August 8, 2000

Mr. Garry L. Randolph
Vice President and Chief Nuclear Officer
Union Electric Company
Post Office Box 620
Fulton, MO 65251

SUBJECT: APPROVAL FOR RELIEF FROM INSERVICE INSPECTION REQUIREMENTS IN 1989 EDITION OF ASME CODE SECTION XI, TABLE IWB-2500-1, FOR CALLAWAY PLANT, UNIT 1 (TAC NO. MA8887)

Dear Mr. Randolph:

By letter dated May 5, 2000 (ULNRC-04242), you requested relief from the examination category requirements in Table IWB-2500-1, of Section XI, of the 1989 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (i.e., the ASME Code). You stated in the two attachments to the letter that item B5.40 (Figure IWB-2500-8) of Examination Category B-F and item B2.40 (Figure IWB-2500-6) of Examination Category B-B require 100% volumetric examination of the weld and base metal, and it is impractical to achieve this requirement at Callaway for welds 2-TBB03-3-C-W and 2-TBB03-4-W (pressurizer nozzle to safe-end weld), and 2-EBB01B-SEAM-1-W and 2-EBB01C-SEAM-1-W (steam generator bottom head to tube sheet vessel weld). You requested relief from the ASME Code 100% examination requirements in accordance with 10 CFR 50.55a(g)(5)(iii).

For Callaway, the applicable edition of Section XI of the ASME Code for the current second 10-year inservice inspection (ISI) interval is the 1989 Edition. The two relief requests ISI-19 and ISI-20 specify weld examination limitations that were encountered during the recent Callaway Refueling Outage 10, which was conducted in the Fall of 1999. The two requests are for the current second 10-year ISI interval and revise the two earlier relief requests that were approved by the NRC staff in its letters of December 14, 1988, and October 3, 1991.

The staff evaluation of your two relief requests is in the enclosed safety evaluation. Based on the evaluation, the staff concludes that the 100% volumetric examination requirement for the above four welds is impractical for Callaway. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i), as requested in relief requests ISI-19 and ISI-20, in that the Table IWB-2500-1 requirement for 100% volumetric examination of the above four welds in Section XI of the 1989 Edition of the ASME Code is impractical. In granting this relief, the Commission has determined that the relief is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

For relief request ISI-19, where the earlier relief request was approved in the staff's letter of December 14, 1988, for a composite weld examination coverage of about 88% and you now state that the composite coverage is actually only about 54%, the authorization of ISI-19 also applies to the first 10-year interval.

If you have any questions, please contact Jack Donohew at 301-415-1307 or, through the Internet, at jnd@nrc.gov.

Sincerely,

/RA/

Stephen Dembek, Chief, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure: Safety Evaluation

cc w/encl: See next page

If you have any questions, please contact Jack Donohew at 301-415-1307 or, through the internet, at jnd@nrc.gov.

Sincerely,

/RA/

Stephen Dembek, Chief, Section 2
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Division of Licensing Project Management
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Enclosure: Safety Evaluiation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF FROM INSERVICE INSPECTION WELD EXAMINATION REQUIREMENTS

IN ASME CODE, SECTION XI, TABLE IWB-2500-1

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

Inservice inspection (ISI) of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a(g)(6)(i) states that the Commission may grant relief from code requirements where they are impractical and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. For Callaway Plant, Unit 1 (Callaway), the applicable edition of Section XI of the ASME Code for the second 10-year ISI interval is the 1989 Edition.

By letter dated May 5, 2000, Union Electric Company (the licensee), submitted two requests for relief from the requirements of Section XI of the 1989 Edition of the ASME Code, for the second 10-year interval ISI at Callaway. The relief requests are numbered ISI-19 and ISI-20.

The licensee requested relief from the examination category requirements in Table IWB-2500-1, of Section XI, of the 1989 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. The licensee stated in the two attachments to the letter that item B5.40 (Figure IWB-2500-8) of Examination Category B-F and item B2.40 (Figure IWB-2500-6) of Examination Category B-B require 100% volumetric examination of the weld and base metal, and it is impractical to achieve this requirement at Callaway for welds 2-TBB03-3-C-W and 2-TBB03-4-W (pressurizer safety nozzle to safe-end weld), and 2-EBB01B-SEAM-1-W and 2-EBB01C-SEAM-1-W (steam generator bottom head to tube sheet vessel weld). The licensee requested relief from the ASME Code 100% examination requirements in accordance with 10 CFR 50.55a(g)(5)(iii).

