

November 22, 2002

Mr. H. A. Sepp  
ATTN: Mr. John DeBlazio  
Manager, Regulatory  
and Licensing Engineering  
Westinghouse Electric Company, LLC  
P. O. Box 355  
Pittsburgh, PA 15230-0355

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING "TOPICAL REPORT ON MODULAR ACCIDENT ANALYSIS PROGRAM VERSION 5 (MAAP5) PRESSURIZED WATER REACTOR (PWR) LARGE DRY CONTAINMENT MODEL," WCAP-15844 (TAC NO. MB4716)

Dear Mr. Sepp:

By letter dated April 1, 2002, Westinghouse Electric Company (W) submitted WCAP-15844, "Topical Report on Modular Accident Analysis Program Version 5 (MAAP5) Pressurized Water Reactor (PWR) Large Dry Containment Model," for Nuclear Regulatory Commission (NRC) staff review and approval. The NRC staff's review of WCAP-15844 is being conducted in parallel with the NRC staff's review of an associated amendment request from FirstEnergy Nuclear Operating Company (FENOC) dated June 5, 2002, to allow plant operation of the Beaver Valley Power Station, Unit Nos. 1 and 2 (Beaver Valley), with containments at atmospheric pressure.

The NRC staff has conducted an initial review of your submittal and we have determined that additional information is required in order for the NRC staff to complete its review. Enclosed is the NRC staff's RAI associated with your topical report. These questions were discussed in a joint conference call with representatives from FENOC and W on November 6, 2002. A separate RAI is also being sent to FENOC regarding their plant-specific application to convert the Beaver Valley containments to operation at atmospheric pressure.

H. Sepp

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The staff of Beaver Valley has proposed that a joint meeting with the NRC and W be held at NRC headquarters on December 10, 2002, to discuss the NRC staff's questions. That date is tentative and is contingent upon the NRC staff receiving docketed responses to this RAI, and the RAI being sent to FENOC, at least 7 days prior to the meeting. If you have any questions, please contact me at 301-415-1427.

Sincerely,

*/RA/*

Daniel S. Collins, Project Manager, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Project No. 700  
Docket Nos. 50-334 and 50-412

Enclosure: RAI

cc w/encl: See next page

H. Sepp

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

WESTINGHOUSE ELECTRIC COMPANY

BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2

REQUEST TO ALLOW PLANT OPERATION WITH ASSOCIATED

CONTAINMENT AT ATMOSPHERIC PRESSURE

The U.S. Nuclear Regulatory Commission (NRC) staff, with support from its contractor, is reviewing WCAP-15844, "Topical Report on Modular Accident Analysis Program Version 5 (MAAP5) Pressurized Water Reactor (PWR) Large Dry Containment Model," which was submitted for NRC review by letter dated April 1, 2002. The NRC's review of WCAP-15844 is being conducted in parallel with the NRC staff's review of an associated amendment request from FirstEnergy Nuclear Operating Company (FENOC) dated June 5, 2002, to allow plant operation of the Beaver Valley Power Station, Unit Nos. 1 and 2 (BVPS-1 and 2), with containments at atmospheric pressure.

The following questions and concerns regarding WCAP-15844 require clarification or additional information in order for the NRC staff to complete its review. The discussion items here do not represent an exhaustive list since the review of the associated BVPS-1 and 2 calculations and MAAP5 code is currently in progress. For the purpose of organization, the items are listed under general and clarification headings.

**1.0 MAAP5 Topical Report**

1.1 General Items

1. Have the new MAAP5 general containment models (GCMs) and validation of those models been independently reviewed? What is the technical review process for new modeling in the MAAP code?
2. Have descriptions of the new MAAP5 general containment models and validation been published in any Journals or Conference papers? Has there been a peer review of these models?
3. How will documentation of the new MAAP5 GCM be presented in the Modular Accident Analysis Program (MAAP) manuals? Will the topical report be absorbed into the manual set?
4. What uncertainties (modeling or input parameters) associated with a) mixed and forced convection condensation, b) momentum-driven velocity, and c) water entrainment have been identified through separate effects tests?
5. Does the term "momentum-driven velocity," as calculated in the MAAP code, have a definition that would allow measurement and/or validation of the momentum velocity model equations? In other words, is the momentum-driven velocity a physical quantity or an abstraction?

1.2 Clarification Items

Enclosure

1. How does an empirical calibration of the natural convection condensation model (improved MAAP5 condensation) apply to other modes of condensation, such as mixed or forced convection condensation?
2. Why were no forced convection condensation separate effects tests used in the validation of the improved MAAP condensation modeling?
3. What is the source of the apparent modeling error in the Modular Accident Analysis Program Version 4 condensation model as indicated in the Dehbi tests? Discuss usage of a sensible heat transfer Grashof number (using temperature differences) vs. a composition Grashof number using density differences. Why is a sensible heat transfer Grashof number used for steam condensation in the presence of noncondensable gases?
4. What is the justification for using the Dittus-Boelter equation (duct internal flow) for turbulent convection within confined enclosures?
5. What is the justification for using the Dittus-Boelter or any other one-dimensional heat transfer correlation with the "momentum-driven velocity" derived as having a property value with no directional dependence? Same question for entrainment correlations?
6. What is the technical basis for a momentum balance constructed using scalar forces and non-directional momentum influx terms? Isn't the classical momentum balance equation a vector equation? Where in the technical literature does one find a similar equation or momentum defined as a fluid property that can be transported as such? Can one transport momentum with an inter-compartment velocity that is significantly different in value than the momentum-driven velocity?
7. Are the FFMULT and FCOND pessimistic, realistic, and optimistic values used for the Carolinas and Virginia Test Reactor (CVTR) calculations those values defined on page 8-6 and 7 of the Topical?
8. To what degree does water entrainment enter into the CVTR calculation? Provide a water entrainment time history profile in compartments for test 3.
9. It appears that Fauske & Associates, Inc. is using the CVTR test 3 measured velocity as a partial validation of the "momentum-driven velocity" model. However, measurements (both direct and indirect), as well as published CFD calculations for test 3, all indicate that the peak wall velocity is 5-6 times lower than calculated using MAAP. Further, the annular gap velocity calculated by MAAP is approximately twice the value reported in the CVTR final report. Please comment. What additional, direct validation of calculated momentum-driven velocity has been obtained (other than CVTR) through the 5SSTAR process?
10. Provide a comparison of CVTR heat plug 2 heat transfer coefficients calculated for the MAAP uncertainty parameters.

Beaver Valley Power Station, Units 1 and 2

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