March 23,2007

Mr. Gordon Bischoff, Manager
Owners Group Program Management Office
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RE: PRESSURIZED WATER REACTOR OWNERS GROUP TOPICAL REPORT (TR) WCAP-16530-NP, "EVALUATION OF POST-ACCIDENT CHEMICAL EFFECTS IN CONTAINMENT SUMP FLUIDS TO SUPPORT GSI-191" (TAC NO. MD1119)

Dear Mr. Bischoff:

By letter dated March 27, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML060890501) and as supplemented by letter dated November 21, 2006 (ADAMS Accession No. ML063390128), the Pressurized Water Reactor Owners Group (PWROG), submitted for U.S. Nuclear Regulatory Commission (NRC) staff review TR WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191." Upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. On March 20, 2007, Mr. Thomas Laubham, Program Manager, and I agreed that the NRC staff will receive your response to the enclosed Request for Additional Information (RAI) questions by April 6, 2007. If you have any questions regarding the enclosed RAI questions, please contact me at 301-415-1842.

Sincerely,

/RA/

Sean E. Peters, Senior Project Manager
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure: RAI questions

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT WCAP-16530-NP, "EVALUATION OF POST-ACCIDENT CHEMICAL EFFECTS IN CONTAINMENT SUMP FLUIDS TO SUPPORT GSI-191"

PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG)

PROJECT NO. 694

Note: References to a Request for Additional Information (RAI) number below refer to the RAI number in the U.S. Nuclear Regulatory Commission (NRC) letter to the PWROG dated October 4, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML062440433) and in the PWROG response letter dated November 21, 2006 (ADAMS Accession No. ML063390128).

1. Your response to RAI #10 appeared to address the multi-part question except for the last part. Please respond to the following questions. Is it plausible for a containment pool at higher pH (e.g., 9 pH) to move a pH unit or more lower due to formation of nitric or hydrochloric acid after an accident? If so, why was no testing performed by adjusting pH from a higher value to a lower value?

2. The response to RAI #13 indicated that data supporting a conclusion that insignificant chloride leaches from coatings was previously provided to the NRC and a reference was provided to a facsimile transmitted from the NRC staff to a coatings industry representative. The referenced data sheets from Keeler and Long/PPG Industries and Carboline Company, however, do not provide sufficient detail to fully respond to RAI #13. For instance, RAI #13 requested an estimate of chloride in the post-loss-of-coolant accident (LOCA) containment pool from leaching of containment materials (e.g., coatings).

   Note: this topic was discussed during the February 8, 2007, public meeting on Generic Safety Issue 191 (GSI-191). The PWROG indicated that it would respond to NRC staff questions about potential interactions between coatings and chemical effects. If a separate response is provided to the NRC staff that addresses the question above, it will be sufficient to provide a reference to that response instead of repeating the information in the RAI response.

3. The reference provided in response to RAI #14, "The Chemistry of Fuel Crud Deposits and Its Effect on AOA (Axial Offset Anomaly) in PWR Plants," provides the basis for the response that 12 to 25 kilograms of crud material represents the upper bound of what could be released during a large-break LOCA. Table 3 in the above reference, under the "Polley/Pick Plant Analysis" column, indicates a total oxide on stainless steel in the range of 2 to 11 kilograms. Should this value be added to the 12 to 25 kilograms oxide on Inconel® to estimate the total amount of corrosion product that could be released

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from the internal surfaces of the reactor coolant system during a LOCA? Discuss how these oxides may affect the sump strainer. The previous response to RAI #15 indicated that this particulate will be dense and tend to settle. Estimate the percentage of these oxides that may be transported to the strainer and the possible impact on head loss.

4. RAI #15 addressed potential effects from the release of radioactive species during the LOCA and their subsequent affect on the containment pool chemistry. Discuss the possible effects from radiolysis of water within the containment pool and reactor vessel that could modify the reduction potential (i.e., redox potential) of the water depending on the relative amounts of H_2, O_2, and H_2O_2 produced. This could potentially alter corrosion rates, chemical speciation, and the solubility of compounds. Discuss the basis for not needing to account for radiological effects in the chemical model.

5. The response to RAI #16 indicated that the dissolution behavior of concrete is expected to be consistent among U.S. pressurized water reactor (PWR) sites. The response appeared to address the question except for the following. Please provide the composition and applicable specifications for the concrete tested. Was the concrete tested representative of concrete in the U.S. PWR plants?

6. In the October 4, 2006, NRC letter, RAI #23 and RAI #25 were related to WCAP-16530-NP Equation 6-1 and Equation 6-2 aluminum release rates, respectively. In particular, the NRC staff questioned whether there might be a better fit to the aluminum corrosion rate data. In response to RAI #24, a corrected value was provided for the “B” coefficient in Equation 6-1 and it was stated that Equation 6-1 was not used in the chemical model. RAI #24 discussed the corrosion of aluminum during the Integrated Chemical Effect Test 1 (ICET 1) that appeared to occur in stages. The initial ICET 1 corrosion rate (i.e., during the initial 10 days of testing) appears to be approximately 30 mg/m2-min. Following an initial linear rate of aluminum dissolution, the corrosion rate appears to decrease and eventually the dissolved aluminum measurements seem to indicate some type of aluminum coupon passivation. Please provide a table that evaluates the following coefficients (relative to Equation 6-2) for fit to the WCAP data and for the initial 15 days of ICET 1. Discuss whether the coefficients in Equation 6-2 or the coefficients below would be more appropriate for the aluminum release rate in the chemical model.

   a = 12.950
   b = 0.540
   c = -4.467
   d = 0.014
   e = -1.413

7. The response to RAI #47 addresses the one hour settling volume of surrogate precipitates. Please address the final part of RAI #47, i.e., discuss how consistency in surrogate settling data interpretation and settling test technique are maintained between these tests and those that may be performed by strainer vendors. In addition, discuss whether any changes have been made or are planned to the surrogate settlement acceptance criteria considering the recent observations made at a vendor facility that showed aged surrogate met the settlement criteria but apparently underwent physical changes that affected head loss.

8. The response to several RAI's (e.g., RAI #29, RAI #43) indicate that the surrogate materials were chosen to be representative of the settling and filtration characteristics of precipitates that may form in prototypical plant conditions. Therefore, exact chemical identification of the precipitates that formed during the WCAP-16530-NP testing was not necessary. In the event that future tests are performed to support removing some of the model's conservative assumptions, for example that all dissolved material precipitates, it is important to understand the nature of the precipitate (e.g., boron adsorption affects the structure of amorphous aluminum hydroxide which affects solubility). Therefore, discuss if you have plans to more fully characterize precipitate chemistry to support future model refinements.

cc:
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