated as a non-cited violation (NCV 483/01008-01).

4OA6 Management Meetings

Exit Meeting Summary

The inspectors presented the inspection results by telephone to Mr. G. Randolph, Senior Vice President and Chief Nuclear Officer, and other members of licensee management at the conclusion of the inspection on May 10, 2001. The licensee acknowledged the findings presented.

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

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Affolter, Vice President, Nuclear
F. Forck, Root Cause Analyst
K. Gilliam, Supervisor, Radiation Protection/Chemistry
J. Hiller, Engineer, Quality Assurance Regulatory Support
R. Lamb, Superintendent, Work Control
G. Randolph, Senior Vice President and Chief Nuclear Officer
M. Reidmeyer, Supervisor, Regional Regulatory Affairs
R. Roselius, Superintendent, Health Physics
W. Witt, Plant Manager

NRC

V. Gaddy, Senior Resident Inspector
G. Good, Chief, Plant Support Branch
J. Hanna, Resident Inspector
C. Hinson, Reactor Health Physicist, Office of Nuclear Reactor Regulation

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed During this Inspection

50-483/01008-01	NCV	Failure to follow procedural guidance when moving temporary shielding (Section 02.04)
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DOCUMENTS REVIEWED

<u>Procedure</u>	<u>Title</u>	<u>Revision</u>
APA-ZZ-00500	Corrective Action Program	031
APA-ZZ-01000	Callaway Plant Health Physics Program	016
APA-ZZ-01001	Callaway Plant ALARA Program	007
HTP-ZZ-01102	Pre-Work ALARA Planning and Briefing	017
PDP-ZZ-00003	Work Document Processing	030

Root Cause analysis Report

OQC 00-0100	Refuel 10 Dose Not ALARA (SOS 00-0377)
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Callaway Action Requests

<u>Number</u>	<u>Topic</u>
199902042	Adverse trend of recurring problems

199902581	Followup actions to review outage radiation dose trend
199902653	Scaffolding RWP exceeding projected person-rem exposure
199903052	Dose and time spent building scaffold that was not used
199903069	Increased radiation level effects on dose goal (total & individuals)
199903084	Extend responsibility for dose ALARA
199903150	Alternative method for cavity work to minimize dose
199903382	Emphasis to minimize worker time in containment
200000377	Refuel 10 radiation exposure significantly exceeded predictions
200001228	Job planning knowingly allowed unnecessary exposure to radiation
200001574	Methodology for executing ALARA not effectively implemented
200001575	Methodology for executing ALARA not effectively implemented
200001576	Methodology for executing ALARA not effectively implemented
200001577	Craft personnel do not own ALARA - lack management support
200001579	RWP instructions contrary to management expectations
200001580	Dose budgeting and tracking needs improvement
200001583	Pre-job briefs do not adequately address ALARA
200001584	Supervision surveillance of craft in the field for ALARA not high priority
200001717	9 rem of exposure expended RF10 for scaffold that was not required

Miscellaneous

HTP-ZZ01102 ALARA Review Triggers by RWP