

September 12, 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-181-A, "BWR VESSEL AND  
INTERNALS PROJECT, STEAM DRYER REPAIR DESIGN CRITERIA",  
ELECTRIC POWER RESEARCH INSTITUTE TECHNICAL REPORT 1020997  
(TAC NO. ME5553)

Dear Mr. Czufin:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of Technical Report (TR) Boiling Water Reactor Vessel Internals Project (BWRVIP)-181-A, "BWR Vessel and Internals Project, Steam Dryer Repair Design Criteria," dated October 31, 2010. This report was submitted for NRC staff review and approval by letter dated January 20, 2011.

The TR provides general design guidance and acceptance criteria for temporary and permanent repairs of existing steam dryers or steam dryer components and/or replacement steam dryers. The guidance is applicable to the repair of existing damage of steam dryers as well as to preemptive modifications to steam dryers in preparation for operation at higher power levels including extended power uprate (EPU) conditions.

The revision of this TR encompassed editorial changes, technical additions proposed by BWRVIP in response to an NRC Request for Additional Information (RAI), recommendations in the NRC safety evaluation (SE), and any necessary changes identified since the previous publication of the report.

By letter dated December 19, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML073551145), the BWRVIP submitted for the NRC staff review and approval the Electric Power Research Institute Technical Report (TR) 1013403, "BWR Vessel and Internals Project, Steam Dryer Repair Design Criteria (BWRVIP-181)." By letter dated September 10, 2008 (ADAMS Accession No. ML082321154), the NRC staff submitted a RAI regarding BWRVIP-181. By letter dated March 25, 2009 ADAMS Accession No. ML090890182), BWRVIP submitted it responses to the NRC staff's RAI.

By letter dated October 22, 2009 (ADAMS Accession No. ML092730195), an NRC draft SE regarding the approval of TR BWRVIP-181 was provided for review and comment. By letter dated December 2, 2009 (ADAMS Accession No. ML093380294), the BWRVIP commented on the draft SE.

By letter dated January 11, 2010 (ADAMS Accession No. ML093440308), the NRC issued the final SE for the BWRVIP -181 and determined it was acceptable for referencing in licensing documentation to the extent specified and under limitations delineated in the BWRVIP report and the SE. By letter dated January 20, 2011 (ADAMS Accession No. ML110240219), the BWRVIP submitted a revised version, BWRVIP-181-A, with changes incorporated by the responses by the BWRVIP to the NRC staff's RAI and recommendations in the NRC's SE. The submitted revision, BWRVIP-181-A, provided an expanded discussion of the safety implications of potential loose parts in the reactor vessel.

The NRC staff has reviewed the information in BWRVIP-181-A and has found that the report accurately incorporates the relevant information which was submitted by the BWRVIP in the documents noted above to support NRC staff approval of the TR. The NRC staff found that sixteen changes were made in the production of the TR BWRVIP-181-A. These changes are discussed in detail below.

The first change was the deletion of the reference to Figure 2-1 in the title of Figure 3-2 of TR BWRVIP-181-A related to a horizontal section through typical BWR steam dryer vane modules (dryer units) as part of RAI response #2 of 2009-118. The NRC staff finds this revision acceptable because the reference was deleted as requested.

The second change was to incorporate the meaning of the EDM acronym, which stands for electrical discharge machining, in Section 9.2.6 of TR BWRVIP-181-A for completion and accuracy of information. The NRC staff finds this revision acceptable because it clarifies the acronym used to describe EDM in TR BWRVIP-181-A.

The third change was to delete the caveat stated in Section 9.2.10 of TR BWRVIP-181-A, thus, allowing augmented inspections to be eliminated if a material can be shown to be in a compressive stress state. Augmented inspections are required whenever solution annealing cannot be performed. The NRC staff finds this revision acceptable because Section 9.2.10 of TR BWRVIP-181-A was revised to clarify the requirements needed for augmented inspections.