The two relief requests ISI-19 and ISI-20 detail weld examination limitations that were encountered during the recent Callaway Refueling Outage 10, which was conducted in the Fall of 1999. The two requests revise the two earlier relief requests that were approved by the staff in its letters of December 14, 1988, and October 3, 1991, for the previous first 10-year interval. In its application, the licensee has stated that the Section XI volumetric examination to the extent practical resulted in the composite coverage of about 54% for the welds in ISI-19, which is lower than was approved by the staff in its letter dated December 14, 1989, and about 78% for the welds in ISI-20, which is higher than was approved by the staff in its letter dated October 3, 1991.

The licensee explained what were the dissimilar metals and how the weld examination was performed for the two welds in relief request ISI-19 in the conference call on July 6, 2000.

2.0 EVALUATION

Request for Relief No. ISI-19: ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-F, item number B5.40 (Figure IWB-2500-8) requires 100% volumetric examination of the inner 1/3 thickness of weld metal plus the inner 1/3 of the adjacent base metal for a distance of 1/4 inches beyond the edge of the weld crown.

The licensee identified two dissimilar metal welds that cannot be 100% volumetrically examined. The two welds are the following: (1) 2-TBB03-3-C-W, which is a pressurizer safety nozzle to safe-end weld, and (2) 2-TBB03-4-W, which is a pressurizer relief nozzle to safe-end weld. For both welds, the steel nozzle with inconel butter is butt welded to the stainless steel safe-end. The interior surface of the nozzle is clad with inconel.

The licensee stated that a composite coverage of 53.7% of the required weld volume was achieved for weld 2-TBB03-3-C-W and a composite coverage of 53.8% for weld 2-TBB03-4-W. The weld examination was performed (1) using a dual 45^{o} shear beam angle on the safe-end side and the dual 60^{o} longitudinal and 45^{o} longitudinal beam angles from the nozzle side, and (2) in the 4 directions (i.e., in the longitudinal direction, approaching from the left and right side, and in the circumferential direction, moving clockwise and counterclockwise). The scanning of the two welds was limited due to the geometry of the safe-end joint and the metallurgical obstruction due to the Inconel buttering of the weld. The licensee stated that no indications were observed in the scanning of the welds and it is impractical to achieve any additional weld

coverage. There is no alternative because, as the licensee stated, the maximum possible volume of the weld as practical was examined.

The licensee stated that weld integrity was ensured by the extent of the ultrasonic testing (UT) examination up to about 54%, the liquid penetrant surface examination, the Section XI VT-2 (visual) examination for leakage performed every refueling outage, and the reactor coolant leakage detection system. The technical specifications (TS) for Callaway require that all unidentified leakage from the reactor coolant system (including the pressurizer) must not be greater than 1 gpm or the plant must begin shutting down in 4 hours. The leakage detection system is required to be operable by TS 3.4.15.

The staff addressed a similar relief request for these welds in its letter and safety evaluation dated December 14, 1988. In the relief requests of November 7, 1986, March 3 and April 2, 1987, on these two welds, the licensee stated that the coverage of these welds would be 80%, and that this limited Section XI coverage, the 100% surface examination of the welds, and the visual examination for leakage from the welds would establish the integrity of the pressure boundary. In its letter of May 5, 2000, the licensee stated that the inspection conducted during the recent Callaway Refueling Outage 10 showed that the composite coverage of the welds was actually only about 54%. The licensee performed the examination using the prescriptive UT requirements of the ASME Code.

In its evaluation of December 14, 1989, the staff accepted the contractor's conclusion, in Technical Evaluation Report EGG-SD-7537 attached to the staff's safety evaluation, that the limited Section XI volumetric examination, along with the Code-required surface examination and pressure test ensures an acceptable level of inservice structural integrity and that compliance with the specific requirements of Section XI of the Code would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety. The accepted licensee alternative, in the safety evaluation, for not meeting the 100% volumetric examination in Section XI was the 100% surface examination and the volumetric examination to the extent practical; however, the evaluation also stated that the licensee should continue to monitor the development of new or improved examination techniques and incorporate improvements in the examination of dissimilar metal welds in its ISI program for this component. Since then, the NRC issued a rule affecting UT requirements that recognizes a performance-based UT alternative for the prescriptive UT technique used by the licensee. After November 22, 2002, the rule will require licensees to examine dissimilar metal pipe welds with qualified performance-based UT techniques.

Based on its review, the staff concludes that (1) the ASME Code requirement for 100% volumetric examination of these two welds is impractical because of obstructions that inhibit the inspection process, and (2) the alternative of the limited 54% UT volumetric examination, the 100% Code Section XI VT-2 (visual) surface examination for leakage performed every refueling outage, and the reactor coolant leakage detection system provides sufficient assurance of reactor coolant system integrity.

