

July 18, 2013

Mr. W. Anthony Nowinowski, PWR Owners Group, Program Manager  
Westinghouse Electric Company LLC, Suite 380,  
1000 Westinghouse Drive  
Cranberry Township, Pennsylvania 16066

Dear Mr. Nowinowski:

In a letter dated May 23, 2013, the pressurized water reactor owners' group (PWROG) provided a letter titled "NRC [Nuclear Regulatory Commission] Technical concerns Regarding Boric Acid Precipitation in the Presence of In-Vessel Fibrous Debris and the Consequential Effects on Long-Term Core Cooling (PWROG PA-SEE-1090 and PA-SEE-1072)." That letter covered several topics related to boric acid precipitation (BAP) as it relates to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents and Pressurized-Water Reactors." The impetus for the letter was the staff decision to require plants that do not meet the fiber limits in WCAP-16793-NP, Revision 2, to address BAP at the same time they attempt to justify higher in-vessel debris limits for GL 2004-02. Previously, the staff had agreed to keep these issues separate in order to facilitate resolution of both. The PWROG asked for the NRC staff's response to the problem statement regarding the technical concerns. The staff suggests a clarification as discussed in the enclosure to this letter.

The PWROG also provided its justification for allowing all plants, not just low fiber plants, to close GL 2004-02 before the BAP program is completed. NRC staff and industry agreed to a meeting at Westinghouse's Cranberry offices to discuss the technical issues and methods for resolving them. Based on the proprietary nature of much of the technical information, the staff will meet with PWROG and Westinghouse in Cranberry in a closed meeting. However, the staff will set up an open public meeting, after the Cranberry visit, to discuss the technical issues and any decisions regarding resolution of BAP and GL 2004-02.

If you have questions on this issue, please contact Stewart Bailey, Chief of the Safety Issues Resolution Branch, at 301-415-1321 or [Stewart.Bailey@nrc.gov](mailto:Stewart.Bailey@nrc.gov).

Sincerely,

*/RA/*

Jack R. Davis, Deputy Director  
Division of Safety Systems  
Office of Nuclear Reactor Regulation

Enclosure  
Boric Acid Precipitation Problem Statement

Mr. W. Anthony Nowinowski, Program Manager  
PWR Owners Group, Program Management Office  
Westinghouse Electric Company LLC  
Suite 380, 1000 Westinghouse Drive  
Cranberry Township, Pennsylvania 16066

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Sincerely,  
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Jack R. Davis, Deputy Director  
Division of Safety Systems  
Office of Nuclear Reactor Regulation

Enclosure  
Boric Acid Precipitation Problem Statement

Accession Number:ML13197A403

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## **Boric Acid Precipitation Problem Statement**

The PWROG sought confirmation from the NRC staff that the following problem statement clearly reflects the central issues associated with BAP and GL 2004-02:

“The NRC approval of WCAP-16793-NP Revision 2 stipulated that consideration of the effects of in-vessel debris on long term cooling following a loss of coolant accident will include the effects associated with boric acid precipitation. Testing and analyses intended to demonstrate the adequacy of long term core cooling will address the localized coolant flow and mixing of boric acid solutions. This is an inter-disciplinary approach in order to fully understand the phenomena. The resequencing of the GSI-191 and boric acid programs needs to consider the timing and effects of the debris and chemicals to determine the debris bed development versus time, the impact of the debris bed on the core inlet flow, and the impact of the alternate flow paths on the local flow mixing as it relates to BAP.”

In the staff's view, the above problem statement generally captures the technical question about how in-vessel debris impacts the timing of the onset of BAP, but the scope should be expanded to include the effectiveness of the BAP control measures in the presence of in-vessel debris. The staff notes that Attachment 1 to the May 23, 2013, letter mischaracterizes the staff's position. Attachment 1 states:

“In the Safety Evaluation (SE) to WCAP-16793-NP Revision 2, debris-related BAP issues were integrated into the overall resolution of GSI-191. Plants with less than 15 grams of fibrous debris reaching the core per fuel assembly (15 g/FA) would not need to address BAP issues due to insufficient debris quantities, but those seeking higher limits would need to integrate BAP into their resolution plan.”

It would be more accurate to state:

“In the Safety Evaluation (SE) to WCAP-16793-NP Revision 2, debris-related BAP issues were integrated into the overall resolution of GSI-191. Plants with less than 15 grams of fibrous debris reaching the core per fuel assembly (15 g/FA) would not need to address BAP issues during the resolution of GL 2004-02 due to ~~insufficient~~ low debris quantities, but those seeking higher limits would need to integrate BAP into their GL 2004-02 resolution plan.”

The clarification relates to the timing of licensees' evaluations. The staff's position is that plants with less than 15 g/FA (i.e., plants that meet the conditions of WCAP-16793 Revision 2) can close GL 2004-02 before they have completed the evaluation of how in-vessel fiber would affect BAP control measures, due to the low amount of debris.

ENCLOSURE.

As discussed in the SE, fuel assembly testing at cold leg flow conditions and low debris amounts did not exhibit a noticeable head loss, indicating that fiber beds will be minimal if a plant meets the conditions in the SE. However, the phenomena governing adequate flow into the core differ somewhat from those that control the boron mixing and diffusion process. The impact of fiber – even low amounts of fiber - on BAP has not been quantified and is one of the technical issues that is being addressed by the PWROG's ongoing BAP program. The staff expects the results of the BAP program to be applied to plants' licensing bases when those results are available. The staff expects plants with higher debris amounts to consider BAP as part of GL 2004-02 closeout because it is more likely for them to require debris-related modifications (e.g., strainer modifications) to recover margin in the BAP analyses.

The staff and the PWROG had discussed whether the SE for WCAP-16793 Revision 2 should be revised to clarify the above staff position. Based on the above discussion, the ongoing work, and the upcoming meetings, the staff does not believe a revision to the SE is necessary.