November 2, 2000

Mr. Henry A. Sepp, Manager
Regulatory and Licensing Engineering
Nuclear Services Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355

SUBJECT: POTENTIAL NON-CONSERVATIVE MODELING IN APPROVED EVALUATION MODELS

References:
1. Letter from H. A. Sepp (Westinghouse Electric Company LLL, NSBU-00-5970) to U.S. Nuclear Regulatory Commisison (J. Wermiel), "1999 Annual Notification of Changes to the Westinghouse Small Break LOCA and Large Break LOCA ECCS Evaluation Models, Pursuant to 10 CFR 50.46(a)(3)(ii)," May 12, 2000.

2. Memorandum from L. Raynard Wharton, Project Manager, Section 2, PDIV&2, to Stuart A. Richards, Director, PDIV&D, "Summary of Meeting Held on August 11, 2000, with Westinghouse Electric Company (W) to Discuss Downcomer Boiling," October 17, 2000.

3. Schoff, Richard, FAX to Warren Lyon (NRC) per his request at the August 11, 2000, meeting, August 21, 2000.

Dear Mr. Sepp:

We request that you respond to a recently identified potential nonconservatism in the accepted Westinghouse analytical model used for licensing analyses of emergency core cooling system performance. As you are aware, 10 CFR 50.46 requires licensees to calculate emergency core cooling system performance for a range of postulated loss of coolant accidents (LOCAs) using an acceptable evaluation model (EM). Licensees may use either a realistic EM as described in 10 CFR 50.46(a)(1)(i) or an applicable enveloping EM that meets the required and acceptable features of 10 CFR Part 50, Appendix K. Realistic EM calculations must account for calculation uncertainty to demonstrate with a high level of probability that the criteria of 10 CFR 50.46(b) are not exceeded. The Appendix K EM is based on a bounding approach using conservative input values and modeling assumptions to ensure that the overall conservatism of the calculation will account for modeling weaknesses when determining compliance with the criteria of 10 CFR 50.46(b). In both cases, licensees are required to perform calculations over a sufficient range of conditions to provide assurance that the most severe postulated LOCAs are calculated.

As a result of information that we have recently received, concerns were raised regarding the continued technical adequacy of the currently approved Westinghouse (W) EM (References 1 - 3) and its continued conformance to the requirements of 10 CFR 50.46 and Appendix K. In Reference 1, Westinghouse reported that analyses using its approved Appendix K EM "... predicted downcomer (DC) boiling to occur before the cladding temperature

and/or oxidation transients have been conclusively terminated." In Reference 2, W reported that a peak clad temperature (PCT) of ~2070°F was predicted at ~280 sec, and the calculation stopped at 295 sec when DC boiling was predicted to initiate. A W-developed extrapolation technique was used to predict reactor vessel fluid behavior following initiation of DC boiling. Using this method, after the approved EM calculations had terminated, W predicted that further PCT increase would be insignificant, but significant additional cladding oxidation was predicted. In one case, an additional oxide thickness of about 40 percent was predicted; in another case, the additional oxide thickness was about 80 percent (Reference 3). A realistic calculation for an ice condenser plant indicated that DC boiling initiated at about 100 seconds and the PCT increase attributable to DC boiling was about 400°F (Reference 2). This indicates that predicted PCT and completion of oxidation may occur beyond the time addressed by the approved W Appendix K EM and DC boiling may be a larger contributor to PCT uncertainty than the 20 percent decay heat increase required by Appendix K.

This behavior appears to originate from the choice of downcomer noding and fluid flow modeling in combination with heat transfer from the reactor vessel, thermal shield, and core former structures. Similar phenomena appear likely in the lower plenum because of the large metal mass and heat transfer surface area associated with the reactor vessel and core structural supports, but we have not seen any analyses that assessed this situation. Non-conservative predictions may also result from accumulator injection calculations under some circumstances.

The recent discovery of the downcomer boiling issue, the potential for a lower plenum non-conservatism, and the potential for other unrecognized nonconservatisms may represent an erosion of the predictive margin required by 10 CFR 50.46. Consequently, the potential impact of nonconservatisms needs to be assessed. Therefore, we request that W provide an assessment of these issues and their implications for their approved EMs. In addition, if changes to the approved methodology are necessary, W should provide a plan and schedule for remedial action to ensure continued compliance with the requirements of 10 CFR 50.46.

Sincerely,
/RA/

Stephen Dembek, Chief, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 700

cc: Mr. Andrew Drake, Project Manager
Westinghouse Owners Group
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Mr. Jack Bastin, Director
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