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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Ladies and Gentlemen: ULNRC-04807

DOCKET NUMBER 50-483
UNION ELECTRIC COMPANY
CALLAWAY PLANT
REVISION TO REQUEST FOR RELIEF FROM
ASME SECTION III REQUIREMENTS REGARDING
NON-DESTRUCTIVE EXAMINATION OF WELDS PERFORMED
UNDER SITE REPAIR/REPLACEMENT PROGRAM (TAC# MB6534)

References (1) AmerenUE Letter ULNRC-04760 from John D. Blosser to USNRC Document Control Desk, dated October 17, 2002, "Request for Relief from ASME Section III Requirements Regarding Non-Destructive Examination of Welds Under Site Repair/Replacement Program"

(2) AmerenUE Letter ULNRC-04768 from John D. Blosser to USNRC Document Control Desk, dated October 30, 2002, "Revision to Request for Relief from ASME Section III Requirements Regarding Non-Destructive Examination of Welds Performed Under Site Repair/Replacement Program (TAC #MB6534)"

By letter dated October 17, 2002 (Reference 1) Union Electric (AmerenUE) submitted an American Society of Mechanical Engineers (ASME) Code relief request pursuant to 10 CFR 50.55a(a)(3)(i) for use of a proposed alternative to the non-destructive examination (NDE) requirements of Subarticle NC 5200 of Section III of the ASME Code, as applicable to a particular group of piping welds for certain Class 2 piping sections at the Callaway plant. A follow-up letter dated October 30, 2002 (Reference 2) was submitted to support and reflect revision of AmerenUE's request, which was prompted in response to a request for additional information received from the NRC staff on October 23, 2002 based on their preliminary review of AmerenUE's request. This letter is also a follow-up to that request since planning activities that have occurred subsequent to the October submittals have prompted AmerenUE to revise its request.

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At the time of our request last October, AmerenUE was anticipating the completion of certain inspection activities that had been planned for Refuel 12 (Fall 2002) at Callaway. The inspections were planned in response to the previous identification of pipe wall thinning [due to flow-accelerated corrosion (FAC)] in certain sections of the main feedwater system during Refuel 11 (Spring 2001). The intent of the inspections was to assess the extent and rate of pipe wall thinning and replace any pipe sections if required based on the inspection results. The welds performed for the replaced pipe sections would require NDE, and the relief requested by AmerenUE in its October submittals would support the performance of ultrasonic examination in lieu of radiography which would otherwise be required by Subarticle NC 5200 of Section III of the ASME Code. The basis for this alternative approach, including details of the ultrasonic examination method to be used, was provided in the relief request that was included as an attachment to Reference 1 (and then as Attachment 2 to Reference 2, as revised).

In planning for the inspections and potential replacement activities in the outage, the pipe sections requiring inspection and subject to replacement were known. Which ones would actually be replaced, however, would not be known until after the inspections were performed and the results were evaluated. As it was desired to process the relief request in advance of the replacement work (if required), and since the NRC staff had indicated that the scope of the relief request should be limited and defined, the pipe sections subject to replacement were identified in the relief request.

The inspections were subsequently completed during Refuel 12. The inspection results indicated, however, that no pipe sections required immediate replacement during the outage. Therefore, although the NRC staff was prepared to process the requested relief at that time, the relief was not immediately needed and was not pursued further at that time.

Notwithstanding the inspection results obtained in RF-12, pipe-wall thinning continues to be monitored under the FAC program established at Callaway, and the subject pipe sections will continue to be inspected and subject to replacement if required. In fact, during the current ten-year Inservice Inspection interval, the potentially affected pipe sections are to be inspected again during Refuel-13 (Spring 2004) and/or Refuel 14 (Fall 2005). AmerenUE is therefore still pursuing the requested relief, as the basis for the relief remains.

In addition to the anticipated FAC inspections, plans have been completed for additional activities that will require repair or replacement of certain other sections of Class 2 piping. These activities include replacement of all four steam generators at Callaway during RF-14 and modification of the feedwater control system in RF-13, both of which will require feedwater piping replacement. (The latter will require replacement of the actuators on the main feedwater control valves, one of which [AEFV0040] is seal welded and will need to be completely removed and replaced.)

