Jeff Ciocco

From: Jeff Ciocco
Sent: Thursday, July 31, 2008 10:50 AM
To: us-apwr-rai@mhi.co.jp
Cc: Jeffrey Poehler; David Terao; Larry Burkhart; Jin Chung; Ruth Reyes; Harrison Botwin
Subject: US-APWR Design Certification Application RAI No. 45-876
Attachments: US-APWR DC RAI 45 CIB1 876 _2_.pdf

MHI,

Attached please find the subject request for additional information (RAI). This RAI was sent to you in draft form. The schedule we are establishing for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule. Please submit your RAI response to the NRC Document Control Desk.

Thanks,

Jeff Ciocco
Office: T-7F14
New Reactor Licensing
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2739
301.415.6391
jeff.ciocco@nrc.gov

REQUEST FOR ADDITIONAL INFORMATION NO. 45-876 REVISION 0

7/31/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 06.02.02 - Containment Heat Removal Systems

Application Section: 6.2.2

CIB1 Branch

QUESTIONS

06.02.02-1

Generic Safety Issue (GSI) 191 addresses the potential for debris accumulation on PWR sump screens to affect emergency core cooling system (ECCS) pump net positive suction head margin. The NRC has issued Bulletin 2003-01, "Potential Impact of Debris Blockage On Emergency Sump Recirculation At Pressurized Water Reactors," and Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," related to the GSI-191 resolution. GL 2004-02 requests, in part, that licensees evaluate the maximum head loss postulated from debris accumulation (including chemical effects) on the submerged sump screen. Chemical effects are corrosion products, gelatinous material, or other chemical reaction products that form as a result of interaction between the PWR containment environment and containment materials after a loss-of-coolant accident (LOCA).

To satisfy the requirements of GDC 38 and 10 CFR 50.46(b)(5) regarding the long-term spray system(s) and ECCS(s), the containment emergency sump(s) in PWRs and suppression pools in BWRs should be designed to provide a reliable, long-term water source for ECCS and CSS pumps. In order to meet these regulatory criteria, SRP Section 6.2.2, "Containment Heat Removal Systems," recommends following the guidance of Regulatory Guide 1.82, Revision 3, as an acceptable method. For PWR plants, RG 1.82 Rev. 3 recommends that chemical effects be considered in any analyses of head loss.

To satisfy the requirement for an evaluation of chemical effects, MHI submitted its test plan for evaluation of chemical effects on sump strainer performance in MUAP-8006-P, "US-APWR Sump Debris Chemical Effects Test Plan," dated June 2008 (Reference 1). The test plan will use a similar methodology to the Integrated Chemical Effects Tests (ICET) documented in NUREG/CR-6914, using materials, buffer, and simulated post-LOCA environment representative of the US-APWR design.

The most recent NRC staff guidance for evaluation of chemical effects on sump strainer performance is contained in "NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Plant-Specific Chemical Effect Evaluations" , dated March 2008, (Reference 2).

Reference 2 recommends that coating materials be listed among the plant-specific materials to be included in the chemical effects evaluation. However, the test plan does not include any coatings materials among the materials to be included in the test, listed in Table 3.1-2. The US-APWR DCD, Section 6.1.2, does indicate that the containment liner will be coated with an inorganic zinc primer with an epoxy topcoat. It is not clear whether the contribution from the inorganic zinc primer will be represented by the "zinc-coated steel" surface area listed in Table 3.1-2. Also, no epoxy coatings materials are included in Table 3.1-2.

Therefore, the staff requests the following information:

1. Is the zinc in the inorganic zinc primer included as part of the zinc coated steel surface area in Table 3.1-2 of the test plan? If not, how will the inorganic zinc primer be accounted for in the chemical effects test?
2. Why is the epoxy paint, or any other organic coating material, not included in the chemical effects testing?

References

1. MUAP-8006-P, "US-APWR Sump Debris Chemical Effects Test Plan (R0)" dated June 2008, ADAMS Accession No. ML081850510
2. NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Plant-Specific Chemical Effect Evaluations, dated March 2008, ADAMS Accession No. ML080380214," Enclosure 3 to letter from William H. Ruland, NRC, to Anthony Pietrangelo, NEI, dated March 28, 2008, Subject "Revised Guidance For Review Of Final Licensee Responses To Generic Letter 2004-02, "Potential Impact Of Debris Blockage on Emergency Recirculation During Design Basis Accidents At Pressurized-Water Reactors"," ADAMS Accession No. ML080230112
3. NUREG/CR-6877, "Characterization and Head-Loss Testing of Latent Debris from Pressurized-Water-Reactor Containment Buildings," July 2005

06.02.02-2

RG 1.82 Rev.3, Section 1.3.2.5 states that the cleanliness of the containment during plant operation should be considered when estimating the amount and type of debris available to block the ECC sump screens. The potential for such material (e.g., thermal insulation other than piping insulation, ropes, fire hoses, wire ties, tape, ventilation system filters, permanent tags or stickers on plant equipment, rust flakes from unpainted steel surfaces, corrosion products, dust and dirt, latent individual fibers) to impact head loss across the ECC sump screens should also be considered. NUREG/CR-6877, "Characterization and Head-Loss Testing of Latent Debris from Pressurized-Water-Reactor Containment Buildings," (Reference 3) provides further definition of latent debris as debris that is already present and that resides inside the containment structure before a postulated loss-of-coolant accident (LOCA) occurs (as opposed to debris that is generated by the LOCA). NUREG/CR-6877 also states that examples of latent debris include ordinary dust and dirt, insulation fibers, clothing fibers, paper fibers, pieces of plastic, metal filings, paint chips, human hair, and anything else that may reside on a

floor or other surface inside an industrial building. Reference 2 recommends that latent debris be considered in plant-specific chemical effects evaluations. The test plan (Reference 1) does not appear to account for latent debris in the listing of materials in Table 3.1-2. Therefore, the staff requests the following information:

Describe how latent debris will be accounted for in the chemical effects test plan, or justify why latent debris is not included.

06.02.02-3

The pH is a key parameter in any chemical effects testing or evaluations. The autoclave portion of the US-APWR sump strainer test will be conducted a several different pH levels to simulate the increase of pH over time as the buffering agent dissolves in the ECCS fluid after a LOCA. However, for the autoclave test, the applicant did not include the target pH for each test run in Table 3.3-1 of the test plan.

Therefore, the staff requests the following information:

Provide the pH corresponding to each test run in Table 3.3-1.

06.02.02-4

Section 3.1.3.1 of the test plan states that the temperature history expected in a post-LOCA environment is highly dependent upon plant operation scenarios and the nature of the break causing the LOCA. Figure 3.1-2(a) and (b) provide the recirculation sump water temperature profiles for the short-term (autoclave test) and long-term (recirculation test) based on preliminary calculations. Figure 3.1.2-b shows the long-term temperature reaching a minimum of around 120°F as compared to the selected long-term test temperature of 149°F. As a general principle, the test conditions should be those at which the maximum precipitate generation can be expected. However, the applicant did not adequately justify why the selected temperature is conservative.

Therefore, the staff requests the following information:

Describe the basis for concluding that the environmental conditions selected for the recirculation test are the most conservative for precipitate generation (i.e., over the range of possible post-LOCA conditions, the conditions selected are those that theoretically would maximize the formation of precipitates).