

January 8, 2014

Mr. Jack Stringfellow
Pressurized Water Reactors Owners Group
Program Management Office
Westinghouse Electric Company LLC
1000 Westinghouse Drive, Suite 380
Cranberry Township, Pennsylvania 16066

Dear Mr. Stringfellow:

The U.S. Nuclear Regulatory Commission (NRC) staff has considered your request to endorse the Westinghouse position paper entitled "Westinghouse Response to NRC Generic Request for Additional Information (RAI) on Boron Mixing in Support of the Pressurized Water Reactor Owners Group (PWROG)," made available in your letter dated August 16, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13235A135 (the enclosure is being withheld from public disclosure for proprietary reasons)).

The NRC is currently evaluating the licensees' mitigation strategies and providing written interim staff evaluations for each affected licensee by February 2014, to provide regulatory certainty to the industry with respect to whether their proposed actions provide a reasonable path for compliance with Order EA-12-049, "Order to Modifying Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). An important aspect of the mitigation strategies is to determine whether or not licensees' determination of the overall sequence of events, timing of those events, and phenomena affecting those events, appear reasonable. Information on the boron mixing model during an extended loss of alternating current power (ELAP) was submitted for NRC review. This model is used to show that during an ELAP, the mitigation strategies that use this model provide reasonable assurance that re-criticality will not occur.

The NRC has reviewed the information submitted to date and have concluded that use of the industry approach dated August 15, 2013, is acceptable with the following clarifications:

- (1) The required timing for providing borated makeup to the primary system should consider conditions with no reactor coolant system leakage and with the highest applicable leakage rate for the reactor coolant pump seals and unidentified reactor coolant system leakage.
- (2) For the condition associated with the highest applicable reactor coolant system leakage rate, two approaches have been identified, either of which is acceptable to the staff:
 - a. Adequate borated makeup should be provided such that the loop flow rate in two-phase natural circulation does not decrease below the loop flow rate corresponding to single-phase natural circulation.
 - b. If loop flow during two-phase natural circulation has decreased below the single-phase natural circulation flow rate, then the mixing of any borated primary

makeup added to the reactor coolant system is not to be credited until one hour after the flow in all loops has been restored to a flow rate that is greater than or equal to the single-phase natural circulation flow rate.

- (3) In all cases, credit for increases in the reactor coolant system boron concentration should be delayed to account for the mixing of the borated primary makeup with the reactor coolant system inventory. Provided that the flow in all loops is greater than or equal to the corresponding single-phase natural circulation flow rate, the staff considers a mixing delay period of one hour following the addition of the targeted quantity of boric acid to the reactor coolant system to be appropriate.

If you have any questions concerning this report, please contact Sheena Whaley, of my staff, at (301) 415-0213, or via email to sheena.whaley@nrc.gov.

Sincerely,

/RA/

Jack Davis, Director
Mitigating Strategies Directorate
Office of Nuclear Reactor Regulation

Cc: Mr. Joseph E. Pollock, Vice President
Nuclear Operations
Nuclear Energy Institute
1201 F Street NW, Suite 1100
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makeup added to the reactor coolant system is not to be credited until one hour after the flow in all loops has been restored to a flow rate that is greater than or equal to the single-phase natural circulation flow rate.

- (4) In all cases, credit for increases in the reactor coolant system boron concentration should be delayed to account for the mixing of the borated primary makeup with the reactor coolant system inventory. Provided that the flow in all loops is greater than or equal to the corresponding single-phase natural circulation flow rate, the staff considers a mixing delay period of one hour following the addition of the targeted quantity of boric acid to the reactor coolant system to be appropriate.

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