

**Response to**

**Request for Additional Information No. 32, Revision 0**

**7/29/2008**

**U. S. EPR Standard Design Certification**

**AREVA NP Inc.**

**Docket No. 52-020**

**SRP Section: 6.3 - Emergency Core Cooling System**

**Application Section: 6.3**

**SRSB Branch**

**Question 6.3-1:**

One valve was identified from the Medium Head Safety Injection System on the P&ID schematic which was not included in Table 2.2.3-1 and/or Figure 2.2.3-1. The valve should be part of ITAAC because the valve is in the primary flow path or support the safety related functionality of the MHSI system. The valve as identified is 30JND\*0 AA001 (where \* = trains 1 through 4).

Please provide the justification to exclude the valve from the ITAAC program (Table 2.2.3-3); if not, include the valve in Table 2.2.3-1 and Figure 2.2.3-1.

**Response to Question 6.3-1:**

Valve 30JND\*0 AA001 (where \* = trains 1 through 4) is a manually-operated maintenance isolation valve. Standard Review Plan (SRP), Section 14.3 (page 14.3-28) provides guidance that maintenance isolation valves should not be included in Tier 1: "Figures for safety-related systems should include most of the valves on the DCD Tier 2 P&ID except for items, such as fill, drain, test tees, and maintenance isolation valves." Therefore, valve 30JND\*0 AA001 is not included in U.S. EPR FSAR, Tier 1, Section 2.2.3.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 6.3-2:**

Two valves were identified from the In-containment Refueling Water Storage System on the P&ID schematic which were not included in Table 2.2.3-1 and Figure 2.2.3-1. The valves should be part of ITAAC because they are in the primary flow or support the functionality of the system. The valves identified are 30JNK\*0 AA001 & 30JNK\*1AA010 (where \* = trains 1 through 4).

Please provide the justification to exclude the two valves from the ITAAC program (Table 2.2.3-3); if not, include the valves in Table 2.2.3-1 and/or Figure 2.2.3-1.

**Response to Question 6.3-2:**

Valve 30JNK\*0 AA001 (where \* = trains 1 through 4) is a three-way isolation valve used to isolate the safety injection system (SIS) suction line from the in-containment refueling water storage tank (IRWST) and does not have a safety-related active function. Valve 30JNK1\* AA01\* (where \* = 0 or 1, depending on the specific train) is a check valve and does not have a safety-related active function. Standard Review Plan (SRP), Section 14.3 (page 14.3-28) provides guidance that only valves with a safety-related active function should be included in Tier 1: "Figures for safety-related systems should include most of the valves on the DCD Tier 2 P&ID except for items, such as fill, drain, test tees, and maintenance isolation valves. The scope of valves to be included on the figures are those MOVs, POVs, and check valves with a safety related active function ..." Therefore, since valves 30JNK\*0 AA001 and 30JNK1\* AA01\* do not have a safety-related active function, they are not included in U.S. EPR FSAR, Tier 1, Section 2.2.3.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 6.3-3:**

ANP-10293 references material which had been published prior to September 13, 2004. Since that time, substantial experimental and analytical work has been performed to address the resolution of GSI-191. This work has been documented in reports listed in Attachment 1 to this RAI.

Please explain how the work performed after September 2004, and presented in the reports listed in Attachment 1, was considered in preparing ANP-10293 and/or the EPR FSAR.

**Response to Question 6.3-3:**

The guidance of Standard Review Plan 6.2.2 (Revision 5, 03/2007) is used to assess the U.S. EPR design features for GSI-191, as documented in ANP-10293. The subject matter that provides the basis for performing the experimental and analytical work documented in Attachment 1 is recognized in SRP 6.2.2. The Attachment 1 subject matter (chemical effects, insulation debris, head loss, etc.) are the type of subject matter considered in preparing ANP-10293.

Specifically, for downstream effects and chemical effects, the methodologies described in the NRC FSERs: (1) Topical Report WCAP-16530-NP "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191" Pressurized Water Reactors Owners Group, and (2) Topical Report (TR) WCAP-16406-P, Revision 1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191" Pressurized Water Reactors Owners Group are used to assess these aspects of GSI-191. Two of the entries listed in ANP-10293, Table B-1 ("U.S. EPR Design Features to Address GSI-191") refer to resolutions "based on results of industry consensus regarding confirmation of downstream and chemical effects." Resolution of these items will be confirmed based on evaluation of downstream and chemical effects consistent with FSERs listed above.

