May 19, 2005

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

SUBJECT: CALLAWAY PLANT, UNIT 1 - REQUEST FOR RELIEF FROM CERTAIN ASME CODE EXAMINATIONS FOR THE SECOND AND THIRD INSERVICE INSPECTION INTERVALS (TAC NO. MC5379)

Dear Mr. Naslund:

By letter dated November 18, 2004 (ULNRC-05092), Union Electric Company (the licensee) requested relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code) to allow Class 2 pipe welds to be examined using a qualified ultrasonic testing (UT) examination instead of the ASME Code-required radiographic testing (RT) examination for the Callaway Plant, Unit 1, (Callaway). The relief request proposes an alternative to the non-destructive examination requirements of Subarticle NC-5200 of Section III of the ASME Code, as applicable to identified pipe welds in sections of the main steam and main feedwater systems at Callaway. The relief request is a revision to an original relief request that was submitted in letters dated (1) October 17 and 30, 2002, and February 13, 2003, and (2) May 7, 2004, and approved in the NRC letters dated (1) July 1, 2003, and (2) May 19, 2004, respectively.

In its application, the licensee stated that Callaway is near the end of its current second 10-year inservice inspection (ISI) interval. The interval ends on December 18, 2005, with the 1-year extension allowed by the ASME Code, as stated in the letter dated July 6, 2004 (ULNRC-05024). Because of this and the activity to replace main feedwater and steam piping that is scheduled for the fall of 2005 and spring of 2006, the early part of the third 10-year ISI interval, when the licensee would use the requested relief, the licensee has requested that the subject relief request be approved for the remainder of the second ISI interval and the forthcoming third ISI interval.

Based on the enclosed safety evaluation, the NRC staff concludes that the proposed alternative to perform UT examinations with personnel and procedures qualified to the ASME Code, Section XI, Appendix VIII methodology, with coverage from four directions, and through-wall volume in lieu of the ASME Code-required Section III RT will provide an acceptable level of quality and safety. This alternative was approved by ASME on February 3, 2003, and published as ASME Code Case N-659. This code case is listed in Table 2, "Conditionally Acceptable Code Cases," in draft Regulatory Guide DG-1133, proposed revision 34 to Regulatory Guide (RG) 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III." The licensee's submittal includes the DG-1133, Table 2, conditions as part of its proposed alternative. Because the licensee is approaching the end of the second ISI interval at Callaway and has scheduled work in refueling outages at the beginning of the third ISI interval that will use the proposed alternative, and the licensee is following the criterion in Code Case

N-659 with the conditions that appear in DG-1133, the proposed alternative is authorized for Callaway, pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations*, for the second and third 10-year ISI intervals.

Sincerely,

/RA/
Robert A. Gramm, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SECOND TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

REQUEST FOR RELIEF TO USE AN ALTERNATIVE EXAMINATION METHOD

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated November 18, 2004 (Agencywide Documents Access Management System Accession No. ML043450359), Union Electric Company (the licensee) submitted a request for relief from certain inservice inspection (ISI) requirements specified in the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code) for the Callaway Plant, Unit 1 (Callaway). Specifically, the licensee requested relief from the radiographic testing (RT) examination of repair welds in Class 2 piping required by the ASME Code, Section III, Subarticle NC-5200. Instead of the ASME Code-required RT, the licensee proposed an alternative to examine the welds using a qualified ultrasonic testing (UT) method. The relief request is for the remainder of the second 10-year ISI interval at Callaway, which began August 1, 1995, and will end on December 18, 2005, and for the third 10-year interval, which will begin on December 19, 2005.

The first 10-year interval started on December 19, 1984, and was to end on December 18, 1994, however, it was extended to July 31, 1995, as allowed by the ASME Code. The second 10-year interval was to end on December 18, 2004, but will end on December 18, 2005, with a one-year extension allowed by the ASME Code.

This request for relief is a revision to previously approved relief requests from the licensee dated (1) October 17 and 30, 2002, and February 13, 2003, and (2) May 7, 2004, and approved in the NRC letters dated (1) July 1, 2003, and (2) May 19, 2004, respectively.

