December 9, 2011

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

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION APPROVAL LETTER WITH COMMENT FOR TECHNICAL REPORT BWRVIP-97-A, "BWR (BOILING WATER REACTOR) VESSEL AND INTERNALS PROJECT, GUIDELINES FOR PERFORMING WELD REPAIRS TO IRRADIATED BWR INTERNALS," ELECTRIC POWER RESEARCH INSTITUTE TECHNICAL REPORT 1015457 (TAC NO. ME3905)

Dear Mr. Czufin:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of Technical Report (TR) Boiling Water Reactor (BWR) Vessel Internals Project (BWRVIP)-97-A, "BWR Vessel And Internals Project, Guidelines for Performing Weld Repairs to Irradiated BWR Internals," Electric Power Research Institute TR-1015457. This report was submitted for NRC staff review and approval by letter dated February 1, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100350195).

The BWRVIP-97-A TR was submitted as a means of exchanging information with the NRC staff to support generic regulatory improvements related to the performance of weld repairs to irradiated BWR internals. BWRVIP-97-A provides a methodology to determine if the irradiated materials can be successfully repaired by using a suitable welding technique and provides guidance on the selection and use of a suitable welding technique for the repair/replacement of irradiated reactor vessel internals components.

BWRVIP-97-A presents a compilation of information from the following sources:

1. BWRVIP-97: BWR Vessel and Internals Project, Guidelines for Performing Weld Repairs to Irradiated BWR Internals, EPRI, Palo Alto, CA, 1019054, October 2009. (ADAMS Accession No. ML100350195)

2. Appendix A, Letter from Meena Khanna (NRC) to Carl Terry (BWRVIP Chairman), "Proprietary Request for Additional Information - Review of BWR Vessel and Internals Project Reports, BWRVIP-96, -97, -99, and -100 (TAC NOS. MB3947, MD3948, MB3951, and MB3946)," dated January 8, 2003. (ADAMS Accession No. ML030130330)

3. Appendix B, Letter from Stephanie M. Coffin (NRC) to William Eaton (BWRVIP Chairman), "Supplementary Request for Additional information – Review of BWR Vessel and Internals Project Report, BWRVIP-97, "Guidelines for Performing Weld Repairs to Irradiated BWR Internals," dated March 18, 2004. (ADAMS Accession No. ML040850345)

4. Appendix C, Letter from William A. Eaton (BWRVIP Chairman) to Meena Khanna, (NRC), “PROJECT NO. 704 - BWRVIP Response to NRC Request for Additional Information on BWRVIP-97," dated July 25, 2005. (ADAMS Accession No. ML052080227)

5. Appendix D, Letter from Matthew Mitchell (NRC) to William Eaton (BWRVIP Chairman), "Supplementary Request for Additional Information – Review of Boiling Water Reactor Vessel and Internals Project Report, "Guidelines for Performing Weld Repairs to Irradiated BWR Internals (BWRVIP-97)," TAC NO. MB3948, dated August 7, 2006. (ADAMS Accession No. ML062300251)

6. Appendix E, Letter from William A. Eaton (BWRVIP Chairman) to Matthew Mitchell (NRC), "Project 704 - BWRVIP Response to NRC Supplementary Request for Additional Information on BWRVIP-97," dated October 5, 2006. (ADAMS Accession No. ML062850108)

7. Letter from Mark Maxin (NRC) to Rick Libra (BWRVIP Chairman), "Safety Evaluation for Electric Power Research Institute (EPRI) Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) Report 1003020 (BWRVIP-97), "BWR Vessel and Internals Project, Guidelines for Performing Weld Repairs to Irradiated BWR Internals," TAC No. MC3948, dated June 30, 2008. (ADAMS Accession No. ML081680730)

The NRC staff has reviewed the information in BWRVIP-97-A and has found that the TR accurately incorporates, with one minor exception noted below, the relevant information in the documents noted above to support NRC staff approval of the TR. The NRC staff found in Appendix E that seven (7) revisions were made in the production of BWRVIP-97-A. These revisions are discussed in detail below:

The first revision was in Figure 4-1 of BWRVIP-97-A to change Figure 4-1 and add Figure 4-2 to provide separate plots for irradiated data and tritium decay data, respectively. These figures replace the existing Figure 4-1. The NRC staff finds this revision acceptable because the modification places the results in better context, one with only the data on the irradiated materials and one with the tritium-trick data.

