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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 30, 1999

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

SUBJECT: CLOSEOUT OF RESPONSE TO GENERIC LETTER 96-06 CONCERNING
WATERHAMMER AND TWO-PHASE FLOW FOR CALLAWAY PLANT, UNIT 1
(TAC NO. M96791)

Dear Mr. Randolph:

This letter documents the closeout of the waterhammer and two-phase flow aspects of Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996. You responded to the generic letter in your letters of October 30, 1996 (ULNRC-3483), January 28, 1997 (ULNRC-3526), October 17, 1997 (ULNRC-3667), May 1, 1998 (ULNRC-3826), May 19, 1998 (ULNRC-3836), May 17, 1999 (ULNRC-4033), and October 29, 1999 (ULNRC-04141).

The generic letter included a request for licensees to evaluate cooling water systems that serve containment air coolers to ensure that they are not vulnerable to waterhammer and two-phase flow conditions. You provided the assessment of these generic letter issues for Callaway Plant, Unit 1, in your letters of January 28 and October 17, 1997, and May 17, 1999, and this information was reviewed by Scientech under a contract to the Nuclear Regulatory Commission (NRC).

The results of the contractor's (Scientech's) review are documented in the enclosed Letter Report (LR) No. 240-1 dated June 1999. The staff has reviewed the LR and concludes that the report addresses the generic letter issues of waterhammer and two-phase flow for Callaway.

The contractor found that, in view of the large uncertainties associated with the amount of air in water, the methodology provided in your submittals for extrapolating the results of the Wolf Creek waterhammer tests to Callaway is questionable and may not be conservative (LR Section 4.1), and that the use of a sonic velocity of 2300 ft/sec is questionable (LR Section 4.2). While these shortcomings should be corrected, the contractor performed a bounding calculation, based on the information that you submitted and using the methodology described in NUREG/CR-5520, that showed that the allowable piping stress cited in your letters would not be exceeded by waterhammer.

The contractor noted in LR Section 6 that you had not submitted any information on the effect of potential hydrodynamic loadings on the fan cooler pipe support analyses for the accident condition. The staff discussed this matter with your staff during a phone call on October 13, 1999. Your staff indicated that the pipe supports were generally assessed based on the analysis that had been completed for the column closure waterhammer (i.e., the non-accident case). The appropriate stress criteria permitted by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the non-accident

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PDR ADOCK

G. L. Randolph

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case is the upset allowable, which you stated in your submittals was not exceeded for this condition. You stated that the load due to condensate-induced waterhammer during a loss-of-coolant accident (LOCA) was at most 26 percent more than the non-accident water hammer load. The appropriate stress criteria permitted by the ASME Code for the LOCA case is the faulted case, which is a factor of two greater than the upset allowable criteria that was used for the non-accident case. Because the allowable stress is increased by 100 percent for the accident case, compared to only a 26 percent increase in the actual stress, you stated that the allowable stress for the accident case would not be exceeded. The staff considers that your explanation is acceptable.

An additional shortcoming in the analysis for waterhammer and two-phase flow provided in your letters is that the air solubility data used in Appendix G of the Altran report is in error. This is addressed in Section 4.2 of the attached LR. The staff concluded that this error did not significantly affect the results of the analysis submitted.

Based on our review of the contractor's LR and the considerations discussed above, the staff concludes that the waterhammer and two-phase flow elements of GL 96-06 are closed for the Callaway Plant, Unit 1. However, as discussed above, there are shortcomings that have been identified in your analysis for Callaway that should be corrected. If you have any questions concerning these shortcomings or any other part of this letter, you may contact me at (301) 415-1307, or through the internet at jnd@nrc.gov.

The GL 96-06 issue concerning thermal overpressurization is still being reviewed and will be addressed in a separate letter. The staff's efforts under TAC No. M96791 will continue until the GL issue of thermal overpressurization is addressed and closed out.

Sincerely,

Jack Donohew, Senior Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure: Sciencetech Letter Report No. 240-1

cc w/encl: See next page

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November 30, 1999

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Jack Donohew, Senior Project Manager, Section 2
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Office of Nuclear Reactor Regulation

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Enclosure: Scientech Letter Report No. 240-1

cc w/encl: See next page

Callaway Plant, Unit 1

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