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April 14, 1998

JMHLTR: #98-0121

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Dresden Nuclear Power Station, Unit 2
Reactor Pressure Vessel Head Stud Flaw Evaluation Report
NRC Docket Nos. 50-237

References:

- a) Teleconference between Nuclear Regulatory Commission (NRC) and Commonwealth Edison (ComEd) dated April 14, 1998.
- b) M.H. Richter (ComEd) letter to T.E. Murley (NRC) concerning "Structural Margin Evaluation for Reactor Pressure Vessel Head Studs," GE-NE-523-93-0991 attached, dated October 3, 1991.
- c) R.J. Barrett (NRC) letter to T.J. Kovach (ComEd) transmitting "Relief Request Number CR-14 for Dresden, Unit 3 (TAC No. M81346)," dated December 6, 1991.

In the referenced teleconference, the Nuclear Regulatory Commission (NRC) and the Commonwealth Edison Company (ComEd) discussed the Dresden Unit 2 Reactor Pressure Vessel Head Stud flaw identified in stud #81. Per that teleconference, pursuant to the provisions of ASME Section XI, 1989 Edition, subparagraph IWB-3134(b), ComEd is submitting the attached evaluation which demonstrates the reactor vessel closure is acceptable for continued service.

The following provides background information, a discussion of Code requirements, and technical discussion.

Background

On March 8, 1998, during inspection of all of the Unit 2 Reactor Pressure Vessel head studs, two studs, #52 and #81, were determined to have flaw indications. End-shot ultrasonic testing (UT) detected flaw indications 56" - 57" from the top of the studs, with 75% Distance Amplitude Curve (DAC). Stud #52 was removed and replaced with a new stud. Stud #81 was inadvertently left in place, while a stud with no flaws (#91) was mistakenly replaced with a new stud.

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Therefore, there is currently one Reactor Pressure Vessel (RPV) Head Stud, #81, with a flaw indication in place on the reactor vessel closure. Dresden Station is currently planning to start up from the fifteenth refueling outage (D2R15) with stud #81 in place. The RPV head has been tensioned and the RPV pressure test has been successfully completed.

Discussion of Code Requirements

ASME Section XI, 1989 Edition, Table IWB-2500-1 and Paragraph IWB-3131(a) requires that flaws detected by volumetric examination of the Reactor Pressure Vessel Head Studs be evaluated by comparing to the acceptance standards of Paragraph IWB-3515, specifically Subparagraphs IWB-3515.1 and IWB-3515.2. These subparagraphs provide flaw standards that are applicable to subsurface and surface flaws. Subparagraph IWB-3515.2 also requires flaws detected by volumetric examination be subject to further characterization by surface examination so that the observed flaws can be evaluated using the correct flaw standard. However, if it is simply assumed for evaluation purposes that the indication in the stud fails both the subsurface and surface standards, per IWB-3132.4, the stud can still be acceptable for service without flaw removal, repair, or replacement if the result of an analytical evaluation meets the acceptance criteria of IWB-3600. Since the flaw indication is evaluated per IWB-3600, the surface examination requirement of IWB-3515.2(c) is not applicable and, therefore, not implemented.

As discussed during the referenced teleconference, ComEd believes that it is appropriate to submit the flaw and structural analysis to the NRC per ASME Section XI, 1989 Edition, paragraph IWB-3134(b).

Technical Discussion

The Dresden Unit 2 RPV head contains 92 studs. All of these studs received an end-shot UT inspection with a technique qualified in accordance with the 1989 Edition of ASME Section XI, Appendix VI, during the current refuel outage. The depth detection threshold of the end-shot UT technique utilized is 0.157 inches.

For the purposes of this analysis, stud #81 is assumed to be completely cracked and incapable of sustaining any load. The other 91 studs are assumed to have a crack depth of 0.157 inches in the shape of an edge flaw, which is consistent with the flaws observed in Dresden 2 in 1989. A crack depth of 0.157 inches is the current lowest limit of detectability for the UT test used. Utilizing this set of assumptions for the current situation, and assuming a crack growth rate for the cycle of 0.33 inches for each cracked stud (based on Stress Corrosion Cracking during the three weeks that the studs will be underwater, and negligible crack growth due to fatigue for the remainder of the cycle),

the end-of-cycle crack depth is estimated to be 0.487 inches. This end-of-cycle flaw depth is considerably smaller than the allowable edge flaw depth of 0.90 inches found in Table 5-1 of Reference b).

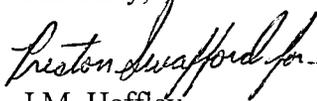
The reduction in total stud cross-sectional area which would result from an end-of-cycle edge flaw depth of 0.487 inches in 91 studs, combined with complete loss of stud #81, was determined to be 123 square inches. This is significantly less than the 465.4 square inches of cross-sectional area reduction which is permitted by Table 5-2 of Reference b).

Assuming one RPV head stud completely cracked, the remaining 91 studs cracked to a depth of 0.157 inches, and a crack growth rate of 0.33 inches for the cycle, the flaw sizes and remaining stud cross-sectional area are substantially within the limits in Reference b), which demonstrated substantial margin of safety for the conservative assumptions taken. Therefore, the current Dresden Unit 2 RPV closure head stud configuration is acceptable for one cycle. RPV head stud #81 will be replaced during D2R16.

The report "Fracture Mechanics Based Structural Margin Evaluation for Reactor Vessel Head Studs" was previously submitted via Reference b), and is included in this transmittal. This document was prepared as a result of cracked studs, which were identified at Dresden Unit 2 in January 1989. This document was part of a relief request which was subsequently approved in Reference c).

Please direct any questions concerning this matter to Mr. Frank Spangenberg, Dresden Regulatory Assurance Manager at (815) 942-2920 extension, 3800.

Sincerely,



J.M. Heffley
Site Vice President
Dresden Station

Enclosure – Fracture Mechanics Based Structured Margin Evaluation for ComEd BWR
Reactor Pressure Vessel Head Studs.

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