The fourth change was to add information to Section 3.1.2 of TR BWRVIP-181-A, stating the potential for steam flow velocities to continuously exceed 100 feet per second (30 m/second) in local areas, such as the steam outlet nozzles. The NRC staff finds this revision acceptable because the statement has been incorporated to the Section 3.1.2 of TR BWRVIP-181-A, thus, providing additional information that clearly states the potential for exposure to high velocities in localized areas.

The fifth change was to clarify the importance of acoustic loading and the potential it has to create alternating stress that can exceed fatigue limits during normal operation. The NRC staff finds this revision acceptable because it provides useful information that was incorporated in TR BWRVIP-181-A.

The sixth change was to modify Section 3.3 of TR BWRVIP-181-A to clearly state all the load cases that are to be analyzed for Category A repairs. In addition, the section was revised to clarify that a detailed structural analysis is not required for Category A repairs. The NRC staff finds this revision acceptable because the load cases to be analyzed for Category A repairs have been clearly stated.

The seventh change was to modify Section 4.1 of TR BWRVIP-181-A in order to clarify the loads that should be used if dryer operation at an EPU is anticipated. The NRC staff finds this revision acceptable because the information requested was incorporated.

The eighth change was to modify Section 5.1 of TR BWRVIP-181-A in order to clarify why there is no specific design life for Category A repairs. This is due to the fact that since a Category A repair essentially returns the dryer to its original condition, the design life will be the same as the original dryer under current loading conditions. The NRC staff finds this revision acceptable because the information requested was incorporated.

The ninth change was to add information to Section 6 of TR BWRVIP-181-A in order to provide an elaborate discussion on how to use the best available information in defining dryer loads. The NRC staff finds this revision acceptable because the information requested was incorporated.

The tenth change was to review the loads and load combinations in Section 7.3 of TR BWRVIP-181-A that are used to analyze reactor internals. The NRC staff finds this change acceptable because the load combinations were revised and updated.

The eleventh change was to clarify the loads that should be used if dryer operation at an EPU is anticipated. Consideration of Flow Induced Vibration loads, as in the case of a Category C repair, shall be given in the design. The NRC staff finds this revision acceptable because the information requested was incorporated.

The twelfth change was to provide guidance in Section 5.8 of TR BWRVIP-181-A regarding the repair of potential damage that may occur during replacement installation or repair of a dryer. The NRC staff finds this revision acceptable because the information requested was incorporated.

The thirteenth change was to modify Section 13.2 of TR BWRVIP-181-A to include discussion of the different methods of acoustic resonance mitigation. The NRC staff finds this revision acceptable because the information requested was incorporated.

The fourteenth change was to clarify the term "leave as is" in Section 13.1.5 of TR BWRVIP-181-A. The use of this approach has been explained to detail the flaws that are acceptable to be left in place. The NRC staff finds this revision acceptable because the information requested was incorporated.

The fifteenth change was to modify Sections 6 and 10.2 and Table 6-1 of TR BWRVIP-181-A to state the appropriate inspections to be performed for specific hardware/components as part of the American Society of Mechanical Engineers (ASME) code design guidance. The NRC staff finds this revision acceptable because the information requested was incorporated.

The sixteenth change was to revise Section 10.2 of TR BWRVIP-181-A to clarify that periodic, ongoing inspections are to be performed in accordance with BWRVIP-139 once the fabrication/construction examinations of Subsection NG of ASME Code, Section III, have been satisfactorily completed. The NRC staff finds this revision acceptable because the information requested was incorporated.

D. Czufin

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Based on the discussion above, the NRC staff has determined that the BWRVIP-181-A Technical Report is acceptable. Please contact my staff, Andy 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

- 4 -

Based on the discussion above, the NRC staff has determined that the BWRVIP-181-A Technical Report is acceptable. Please contact my staff, Andy Hon at (301) 415-8480, if you have any further questions regarding this subject.

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**/RA/**

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**ADAMS ACCESSION NO.: ML11231A924**

**NRR-106**

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