2.0 REGULATORY EVALUATION

In the Commission's regulations, Section 50.55a(g) of Title 10 of the *Code of Federal Regulations* (10 CFR) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(a)(3) or 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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will 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) twelve months prior to the start of the 10-year interval, subject to the limitations and modifications listed therein. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval. The ISI Code of record for the second 10-year ISI interval for the Callaway Plant, Unit 1, is the 1989 Edition of Section XI of the ASME Code. The ISI Code of record for the third 10-year ISI interval will be the 1998 Edition through the 2000 Addenda of Section XI of the ASME Code.

3.0 DISCUSSION

3.1 System/Components for which Relief is Requested

The components affected by this relief request are listed in Table 1, "Feedwater Pipe Welds," and Table 2, "Main Steam Pipe Welds," of the licensee's letter dated November 18, 2004.

3.2 ASME Code Requirements from which Relief is Requested

The licensee is requesting relief from the 1974 Edition with Summer 1975 Addenda, ASME Code, Section III, Subarticle NC-5200. Specifically, the licensee is requesting relief from the (1) NC-5212 requirement that longitudinal pipe butt-welded joints be radiographed and (2) NC-5222 requirement that circumferential pipe welds be radiographed. Alternatively, when pressure testing is performed in accordance with ASME Code Case N-416-1, the welds are nondestructively examined in accordance with the 1992 Edition with no Addenda of Section III of the ASME Code.

3.3 Proposed Alternative

The licensee proposed an alternative to use the UT method described in Attachment 2 of the licensee's letter dated November 18, 2004, instead of the ASME Code-required RT examination method for the subject welds, as discussed in Section 3.2 above. The proposed alternative uses procedures and personnel qualified to ASME Code, Section XI, Appendix VIII for carbon steel piping. The coverage consists of scanning through-wall with angle beam transducers in two opposite directions perpendicular to the weld axis and two opposite directions parallel to the weld axis and with a straight beam transducer. The scanned volume is 100 percent of the weld volume and adjacent base metal.

3.4 Basis for Relief

The examination will cover 100 percent of the weld volume and include base material for a distance of half the nominal through-wall weld thickness on each side of the weld. A demonstration of the capability of the UT system to detect both subsurface and surface workmanship type flaws (i.e., slag, porosity, lack of fusion, and incomplete penetration) will be performed on a qualification block. All flaws and indications will be evaluated in accordance with the standard acceptance criteria of NC-5330. In addition, an automated scan and data acquisition system will be used to improve examination repeatability and provide permanent storage of the raw data. Finally, the proposed alternative UT will be limited to base and weld material that is conducive to UT.

The proposed alternative UT requirements and provisions address the known limitations of the UT method to ensure both planar and volumetric flaws in all orientations are detected and properly evaluated. First, an examination using a procedure qualified for 100 percent of the weld volume in accordance with the performance demonstration methodology of Section XI, Appendix VIII is required. Second, examination scans in two directions perpendicular to the weld axis and two directions parallel to the weld axis or examination scans as qualified on 100 percent of the weld volume in accordance with the performance demonstration methodology of Section XI, Appendix VIII is required. Third, to ensure laminar type flaws are detected, a supplemental examination using a straight beam is also required. Finally, if an indication, such as slag or porosity, is not characterized as volumetric, the indication will be characterized as a planar type flaw and evaluated in accordance with the acceptance criteria of NC-5330. The acceptance criteria of NC-5330 specify acceptable lengths of indications only and do not differentiate between planar and volumetric type flaws. Most importantly, planar type flaws such as cracks, incomplete penetration, and lack of fusion, which are rejectable by NC-5330 for any size, are readily and properly characterized by UT.

In addition to the effectiveness, the proposed alternative UT in lieu of RT will significantly reduce radiation exposure to personnel during refueling outage maintenance work. Also, outage duration and costs will be reduced by allowing parallel path work to progress uninterrupted during examination of welds. Finally, the personnel safety risk of inadvertent or accidental exposure and also the normal anticipated exposure associated with transporting, positioning and exposing a source for RT is eliminated.

4.0 EVALUATION

The licensee is anticipating the detection of wall deterioration of the main feedwater and steam Class 2 piping during refueling outage 14. The deterioration is caused by corrosion/erosion of cast and wrought carbon steel components. The component dimensions are 14-, 16-, 28-, and 32-inch nominal diameter with 0.750-, 0.844-, 0.934-, and 1.068-inch wall thicknesses, respectively.