As a result of these planned activities, some additional feedwater system welds (~ 8 additional welds) are being added to the scope of AmerenUE's pending relief request. Further, steam generator replacement will also affect piping in the main steam system such that welds on sections associated with the pipe, reducer and elbow downstream of the A, B, C and D steam generator outlets have been identified for inclusion in the scope of the relief request.

Due to this change in scope of the subject Class 2 system pipe welds, the relief request has been revised to reflect the new scope. In addition, the revision reflects a change that was made to clarify information provided with regard to the directions of the examination scans to be used for the ultrasonic examination method. The revised relief request is therefore attached. It supersedes the last version provided in the October 30, 2002 submittal.

AmerenUE appreciates the NRC staff's continued review of this relief request. Because this relief request significantly affects the planning of work activities for Refuel 13, please note that AmerenUE requests approval of this request by September 30, 2003. For any further questions or requests for additional information that you may have, please contact David Shafer at 314-554-3104, or Thomas Elwood at 314-554-4593.

Very truly yours,

David Shafer
for John D. Blosser
Manager - Regulatory Affairs

TBE/jdg

Attachment

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Relief Request

Request to Use Alternative Ultrasonic Examination Method in Lieu of the Radiography Required by ASME Section III, Subarticle NC-5200

Note

Revisions made to the text of this Relief Request since original submittal (October 17, 2002) are shown in italics and are indicated by a revision bar in the left margin. Changes also include new welds added to Table 1 and the addition of new Table 2 for welds associated with main steam piping.

Request to Use Alternative Ultrasonic Examination Method in Lieu of the Radiography Required by ASME Section III, Subarticle NC-5200

Background:

The 1989 Edition with no Addenda of ASME Section XI currently governs repair/replacement activities at the Callaway Nuclear Plant. Callaway Plant is currently in the second 10-year inservice inspection interval which began on August 1, 1995. ASME Class 2 welds installed under the Callaway Repair/Replacement Program are nondestructively examined in accordance with the 1974 Edition with Summer 1975 Addenda of ASME Section III. Alternatively, when pressure testing is performed in accordance with Code Case N-416-1, the welds are nondestructively examined in accordance with the 1992 Edition with no Addenda of ASME Section III. Pursuant to the provisions of 10CFR 50.55a(a)(3)(i), Callaway Plant requests permission to use an alternative ultrasonic examination method in accordance with the justification, requirements, and provisions detailed below in lieu of the radiography required by ASME Section III, NC-5200.

Components for Which Alternative Ultrasonic Examination is Requested:

Alternative ultrasonic examination is requested for Class 2 feedwater pipe welds listed in Table 1 *and Class 2 main steam pipe welds listed in Table 2. These tables list a piping* description, weld identification number, nominal pipe size, pipe schedule, and base material for each weld.

Justification for Alternative Ultrasonic Examination in Lieu of Radiography:

The proposed alternative ultrasonic examination will ensure an adequate level of safety and quality and will provide adequate verification that the Class 2 welds are free of significant flaws that could affect structural integrity. The examination will cover 100% of the weld volume and include base material for a distance of 1/2 the nominal through-wall weld thickness on each side of the weld. A demonstration of the ultrasonic examination system capability 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 ultrasonic examination will be limited to base material and weld material that is conducive to ultrasonic examination.

Ultrasonic and radiographic examination methods are complimentary and are 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. Radiography 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, radiography is limited in detection of planar flaws not oriented parallel to the beam. In contrast, ultrasonic examination is very effective in detection of planar type flaws that are not oriented in a plane parallel to the sound beam and less effective in detecting flaws in a plane parallel to the sound beam. Finally, ultrasonic examination is capable of detecting volumetric type flaws such as slag or porosity but is limited, compared to radiography, in ability to characterize volumetric flaws.

The proposed alternative ultrasonic examination requirements and provisions address the known limitations of the ultrasonic method to ensure both planar and volumetric flaws in all orientations are detected and properly evaluated. First, examination using two angle beams (i.e., 45 and 60 degree nominally) or a procedure qualified on 100% 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% of the weld volume in accordance with*

the performance demonstration methodology of Section XI, Appendix VIII are required. Third, to ensure laminar type flaws are detected, a supplemental examination using 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 more readily and properly characterized by ultrasonic examination.

In addition to the effectiveness of the proposed alternative, use of ultrasonic examination in lieu of radiography will provide a significant reduction in personnel radiation exposure 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 radiography is eliminated.

