Response to

Request for Additional Information No. 52 (950), Revision 0

8/15/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.09.02 - Dynamic Testing and Analysis of Systems Structures and Components
Application Section: 3.9.2.2
EMB2 Branch

Question 03.09.02-1:

In EPR FSAR, Tier 2, Section 3.9.3, AREVA incorporates by reference the Topical Report (identified as Reference 2), ANP-10264NP, "U.S. EPR Piping Analysis and Pipe Support Design Topical Report," AREVA NP Inc., September 2006, Rev. 0. Based on a previous safety evaluation report issued by NRC on the Topical Report, with all comments resolved, AREVA should properly revise the reference (i.e., Rev. 1) of the Topical Report in the application.

Response to Question 03.09.02-1:

The final SER on the referenced topical report was issued on August 11, 2008. Per NRC Office Instruction LIC-500, following receipt of the final SER the applicant has three months to submit the approved version of the topical report to the NRC. At that time, AREVA would then revise the U.S. EPR FSAR to reference the approved version of the topical report, similar to other approved topical reports that are listed in the U.S. EPR FSAR Tier 2, Table 1.6-1—Reports Referenced.

FSAR Impact:

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

Question 03.09.02-2:

In EPR FSAR Tier 2, Section 3A.2.4.4, AREVA states that the methods for the seismic analysis of HVAC ductwork and supports are provided in FSAR Tier 2, Section 3.7. Similar statement is also made in Section 3A.3.6 for cable tray, conduit, and supports. The staff found the above description for the seismic analysis methodology to be too general. The staff requests AREVA to provide on an item by item basis all the pertinent methods and criteria that are presented in FSAR Tier 2, Section 3.7, for the seismic analysis of HVAC ductwork and cable tray, conduit, and their supports.

Response to Question 03.09.02-2:

A response to this question will be provided by December 15, 2008.

Question 03.09.02-3:

For the references provided in Section 3A.4, confirm that all the codes and standards (including the editions) have been approved by NRC for the use on the design analysis of HVAC ductwork and cable tray, conduit, and their supports.

Response to Question 03.09.02-3:

Table 03.09.02-3-1 lists references from U.S. EPR FSAR Tier 2, Section 3A.4 and also includes the latest information relative to NRC approvals and endorsements:

Table 03.09.02-3-1—References vs. NRC Approval

Ref.	Document	NRC Approval/Endorsement
1	ANP-10264 (NP), "U.S. EPR Piping Analysis and Support Design," AREVA NP Inc., September 2006	Refer to response to Question 03.09.02-1
2	ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 2003 with 2004 Addenda	SRP 3.9.2 endorses AG-1-1997 edition. When the U.S. EPR FSAR was submitted, AREVA applied for a deviation to use the 2004 edition.
3	AISC "Manual of Steel Construction," Ninth Edition, American Institute of Steel Construction, April 2002	Endorsed as a reference in the Safety Evaluation Report for Topical Report ANP-10264P
4	AISI "North American Specification for the Design of Cold-Formed Steel Structural Members," American Iron and Steel Institute, 2001 Edition with 2003 Errata	Specifications are not required to be approved by the NRC
5	SMACNA "HVAC Duct Construction Standards, Metal and Flexible," Sheet Metal and Air Conditioning Contractors National Association, Third Edition, 2005	The NRC does not approve industry standards.
6	AWS D1.1/D1.1M: 2004, "Structural Welding Code - Steel," American Welding Society with errata through June 2005	Endorsed as a reference in the Safety Evaluation Report for Topical Report ANP-10264P
7	AWS D1.3-98, "Structural Welding Code - Sheet Steel," American Welding Society, 1998	Endorsed in RG 1.143, Revision 2
8	ANSI/AISC-N690-1994, AISC "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities," American National Standards Institute/American Institute of Steel Construction, with Supplement 2, October 2004	Endorsed as a reference in the Safety Evaluation Report for Topical Report ANP-10264P

FSAR Impact:

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

Question 03.09.02-4:

EPR FSAR Tier 2, Tables 3A-1 and 3A-2, list the loading combinations for the HVAC ductwork and the HVAC supports, respectively. The staff requests AREVA to explain why loading and loading combinations for Service Levels B are not required. For Service Level D, explain why it is not required unless a design pressure differential (DPD) load is applicable. Discuss what would be the required loadings and loading combinations to be considered with DPD. The staff also requests AREVA to discuss the methods of combining the dynamic loads (including seismic loads), and the bases of the combinations.