Of the 22 documents listed in Attachment 1, these two FSERs address the following 13 documents: 5, 7a, 7b, 7c, 7d, 7e, 7f, 8, 9, 13, 14, 16, and 17. The remaining nine documents are addressed as follows:

- Documents 1, 2, and 10 are addressed by testing performed in support of the methodology approved in FSER (1) above.
- Document 3 is not applicable since the U.S. EPR does not use calcium silicate insulation.
- Documents 4, 11, 12, and 15 have already been evaluated by AREVA testing discussed in ANP-10293. This testing used the approved methods for debris generation described in NEI 04-07. These documents were prepared for use by the NRC and are based on specific configurations that do not specifically match the U.S. EPR design.
- Document 6 is addressed by testing in support of the methodology approved in FSER (2) above. This testing is also addressed in response to RAI 32, Question 6.3-4.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Attachment 1****(ECCS System Reliability)  
Staff- and Contractor-Prepared  
NUREG-Series Reports and Letter Reports  
Prepared for the Resolution of Generic Safety Issue (GSI) 191**

1. NUREG/CR-6868, "Small-Scale Experiments: Effects of Chemical Reactions on Debris-Bed Head-Loss," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, March 2005.
2. NUREG/CR-6873, "Corrosion Rate Measurements and Chemical Speciation of Corrosion Products Using Thermodynamic Modeling of Debris Components to Support GSI-191," prepared by the Center for Nuclear Waste Regulatory Analyses for the U.S. Nuclear Regulatory Commission, Washington, DC, April 2005.
3. NUREG/CR-6874, "GSI-191: Experimental Studies of Loss-of-Coolant-Accident-Generated Debris Accumulation and Head Loss with Emphasis on the Effects of Calcium Silicate Insulation," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, May 2005.
4. NUREG/CR-6877, "Characterization and Head-Loss Testing of Latent Debris from Pressurized-Water-Reactor Containment Buildings," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, July 2005.
5. NUREG/CR-6885, "Screen Penetration Test Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, October 2005.
6. NUREG/CR-6902, "Effects of Insulation Debris on Throttle-Valve Flow Performance," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, March 2006.
- 7a. NUREG/CR-6914, Volume 1, "Integrated Chemical Effects Test Project: Consolidated Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.
- 7b. NUREG/CR-6914, Volume 2, "Integrated Chemical Effects Test Project: Test #1 Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.
- 7c. NUREG/CR-6914, Volume 3, "Integrated Chemical Effects Test Project: Test #2 Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.
- 7d. NUREG/CR-6914, Volume 4, "Integrated Chemical Effects Test Project: Test #3 Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.
- 7e. NUREG/CR-6914, Volume 5, "Integrated Chemical Effects Test Project: Test #4 Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.
- 7f. NUREG/CR-6914, Volume 6, "Integrated Chemical Effects Test Project: Test #5 Data Report," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, September 2006.

8. NUREG/CR-6915, "Aluminum Chemistry in a Prototypical Post-Loss-of-Coolant-Accident, Pressurized-Water-Reactor Containment Environment," prepared by Los Alamos National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, December 2006.
9. NUREG/CR-6913, "Chemical Effects Head-Loss Research in Support of Generic Safety Issue 191," prepared by Argonne National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, December 2006.
10. NUREG/CR-6912, "GSI-191 PWR Sump Screen Blockage Chemical Effects Tests: Thermodynamic Simulations," prepared by the Center for Nuclear Waste Regulatory Analyses for the U.S. Nuclear Regulatory Commission, Washington, DC, December 2006.
11. NUREG-1862, "Development of Pressure Drop Calculation Method for Debris-Covered Sump Screens in Support of Generic Safety Issue 191," U.S. Nuclear Regulatory Commission, Washington, DC, January 2007.
12. NUREG/CR-6917, "Experimental Measurements of Pressure Drop Across Sump Screen Debris Beds in Support of Generic Safety Issue 191," prepared by Pacific Northwest National Laboratory for the U.S. Nuclear Regulatory Commission, Washington, DC, January 2007.
13. NUREG/CR-6916, "Hydraulic Transport of Coating Debris," @ prepared by the Naval Surface Warfare Center for the U.S. Nuclear Regulatory Commission, Washington, DC, December 2006.
14. NUREG-1861, "Peer Review of GSI-191 Chemical Effects Research Program," U.S. Nuclear Regulatory Commission, Washington, DC, December 2006.
15. "Survey on Leaching of Coatings Used in Nuclear Power Plants: Letter Report," Argonne National Laboratory, Argonne, IL, August 2006.
16. Technical Letter Report: "Supplementary Leaching Tests of Insulation and Concrete for GSI-191 Chemical Effects Program," Center for Nuclear Waste Regulatory Analyses, San Antonio, TX, November 2006.
17. "Technical Letter Report on Follow-On Studies in Chemical Effects Head-Loss Research: Studies on WCAP Surrogates and Sodium Tetraborate Solutions," Argonne National Laboratory, Argonne, IL, February 2007.

**Question 6.3-4:**

ANP-10293 Appendix B provides U.S. EPR sump recirculation information in response to requested information outlined in GL 2004-02. Two of the entries listed in Table B-1 of Appendix B refer to resolutions “based on results of industry consensus regarding confirmation of downstream effects”. See entries 2. (d)(v) and 2. (d)(vi) in Table B-1 of Appendix B.

Please provide the resolution of these two entries, the bases of the resolutions and their impact if any on ANP-10293 and/or the EPR FSAR.

**Response to Question 6.3-4:**

Two of the entries listed in ANP-10293, Table B-1 (“U.S. EPR Design Features to Address GSI-191”) refer to resolutions “based on results of industry consensus regarding confirmation of downstream effects.” An evaluation of downstream effects consistent with the FSER (ADAMS accession number ML073520295) will be performed by March, 2009 to resolve these two entries. Results of this evaluation, which are expected to confirm the statements in ANP-10293, will be incorporated into a revision to ANP-10293.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.