The second revision was to reference American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-516-3, with associated limitations as described in

Regulatory Guide 1.147, Revision 16, in Section 5 of BWRVIP-97-A in lieu of ASME Code Case N-516-1, as referenced in BWRVIP-97. The NRC staff finds this revision acceptable because it the updates the ASME Code Case N-516-1 revision to the latest revision referenced in the latest Regulatory Guide.

The third revision was in Section 4.3 where a discussion of welding processes for which Figure 4-1 is applicable was added to Section 4.3. The NRC staff finds this revision acceptable since it clarifies the welding processes that apply to Figure 4-1.

The fourth revision was also in Section 4.3. This revision attempted to respond to item 3. in the conclusion to the staff's "Safety Evaluation by the Office of Nuclear Reactor Regulation, Boiling Water Reactor Vessel and Internals Project (BWRVIP) Report 1003020 (BWRVIP-97): BWR Vessel and Internals Project, Guidelines for Performing Weld Repairs to Irradiated BWR Internals" dated June 30, 2008. This item states, in part:

> "As a condition of NRC staff acceptance of BWRVIP-97, the BWRVIP should revise BWRVIP-97 to include following items…
>
> (3) Emerging information (when available) regarding the effect of dry or underwater welding on the mechanical properties of the irradiated stainless steel materials."

However the submittal fell short of this goal. In response to a Request for Additional Information on June 6, 2011 (ADAMS Accession No. ML111190576) on this subject, the BWRVIP submitted a letter on September 20, 2011(ADAMS Accession No. ML11264A155), which stated that:

> *"The BWRVIP agrees that this issue was not properly captured in the BWRVIP-97-A report. However, this discrepancy will in no way interfere with the proper application of the BWRVIP-97-A welding guideline by utilities. Rather than revising the current version of the report, the BWRVIP proposes to address this issue in the next revision of the report, possibly as early as 2012. It is likely that, by that time, the additional information regarding the comparison of in-air to underwater welding will be available and if so, it will be included in the report. If the information is not available at the time of the next revision, the following sentence will be added to the end of the second to last paragraph in Section 4.2.1:*
>
> > *"As it becomes available, additional information on the comparison of the welding threshold for in-air versus underwater welding will be included in a future revision of BWRVIP-97-A.""*

The NRC staff determined this response is acceptable because this discrepancy will not interfere with the proper application of the BWRVIP-97-A welding guideline by utilities. However, the BWRVIP is expected to revise the TR as stated above in the next revision.

The fifth revision was in Section 4.3 by stating that it will recommend surface examination or ultrasonic test (UT) examination for repair welds where possible. However, for some welds where the configuration makes UT examination infeasible (e.g., fillet welds), the BWRVIP recommends EVT-1 visual examination. The NRC staff finds this revision acceptable because it clarifies the inspection requirements for UT examination.

The sixth revision revised Section 3.1 to require the use of an appropriately benchmarked methodology for establishing the helium content by calculation. The NRC staff finds this revision acceptable because the BWRVIP determined that the simplified equations in the original version of BWRVIP-97 have been found to result, in some cases, in non-conservative estimates of the helium content. Therefore, Section 3.1 has been revised to require the use of an appropriately benchmarked methodology for establishing the helium content by calculation.

The seventh revision added a new paragraph, Section 1.3, “Implementation Requirements.” The NRC staff finds this revision acceptable because the new section clarifies the goals of the report; specifically the requirements of this report are "Needed" in terms of the Nuclear Energy Institute (NEI) 03-08, Guideline for the Management of Materials Issues when performing weld repairs to irradiated reactor internal components.

Based on the discussion above, the NRC staff has determined that the BWRVIP-97-A TR is acceptable with the understanding that in the next revision of the BWRVIP-97-A report will address the emerging information issue as discussed in the fourth revision above. Please contact my staff, Andrew Hon at (301) 415-8480, if you have any further questions regarding this subject.

Sincerely,

/RA/

Robert A. Nelson, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 704

cc: See next page

D. Czufin

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/RA/

Robert A. Nelson, Deputy Director
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Office of Nuclear Reactor Regulation

Project No. 704

cc: See next page

ADAMS ACCESSION NO.: ML112930082 **NRR-106**

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