Therefore, in accordance with 10 CFR 50.55a(g)(6)(i), the staff concludes that requested relief in ISI-19 from the 1989 edition of the ASME Code requirement may be granted. However, the

licensee should continue to monitor the development of new or improved examination techniques and, as improvements in these areas are achieved, incorporate enhanced techniques into the ISI program plan for these welds to achieve a higher volumetric examination.

Request for Relief No. ISI-20: ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-B, item number B2.40 (Figure IWB-2500-6) requires 100% volumetric examination of the weld metal plus the adjacent base metal for a distance of 1/2-inch vessel thickness beyond the edge of the weld crown.

The licensee identified two welds that cannot be 100% volumetrically examined. The two welds are the following: (1) 2-EBB01B-SEAM-1-W, which is a steam generator bottom head-to-tube sheet vessel weld on the "B" steam generator, and (2) 2-EBB01C-SEAM-1-W, which is a steam generator bottom head-to-tube sheet vessel weld on the "C" steam generator. These are steel-to-steel welds.

The licensee stated that a composite coverage of 77.5% of the required weld volume was achieved for both welds. The scanning of the two welds was limited due to the geometry of the four permanent support lugs on each of the two steam generators. The licensee stated that no indications were observed in the scanning of the welds and it is impractical to achieve any additional weld coverage. There is no alternative because, as the licensee stated, the maximum possible volume of the weld as practical was examined.

The licensee stated that weld integrity was ensured by the extent of the UT examination up to about 78%, the Section XI VT-2 (visual) examination for leakage performed every refueling outage, and the reactor coolant leakage detection system. The TS for Callaway require that all unidentified leakage from the reactor coolant system (including the pressurizer) must not be greater than 1 gpm or the plant must begin shutting down in 4 hours. The leakage detection system is required to be operable by TS 3.4.15.

The staff addressed a similar relief request for these welds in its letter and safety evaluation dated October 3, 1991. In the relief requests of April 11, 1988, March 10, 1989, and June 28, 1991, on these two welds, the licensee stated that the coverage of these welds would be 65%, and that this limited Section XI coverage, the 100% surface examination of the welds, and the reactor coolant detection system for reactor coolant system leakage from the welds would establish the integrity of the pressure boundary. In its letter of May 5, 2000, the licensee stated that the inspection conducted during the recent Callaway Refueling Outage 10 showed that the composite coverage of the welds was actually greater, at about 78%.

In its evaluation of October 3, 1991, the staff stated that the required reactor coolant system operational leakage, hydrostatic, and other pressure tests, as applicable, provide an acceptable level of structural integrity assurance for the steam generators welds. The accepted licensee alternative, in the safety evaluation, for not meeting the 100% volumetric examination in Section XI was the 100% surface examination, the reactor coolant leakage detection system, and the volumetric examination to the extent practical.

Based on its review, the staff concludes that (1) the ASME Code requirement for 100% volumetric examination of these two welds is impractical because of obstructions that inhibit the inspection process, and (2) the alternative of the limited 78% UT volumetric examination, the 100% Code Section XI VT-2 (visual) surface examination for leakage performed every refueling outage, and the reactor coolant leakage detection system provides sufficient assurance of reactor coolant system integrity.

Therefore, in accordance with 10 CFR 50.55a(g)(6)(i), the staff concludes that the requested relief in ISI-20 from the 1989 edition of the ASME Code requirement may be granted. However, the licensee should continue to monitor the development of new or improved examination techniques and, as improvements in these areas are achieved, incorporate enhanced techniques into the ISI program plan for these welds to achieve a higher volumetric examination.

3.0 CONCLUSION

Based on the review of the licensee's submittal and as stated above, the staff concludes that (1) the ASME Code requirement for 100% volumetric examination of the four welds in relief requests ISI-19 and ISI-20 are impractical because of obstructions that inhibit the inspection process, and (2) the alternative of the limited UT volumetric examination for each relief request, the 100% Code Section XI VT-2 (visual) surface examination for leakage performed every refueling outage, and the reactor coolant leakage detection system provides sufficient assurance of reactor coolant system integrity. Therefore, in accordance with 10 CFR 50.55a(g)(6)(i), the staff concludes that requested relief in ISI-19 and ISI-20 from the 1989 edition of the ASME Code requirement may be granted.

In granting this relief, the Commission has determined that the relief is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. However, the licensee should continue to monitor the development of new or improved examination techniques and, as improvements in these areas are achieved, incorporate enhanced techniques into the ISI program plan for these welds to achieve a higher volumetric examination.

Principal Contributors: J. Donohew
D. Naujock

Date: August 8, 2000