Proposed Alternative Ultrasonic Examination Requirements and Provisions:

For ASME Class 2 welds installed under the Callaway Repair/Replacement Program where ultrasonic examination will be performed in lieu of radiography the following requirements shall apply:

(1) The nominal weld thickness shall be 1/2 inch or greater.

(2) The ultrasonic examination shall not be applied to welds that include austenitic cast product forms or austenitic corrosion-resistant-clad piping butt welds.

(3) The ultrasonic examination area shall include 100% of the volume of the entire weld plus 0.5T on each side of the weld, where T is the nominal thickness of the weld. The ultrasonic examination area shall be accessible for angle beam examination in four directions, two directions perpendicular to the weld axis and two directions parallel to the weld axis. Where perpendicular scanning is limited on one side of the weld, a technique using the second leg of the V-path may be credited as access for the second perpendicular examination direction provided that the detection capability of that technique is included in the procedure demonstration described in (5) and (6) below.

(4) The ultrasonic examination shall be in accordance with (a) or (b) below:

   (a) Examination shall be performed in accordance with Section V, Article 5 up to and including the 2001 Addenda. Two angle beams having nominal angles of 45 and 60 degrees should generally be used; however, other pairs of angle beams may be used provided the measured difference between the angles is at least 10 degrees. *Examination scans shall be in four directions; two beam path directions perpendicular to the weld axis and two beam path directions parallel to the weld axis. Where the examination scan perpendicular to the weld is limited on one side, the second leg of the V-path may be used to achieve the two beam path directions.* A supplemental straight beam shall also be used.

   (b) Examination shall be performed by a procedure qualified in accordance with the performance demonstration methodology of Section XI, Appendix VIII provided the entire volume of the weld examination is included in the demonstration. *Examination scans shall be in four directions; two beam path directions perpendicular to the weld axis and two beam path directions parallel to the weld axis.* A supplemental straight beam shall also be used.

(5) A written procedure shall be followed. The procedure shall be demonstrated to perform acceptably on a qualification block or specimen that includes a weld with both surface and subsurface flaws as described in (7) below.

(6) The qualification block material shall conform to the requirements applicable to the calibration block and in addition meet the following requirements:

(a) The material from which blocks are fabricated shall be one of the following: a nozzle dropout from the component; a component prolongation; or material of the same material specification, product form, and heat treatment condition as one of the materials joined. For piping, if material of the same product form and specification is not available, material of similar chemical analysis[1], tensile properties, and metallurgical structure[2] may be used.

(b) Where two or more base material thicknesses are involved, the calibration block thickness shall be of a size sufficient to contain the entire examination path.

(c) Qualification block configuration shall contain a weld representative of the joint to be ultrasonically examined, including, for austenitic materials, the same welding process.

(7) The qualification block shall include flaws in accordance with (a) or (b) below:

(a) At least two planar flaws shall be included in the qualification block weld, one surface and one subsurface oriented parallel to the fusion line. The flaws shall be no larger in the through-wall direction than the diameter of the applicable side-drilled hole in the calibration block shown in Figure T-542.2.1 of Section V, Article 5, and no longer than the shortest unacceptable elongated discontinuity length listed in NC-5330 for the thickness of the weld that will be examined.

(b) Where a Section XI, Appendix VIII, performance demonstration methodology is used, supplemental qualification to a previously approved procedure may be demonstrated through the use of a blind test with appropriate specimens that contain a minimum of three different construction-type and fabrication-type flaws distributed throughout the thickness of the specimen(s).

(8) A documented examination plan shall be provided showing the transducer placement, movement and component coverage that provides a standardized and repeatable methodology for weld acceptance. The examination plan shall also include the ultrasonic beam angle used, beam directions with respect to weld centerline, and volume examined for each weld.

(9) The ultrasonic examination shall be performed using a device with an automated computer data acquisition system.

(10) Data shall be recorded in unprocessed form. A complete data set with no gating, filtering, or thresholding for response from the examination volume in paragraph (3) above shall be included in the data record.

(11) Personnel who acquire and analyze ultrasonic data shall be qualified and trained using the same type of equipment as in (9) above, and demonstrate their capability to detect and characterize the flaws using the procedure as described in (5) above.

(12) The evaluation and acceptance criteria shall be in accordance with Section III NC-5330.

(13) Flaws exceeding the applicable acceptance criteria referenced in (12) above shall be repaired, and the weld subsequently reexamined using the same ultrasonic examination procedure that detected the flaw.