The proposed alternative is to perform UT examinations of the subject welds listed in Attachment 2 of the November 18, 2004, letter in lieu of the ASME Code-required RT examinations. The UT personnel and procedure will be qualified using the carbon steel pipe methodology of the ASME Code, Section XI, Appendix VIII. The methodology adds a minimum of three construction flaws to the performance demonstration of the appropriate supplement of

a prior qualified procedure or to a supplement test set of an initial procedure and personnel qualification.

The UT and RT examinations are complementary and not directly comparable or equivalent. Depending on flaw type (i.e., volumetric or planar) and orientation, ultrasonic examination may be superior to radiography or vice versa. The RT is most effective in detection of volumetric type flaws (i.e., slag and porosity) and detection of planar type flaws (i.e., lack of fusion and cracks) that are oriented in a plane parallel to the x-ray beam. However, RT is limited in detecting planar flaws not oriented parallel to the beam. In contrast, UT is very effective in detecting planar type flaws that are not oriented in a plane parallel to the sound beam. Finally, UT is capable of detecting volumetric type flaws such as slag or porosity but is limited, compared to RT, in ability to characterize volumetric flaws.

In the proposed alternative, the examination coverage consists of scanning with angle beam transducers in two opposite directions perpendicular to the weld axis and two opposite directions parallel to the weld axis and with a straight beam transducer scanning through-wall. The scanned volume is 100 percent of the weld volume and adjacent base material for a distance of one-half the nominal through-wall pipe thickness on each side. Where the scan (perpendicular to the weld) is limited on one side, a full V-path will be used for the second direction provided the procedure is qualified for a full V-path. The scans provide assurance that planar flaws, regardless of orientation, will be detected and non-planar, construction flaws will be easier to discern from inhomogeneities. Also, the licensee will perform an examination of the weld area for laminar flaws using a straight beam scan. The qualification process assures that the UT procedure contains sufficient detail and that the personnel have the necessary skills for detecting various types of flaws. In order to detect construction and material flaws occurring axially, circumferentially, and volumetrically, the coverage will exceed that required during the ASME Code, Section XI, Appendix VIII demonstration. Flaws that are detected using UT will be evaluated in accordance with the acceptance criteria of NC-5330, ASME Code, Section III, which is the same for crack-type flaws detected by RT. Because UT is capable of characterizing depth, the length acceptance criteria also applies to depth measurements.

This alternative was approved by ASME on February 3, 2003, and published as ASME Code Case N-659. This code case is listed in Table 2, "Conditionally Acceptable Code Cases," in draft Regulatory Guide DG-1133, proposed revision 34 to Regulatory Guide (RG) 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III." The licensee's submittal includes the DG-1133, Table 2, conditions as part of its proposed alternative.

In its application, the licensee stated that Callaway is near the end of its current second 10-year ISI interval, which ends July 31, 2005. Because of this and of activity to replace main feedwater and steam piping that is currently scheduled for the fall of 2005 and spring of 2006, the early part of the third 10-year ISI interval, and would use the requested relief, the licensee requested that the subject relief request be approved for the remainder of the second ISI interval and the forthcoming third ISI interval.

Because the licensee is approaching the end of the second ISI interval at Callaway and has scheduled work in refueling outages at the beginning of the third ISI interval that will use the proposed alternative, and the licensee is following the criterion in Code Case N-659 with the

conditions that appear in DG-1133, the staff has determined that the proposed alternative is acceptable.

Because the licensee is using the ASME Code, Section XI, Appendix VIII methodology for qualifying procedures and personnel, the NRC staff did not evaluate the references to the ASME Code, Section V.

5.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed alternative to perform UT examinations with personnel and procedures qualified to the ASME Code, Section XI, Appendix VIII methodology, with coverage from four directions, and through-wall volume instead of the ASME Code-required Section III RT will provide an acceptable level of quality and safety. Based on this conclusion, the NRC staff authorizes the proposed alternative for Callaway, pursuant to 10 CFR 50.55a(a)(3)(i), for the second and third 10-year ISI intervals.

All other requirements of the ASME Code, Section III and XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Don Naujock

Dated: May 19, 2005

Callaway Plant, Unit 1

cc:

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