ArevaEPRDCPEm Resource

From: Getachew Tesfaye
Sent: Wednesday, March 11, 2009 6:24 PM
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Subject: U.S. EPR Design Certification Application RAI No. 191 (2228), FSAR Ch. 15
Attachments: RAI_191_SRSB_2228.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on February 20, 2009, and discussed with your staff on March 3, 2009. The staff took action to review previous RAIs to determine if some of the draft questions were previously asked as suggested by AREVA during that discussion. The staff reviewed the references AREVA provided and concluded that the new RAIs were not covered by previous RAIs. Therefore, with minor modifications to draft RAI Questions 15.06.05-43, 15.06.05-44, 15.06.05-45, and 15.06.05-46, for clarification, the draft RAIs are issued as final. The schedule we have established 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.

Thanks,
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Hearing Identifier: AREVA_EPR_DC_RAIs
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Request for Additional Information No. 191 (2228), Revision 0

03/11/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 15.06.05 - Loss of Coolant Accidents Resulting From Spectrum of Postulated Piping Breaks Within the Reactor Coolant Pressure Boundary
Application Section: Ch 15

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

15.06.05-43

Addressing Regulatory Position 1.1.1.12 in Regulatory Guide RG 1.82 Revision 3 on buildup of debris at downstream flow restriction locations including coolant channel openings in the core fuel assemblies and fuel assembly inlet debris screens, Appendix A of ANP-10293 Revision 0, in its conformance assessment states that "The impact of debris clogging downstream of the ECC sump screens on … fuel assemblies is expected to be negligible. An evaluation to support this conclusion is part of the U.S. EPR design process. This issue will be further assessed based on the results of industry consensus regarding confirmation of downstream effects."

Provide the results from such further assessments and the resolution for the U.S. EPR that considers such additional results of industry consensus regarding confirmation of downstream effects on fuel assemblies, including inlet nozzle, grid spacers, and fuel rods, in accordance with Regulatory Position 1.1.1.12 in Regulatory Guide RG 1.82 Revision 3. In this regard, provide the basis for the resolution and describe the impact of additional experimental and analytical work, including such that was carried out in addressing the resolution of GSI-191 and made available after the publication of Generic Letter GL-2004-02 on September 13, 2004, which is the most recently dated reference considered in ANP-10293 Revision 0, on the U.S. EPR FSAR and ANP-10293, if any.

15.06.05-44

Addressing Regulatory Position 1.1.2.3 in Regulatory Guide RG 1.82 Revision 3 on chemical reaction effects, Appendix A of ANP-10293 Revision 0, in its conformance assessment states that "The need to address the potential impact of chemical reaction with the debris sources, filter differential pressure and other downstream effects is recognized by the U.S. EPR design program. This issue will be further assessed based on the results of industry consensus regarding confirmation of downstream effects."

Provide the results from such further assessments and the resolution for the U.S. EPR that considers additional results of industry consensus regarding confirmation of downstream effects on fuel assemblies, including inlet nozzle, grid spacers, and fuel rods in accordance with Regulatory Position 1.1.2.3 in Regulatory Guide RG 1.82 Revision 3. In this respect, provide the basis for the resolution and describe the impact

of additional experimental and analytical work, including such that was carried out in addressing the resolution of GSI-191 and made available after the publication of Generic Letter GL-2004-02 on September 13, 2004, which is the most recently dated reference considered in ANP-10293 Revision 0, on the U.S. EPR FSAR and ANP-10293, if any.

15.06.05-45

In response to requested information item 2.(d)(v) in Generic Letter GL-2004-02, Appendix B of ANP-10293 Revision 0 states that "The impact of debris clogging downstream of the ECCS sump screens on … fuel assemblies is expected to be negligible. An evaluation to support this conclusion is part of the U.S. EPR design process. This issue is to be addressed based on the results of industry consensus regarding confirmation of downstream effects."

Provide the results from additional assessments and the resolution for the U.S. EPR based on the results of such industry consensus regarding confirmation of downstream effects on fuel assemblies, including inlet nozzle, grid spacers, and fuel rods related to requested information item 2.(d)(v) in Generic Letter GL-2004-02. In this regard, provide the basis for the resolution and explain the impact on the U.S. EPR FSAR and ANP-10293, if any.

15.06.05-46

Provide quantification of all types of debris generating/representing materials initially present in the U.S. EPR containment building along with sufficient evidence that the amounts assumed account in a conservative manner for any associated data uncertainties. Based on the amount and location of the identified debris generating/representing materials in the containment, determine and provide explanation of the critical LOCA conditions that will result in the maximum possible negative impact on the long-term coolability of the fuel assemblies. In particular, provide the amounts of generated debris of all possible types under the critical LOCA conditions determined, taking into account latent debris as well, and explain how the debris amounts, types, characteristics and flow conditions, along with limiting strainer response assumptions, lead to the most limiting downstream effects on the fuel. In assessing those effects, consider the impact of specific design characteristics and features of the U.S. EPR vessel and fuel assembly components, including inlet nozzle, grid spacers and fuel rods on the fluid flow and debris behavior in accounting for possible participating phenomena like chemical plate-out on fuel rod surfaces, blocking of core plates or fuel assembly inlet nozzles due to thin-bed or large fiber beds formation, localized hot spots formation due to fibers hanging up on fuel assembly grid spacer straps.

15.06.05-47

Provide a conservative estimate for the potential core inlet flow area blockage fraction in the U.S. EPR and assess the core cooling conditions versus the minimum core boil-off

flow rate requirements. In assessing the core inlet flow area blockage, account for downstream effects associated with debris particulates, fibers and chemical reaction by-products entering into the reactor coolant system under the most limiting post-LOCA conditions in terms of debris ingress. Discus associated possible effects from potential flow blockages and formation of flow restriction patterns within the core region itself, if any.

15.06.05-48

The test apparatus described in ANP-10293 Revision 0 was of full vertical height and 1:20 scale ratio for the design flow rate, generated debris mass and surface area of the strainer, retaining basket and heavy floor opening. Provide numerical results demonstrating that the test apparatus and debris quantities and characteristics including size distribution were properly scaled to the U.S. EPR design characteristics and debris generation under the LOCA conditions determined as limiting from point of view of downstream effects on the fuel. Describe the preparation and preconditioning of the debris used in the tests and explain the timing and manner of debris introduction into the test fluid. Demonstrate that the test conditions were limiting in terms of maximizing the debris presence in the effluent downstream of the sump strainer.

15.06.05-49

Demonstrate that the solids concentration in the downstream water of 10 ppm at 30 minutes into the test, as reported in ANP-10293 Revision 0, is representative for the worst U.S. EPR post-LOCA conditions in terms of downstream effects on the fuel in the core. Demonstrate how this experimental evidence can be scaled and applied to evaluate potential downstream effects considering the presence of debris particulates, fibers and chemical reaction by-products in the U.S. EPR reactor coolant system under post-LOCA conditions that lead to most limiting conditions in terms of downstream effects on the fuel. Explain why the independent review of the ANP-10293 Revision 0 did not address reported observations on downstream effects.