(14) Review and acceptance of the ultrasonic examination procedure by the Authorized Nuclear Inservice Inspector is required.

(15) All other related requirements of the Callaway Repair/Replacement Program shall be met.

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[1] *Chemical composition is within the same ranges as required in the original material specification.*

[2] *Same phase and grain shape as produced by the thermal process for the original specification.*

(16) Use of ultrasonic examination in lieu of radiography shall be documented in accordance with the Callaway Repair/Replacement Program on a Form NIS-2A and/or Section XI Repair/Replacement Plan, as applicable.

Table 1: Feedwater Pipe Welds

Description	Weld ID No. [1]	NPS	Sch.	Mat.
5-Dia. bend & expander upstream of A S/G inlet	2-AE-04-F014 [2]	14	80	CS
	2-AE-04-S010-A	14	80	CS
	2-AE-04-S010-C	16	80	CS
	2-AE-04-F015	16	80	CS
5-Dia. bend & expander upstream of B S/G inlet	2-AE-04-F030 [2]	14	80	CS
	2-AE-04-FW8	14	80	CS
	2-AE-04-FW7	14	80	CS
	2-AE-04-S021-C	16	80	CS
	2-AE-04-F035	16	80	CS
5-Dia. bend & expander upstream of C S/G inlet	2-AE-05-F030 [2]	14	80	CS
	2-AE-05- S021-A	14	80	CS
	2-AE-05-S021-C	16	80	CS
	2-AE-05-F036	16	80	CS
5-Dia. bend & expander upstream of D S/G inlet	2-AE-05-F015 [2]	14	80	CS
	2-AE-05-S022-A	14	80	CS
	2-AE-05-S022-C	16	80	CS
	2-AE-05-F035	16	80	CS
Feedwater isolation valve AEFV0040	2-AE-04-F020	14	120	CS
	2-AE-04-F019	14	120	CS
Elbow & pipe upstream of valve AEV0120 (B loop)	2-AE-04-S017-A	14	80	CS
	2-AE-04-F027	14	80	CS
	2-AE-04-F067	14	80	CS
Elbow & pipe downstream of valve AEV0120 (B loop)	2-AE-04-F070	14	80	CS
	2-AE-04-S019-A	14	80	CS
	2-AE-04-FW10	14	80	CS
Elbow downstream of valve AEV0123 (C loop)	2-AE-05-F029	14	80	CS
	2-AE-05-S020-A	14	80	CS
Elbow & pipe upstream of valve AEV0122 (D loop)	2-AE-05-F012	14	80	CS
	2-AE-05-S008-A	14	80	CS
	2-AE-05-F073	14	80	CS

Notes:

(1) Listed Weld ID Numbers are those currently identified in the Callaway ISI Program Plan.

(2) New weld will be at this weld location or several inches upstream.

Table 2: Main Steam Pipe Welds

Description	Weld ID No. [1]	NPS	Sch.[2]	Mat.
Pipe, reducer & elbow downstream of A S/G outlet	2-AB-01-F001	32	1.068"	CS
	2-AB-01-S001-A	32	1.068"	CS
	2-AB-01-S001-D	28	0.934"	CS
	new pipe weld [3]	28	0.934"	CS
Pipe, reducer & elbow downstream of B S/G outlet	2-AB-01-F020	32	1.068"	CS
	2-AB-01-S013-A	32	1.068"	CS
	2-AB-01-S013-D	28	0.934"	CS
	new pipe weld [3]	28	0.934"	CS
Pipe, reducer & elbow downstream of C S/G outlet	2-AB-01-F044	32	1.068"	CS
	2-AB-01-S027-A	32	1.068"	CS
	2-AB-01-S027-D	28	0.934"	CS
	new pipe weld [3]	28	0.934"	CS
Pipe, reducer & elbow downstream of D S/G outlet	2-AB-01-F068	32	1.068"	CS
	2-AB-01-S041-A	32	1.068"	CS
	2-AB-01-S041-D	28	0.934"	CS
	new pipe weld [3]	28	0.934"	CS

Notes:

(1) Listed Weld ID Numbers are those currently identified in the Callaway ISI Program Plan.

(2) Minimum wall thickness is listed in pipe schedule column.

(3) New weld to be in pipe section downstream of 1st elbow from S/G outlet.