

January 10, 2000

Mr. S. K. Gambhir
Division Manager - Nuclear Operations
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
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Fort Calhoun, NE 68023-0399

SUBJECT: GENERIC LETTER 97-01, "DEGRADATION OF CRDM/CEDM NOZZLE AND OTHER VESSEL CLOSURE HEAD PENETRATIONS" - REVIEW OF THE RESPONSES FOR THE FORT CALHOUN STATION (TAC NO.M98566)

Dear Mr. Gambhir:

On April 1, 1997, the staff issued GL 97-01, "Degradation of CRDM/CEDM Nozzle and Other Vessel Closure Head Penetrations," to the industry, requesting that addressees provide a description of the plans to inspect the vessel head penetrations (VHPs) at their respective pressurized-water reactor (PWR) designed plants. In the discussion section of the GL, the staff indicated that it did not object to individual PWR licensees basing their inspection activities on an integrated, industry-wide inspection program.

The Combustion Engineering Owners Group (CEOG), in coordination with the efforts of the Nuclear Energy Institute (NEI) and the other PWR Owners Groups (the Westinghouse Owners Group [WOG] and Babcock and Wilcox Owners Group [BWO]), determined that it was appropriate for its members to develop a cooperative integrated inspection program in response to GL 97-01. Therefore, on July 25, 1997, the CEOG submitted Topical Report CE NPSD-1085, "CEOG Response to NRC Generic Letter 97-01, Degradation of CEDM Nozzle and Other Vessel Closure Head Penetrations," on behalf of the utility members in the CEOG.

In this report, the CEOG provided a description of the CEOG timing model (crack initiation and growth susceptibility model) that was used to rank the VHPs at the participating plants in the owners group. As part of the CEOG's coordinated effort, you provided your 30-day and 120-day responses for Fort Calhoun on April 30, 1997, and July 30, 1999. Information provided in these responses indicated that you were a participant in the CEOG's integrated program for evaluating the potential for primary water stress corrosion cracking (PWSCC) to occur in the VHPs of CE designed PWRs, and that you were endorsing the probabilistic susceptibility model in Topical Report CE NPSD-1085 as applicable to the assessment of VHPs at Fort Calhoun.

Additionally, in a letter dated April 26, 1999, you responded to the staff's request for additional information (RAI) dated January 26, 1999. The RAI requested: (1) a description of the probabilistic susceptibility ranking for a plant's VHPs to undergo PWSCC relative to the rankings for the rest of the industry; (2) a description of how the respective susceptibility models were benchmarked; (3) a description of how the variability in the product forms, material specifications, and heat treatments used to fabricate a plant's VHPs were addressed in the susceptibility models; (4) a description of how the models would be refined in the future to include plant-specific inspection results; and (5) a request for confirmation that you had decided

to apply the susceptibility model in BWOOG Topical Report BAW-2301 to the evaluation of VHPs at Fort Calhoun in lieu of using the model summarized in CEOG Report CE NPSD-1085; and (6) a request for confirmation that the VHPs at Fort Calhoun had been re-evaluated (re-ranked) through application of the susceptibility model as described in Topical Report BAW-2301 (i.e., the EPRI model). As was the case for the earlier responses to the GL, the staff encouraged a coordinated generic response to the RAIs.

On December 11, 1998, NEI submitted a generic integrated response to the RAIs on behalf of the PWR-industry and the utility members in the owners groups. In the generic submittal, NEI informed the staff that it normalized the susceptibility rankings for the industry based on a calculation of the time it would take for a VHP of a subject plant to have the same predicted probability of containing a 75 percent through-wall flaw relative to the "worst-case flawed" VHP at DC Cook Unit 2. The normalized ranking for a plant's nozzles was then grouped by histogram into one of three time-dependent susceptibility groupings: (1) those plants whose 75 percent through-wall probability would occur within 5 years of January 1, 1997 (e.g., plants with high susceptibility VHPs); (2) those plants whose 75 percent through-wall probability would occur within 5-15 years of January 1, 1997 (e.g., plants with moderate susceptibility VHPs); and (3) those plants whose 75 percent through-wall probability would occur at a time beyond 15 years of January 1, 1997 (e.g., plants with low susceptibility VHPs).

The generic response to the RAIs also provided sufficient information to answer the information requests in the RAIs, and emphasized that the integrated program is an ongoing program that will be implemented in conjunction with EPRI, the PWR Owners Groups, the participating utilities, and the Material Reliability Projects' Subcommittee on Alloy 600. By letter dated March 21, 1999, the staff informed NEI that the integrated program was an acceptable approach to address the potential for PWSCC to occur in the VHPs of PWR-designed nuclear plants, and that licensees responding to the GL could refer to the integrated program as a basis for assessing the postulated occurrence of PWSCC in PWR-design VHPs.

To date, all utilities have implemented VT-2 type visual examinations of their VHPs in compliance with the ASME requirements specified in Table IWB-2500 for Category B-P components. Most utilities, if not all, have also performed visual examinations as part of plant-specific boric acid wastage surveillance programs. In addition, the following plants have completed voluntary, comprehensive augmented volumetric inspections (eddy current examinations or ultrasonic testing examinations) of their CRDM nozzles:

- o 1994 - Point Beach Unit 1 (Westinghouse design)
- o 1994 - Oconee Unit 2 (B&W design)
- o 1994 - D.C. Cook Unit 2 (Westinghouse design)
- o 1996 - North Anna Unit 1 (Westinghouse design)
- o 1998 - Millstone Unit 2 (CE design)
- o 1999 - Ginna (Westinghouse design)

In addition, the following plants have completed voluntary, limited augmented volumetric inspections of their VHPs as well:

- 1995 - Palisades - eight instrument nozzles (CE design)
- 1996 - Oconee Unit 2 - reinspection of two CRDM nozzles (B&W design)
- 1997 - Calvert Cliffs Unit 2 - vessel head vent pipe (CE design)

The majority of these plants have been ranked as having the more susceptible VHPs in the industry. Of these inspections, only the inspections at D.C. Cook Unit 2 have resulted in the identification of any domestic PWSCC type flaw indications. The current program includes additional commitments to perform further volumetric inspections of the CRDM nozzles at Oconee Unit 2 (a reinspection of 2-12 nozzles in 1999), Crystal River 3 (in 2001, a B&W design), Diablo Canyon Unit 2 (in 1999, a Westinghouse design), Farley Unit 2 (in 2001, a Westinghouse design), and San Onofre Unit 3 (in 2002-2008, a CE design). These plants are currently ranked in either the high or moderate susceptibility categories.

The additional volumetric inspections performed to date have confirmed that PWSCC is not an immediate safety concern with respect to the structural integrity of VHPs in domestic PWRs. Since the staff has approved the integrated program for implementation, it was concluded that the integrated program provides an acceptable basis for evaluating your VHPs. You may refer to the integrated program when submitting VHP-related licensing action submittals for the remainder of the current 40-year licensing period. Furthermore, if you are considering applying for license renewal of the Fort Calhoun Station, your application will need to address the following items: (1) an assessment of the susceptibility of your VHPs to develop PWSCC during the extended license terms for the Fort Calhoun Station; (2) a confirmation that the VHPs at the Fort Calhoun Station are included under the scope of your boric acid corrosion inspection program, and (3) a summary of the results of any inspections that have been completed on your VHPs prior to the license renewal application, as appropriate.

This completes the staff's efforts relative to your responses to GL 97-01. Thank you for your consideration and efforts in addressing this issue.

Sincerely,

/RA/

L. Raynard Wharton, Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-285

cc: See next page

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