



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

November 26, 1999

Mr. C. H. Cruse
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657

SUBJECT: GENERIC LETTER 97-01, "DEGRADATION OF CRDM/CEDM NOZZLE AND OTHER VESSEL CLOSURE HEAD PENETRATIONS:" REVIEW OF THE RESPONSES FOR THE CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 (TAC NOS. M98552 AND M98553)

Dear Mr. Cruse:

The NRC staff has reviewed your letters of April 30, 1997, and July 29, 1997, which provided your 30-day and 120-day responses to Generic Letter (GL) 97-01, "Degradation of CRDM/CEDM Nozzle and Other Vessel Closure Head Penetrations," and your letter of December 22, 1998, which provided your response to the staff's request for additional information (RAI) dated August 24, 1998, relative to the issuance of the GL. Your responses provided your proposed program and efforts to address the potential for primary water stress corrosion cracking (PWSCC) to occur in the control element drive mechanism (CEDM) nozzles at the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2.

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 [BWOG]), 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 the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 on April 30, 1997, and July 29, 1997. The combined information in these responses indicated that you were a participant in the CEOG's integrated program for evaluating the potential for PWSCC to occur in the VHPs of CE designed PWRs, and that you were endorsing the probabilistic susceptibility

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model in Topical Report CE NPSD-1085 as applicable to the assessment of VHPs at the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 .

The staff performed a review of both Topical Report CE NPSD-1085 and your responses of April 30, 1997, and July 29, 1997, and determined that some additional information was needed for completion of the review. Therefore, on August 24, 1998, the staff issued an RAI requesting: (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 the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, in lieu of using the model summarized in CEOG Report CE NPSD-1085; and (6) a request for confirmation that the VHPs at the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, 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 GL 97-01 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 as the "worst-case flawed" VHP at DC Cook Unit 2. 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 for addressing 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:

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

On December 22, 1998, you provided your response to the staff's RAI of August 24, 1998. In your letter of December 22, 1998, you endorsed the NEI submittal of December 11, 1998, and indicated that you were a participant in the NEI/CEOG integrated program. Since 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, and since we have approved the integrated program for implementation, we conclude 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, you have addressed the integrity of your vessel head penetration nozzles in your application for license renewal of the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2. The assessment of this matter will be addressed in the staff's safety evaluation for license renewal.

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,



Alexander W. Dromerick, Sr. Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

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