March 1, 2010

Mr. Rick Libra
Exelon
Chairman, BWR Vessel and Internals Project
Electric Power Research Institute
3420 Hillview Avenue
Palo Alto, CA 94304-1395

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION (NRC) APPROVAL LETTER WITH COMMENT FOR TOPICAL REPORT BWRVIP-59-A, "BWR VESSEL AND INTERNALS PROJECT [BWRVIP], EVALUATION OF CRACK GROWTH IN BWR [BOILING WATER REACTOR] NICKEL BASE AUSTENITIC ALLOYS IN RPV [REACTOR PRESSURE VESSEL] INTERNALS: EPRI [ELECTRIC POWER RESEARCH INSTITUE] TECHNICAL REPORT 1014874, MAY 2007 (TAC NO. MD6254)

Dear Mr. Libra:

By letter dated June 21, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100340021), the Boiling Water Reactor Vessel and Internals Project (BWRVIP) submitted the topical report BWRVIP-59-A, "BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Nickel Base Austenitic Alloys in RPV Internals," Electric Power Research Institute (EPRI) Technical Report 1014874 for NRC staff review.

The BWRVIP-59-A topical report was submitted as a means of exchanging information with the NRC staff for the purpose of providing a methodology to disposition flaws in nickel alloy components and weldments in BWR environments. The topical report includes crack growth curves that are applicable to any nickel alloy component or weldment not subject to high radiation fields. The BWRVIP-59-A topical report also provides the stress intensity factor (K) distributions for a variety of core support structure welds. The specific analyses are for the core support geometry of a BWR Type 6 (BWR-6) configuration, but most of the results are also applicable to core support structures for other BWR models. The NRC has found that the BWRVIP-59-A topical report provides an acceptable technical justification for a methodology for determining through-thickness intergranular stress corrosion cracking growth rates in nickel base alloys based upon empirical field and laboratory test data and field in-service inspection information.

BWRVIP-59-A presents a compilation of information from the BWRVIP-59 topical report submitted on December 23,1998 (ADAMS Accession No. 9812290036), as supplemented by letters dated December 4, 2000, and February 19, 2001 (ADAMS

Accession Nos. ML003775488 and ML010520062), submitted prior to an NRC staff safety evaluation (SE) dated July 31, 2001 (ADAMS Accession No. ML012120366). BWRVIP-59-A also incorporates information included in a letter dated December 20, 2004 (ADAMS Accession No. ML050590017), which responded to the NRC staff SE of July 31, 2001, and submitted a revised version of BWRVIP-59 for NRC staff review. The NRC staff subsequently developed a second SE dated July 17, 2006 (ADAMS Accession No. ML062090298), which evaluated the revised BWRVIP-59 submitted on December 20, 2004. The NRC staff has reviewed the information in BWRVIP-59-A and has found that the topical report accurately incorporates, with one minor error, the relevant information which was submitted by the BWRVIP in the documents noted above to support NRC staff approval of the topical report. The NRC staff did identify a minor error in the labeling of two figures in BWRVIP-59-A, described in more detail below in the discussion of the revisions made to BWRVIP-59. The BWRVIP should ensure that this error is addressed appropriately in order to ensure proper application of this topical report. The NRC staff found that five revisions of modest scope were made to the 2004 version of BWRVIP-59 in the production of BWRVIP-59-A. These revisions are discussed in detail below.

The first revision to the 2004 version of BWRVIP-59 was that Section 3.2.4 of BWRVIP-59-A was revised to provide an explanation for the apparent discrepancy between Figure 3-15 and Figure E-35 of the 2004 version of BWRVIP-59. The text of BWRVIP-59-A explains that Figure 3-15 is the mirror image of Figure E-35, Run E, Section 4 of Appendix E of the report since the crack initiation can occur from either the top or bottom surface of Weld H9 depending on where the K distribution is higher. This explanation is inaccurate with respect to the actual text of BWRVIP-59-A. The comparison should be between Figures 3-15 and E-53 of BWRVIP-59-A, both of these figures representing the H9 Cut Line Residual Stresses Perpendicular to Cut Line (Run E). However, Figure 3-15 of BWRVIP-59-A is the mirror image of Figure E-35 of the 2004 version of BWRVIP-59. Figure E-35 of the 2004 version of BWRVIP-59 is now represented by Figure E-53 of BWRVIP-59-A. The text of BWRVIP-59-A, however, was not revised to reflect this fact. Therefore, the NRC staff accepts the explanation offered for the first revision contingent upon the BWRVIP issuing communication to all holders of BWRVIP-59-A identifying this error, or issuing a new revision to BWRVIP-59-A with the labeling error corrected.

The second revision to the 2004 version of BWRVIP-59 was that Figures 3-14 and 3-15 were updated to show third order polynomial fits to the stress distributions. The NRC staff finds this revision acceptable because the updates requested were provided.

The third revision to the 2004 version of BWRVIP-59 was that the text in Section 4.1 was revised to indicate that for Welds H8 and H9, the polynomial stress fits for the entire residual stress distribution were used with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, methodology to determine the through-wall K distribution. The NRC staff finds this revision acceptable because it addresses the NRC staff's request to update Figures 3-14 and 3-15.

The fourth revision to the 2004 version of BWRVIP-59 was that the text in Section 4.1 was revised to indicate that the K solutions for Welds H8 and H9 are limited to certain aspect ratios. Furthermore, the text of Section 4.1 was revised to indicate that for certain aspects ratios, a plant-specific analysis is required to calculate K, or that the bounding K-independent crack growth rates discussed in Sections 5 and 6 of BWRVIP-59-A must be used. The NRC staff finds that this revision is acceptable because it addresses limitations identified in the analyses of the 2004 version of BWRVIP-59.

The fifth revision to the 2004 version of BWRVIP-59 was that a new Section 5.7 was added to address the potential influence of fluence level on crack growth. The NRC staff finds that this revision is acceptable because it provides adequate data and analyses to justify the position that the fluence level at the shroud support plates are reasonably low and should not affect crack growth.

Based on the discussion above, the NRC staff has determined that the BWRVIP-59-A topical report is acceptable, provided that the BWRVIP adequately addresses the labeling error found in the first revision to the 2004 version of BWRVIP-59 described above.

Please contact Eric Bowman of my staff at (301) 415-2963 if you have any further questions regarding this subject.

Sincerely,

/RA/

Thomas B. Blount, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 704

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