Response to Question 03.09.02-4:

The information in the two load combination tables, U.S. EPR FSAR Tier 2, Table 3A-1—HVAC Ductwork Load Combinations and Table 3A-2—HVAC Support and Restraint Load Combinations, is similar to the information in Tables SA-4212 and SA-4216 of the ASME AG-1-2003 Code.

AREVA has formally asked the ASME for a clarification regarding reasons for not requiring load combinations for Level B and not requiring load combinations for Level D unless a design pressure differential (DPD) is applicable. AREVA has also asked the ASME for clarification regarding the combination that would be utilized for Level D if DPD was applicable.

Regarding the methodology for combining dynamic loadings, the following Note 5 will be added to both Tables 3A-1 and 3A-2:

"Loads due to dynamic events are combined considering the time phasing of the events (i.e., whether the loads are consistent in time). When the time phasing relationship can be established, dynamic loads may be combined by the square-root-sum-of-the-squares (SRSS) method, provided it is demonstrated that the non-exceedance criteria given in NUREG-0484 (Reference 9) are met. When the time phasing relationship cannot be established or when the non-exceedance criteria in Reference 9 are not met, dynamic loads are combined by absolute sum. Safe shutdown earthquake (SSE) and high energy line break (loss-of-coolant accident (LOCA) and secondary side rupture) loads are always combined using the SRSS method."

U.S. EPR FSAR Tier 2, Section 3A.4 will also be revised to reflect the addition of another reference.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 3A.4 and Tables 3A-1 and 3A-2, will be revised as described in the response and indicated on the enclosed markup.

Question 03.09.02-5:

In EPR FSAR Section 3A.2.4.1, AREVA states that the combined membrane and bending stress for Service Level A does not exceed 1.5 x 0.6 Fy. AREVA also states that the combined membrane and bending stress for Service Level C does not exceed 0.9 Fy. Explain why the same stress criteria are specified for Service Level A and Service Level C loading conditions.

Response to Question 03.09.02-5:

Presently, Section SA-4220 of ASME AG-1-2003 states that the allowable stresses for membrane and bending design stress are 0.9 F_y for Level C and 1.8 x 0.6 F_y for Level A. These appear to be reversed, and since the Level A allowable in the code produces a value above the yield strength of the material, AREVA limited the Level A allowable in this section to 1.5 x 0.6 F_y or 0.9 F_y also. AREVA has formally requested a clarification of these allowables from the ASME.

FSAR Impact:

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

Question 03.09.02-6:

For HVAC ductwork and cable trays supported in different buildings, discuss the design analysis provisions for differential motions experienced by the component supports. Discuss how the provisions meet the guidance of SRP 3.9.2.

Response to Question 03.09.02-6:

A response to this question will be provided by December 15, 2008.

U.S. EPR Final Safety Analysis Report Markups

3A.3.6 Seismic Analysis

The methods for seismic analysis are the same as described in Section 3A.2.4.4.

3A.4 References

1. ANP-10264(NP), "U.S. EPR Piping Analysis and Support Design," AREVA NP Inc., September 2006.

2. ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 2003 with 2004 Addenda.

3. AISC "Manual of Steel Construction," Ninth Edition, American Institute of Steel Construction, April 2002.

4. AISI, "North American Specification for the Design of Cold-Formed Steel Structural Members," American Iron and Steel Institute, 2001 Edition with 2003 Errata.

5. SMACNA, "HVAC Duct Construction Standards, Metal and Flexible," Sheet Metal and Conditioning Contractors National Association, Third Edition, 2005.

6. AWS D1.1/D1.1M: 2004, "Structural Welding Code-Steel," American Welding Society with errata through June 2005.

7. AWS D1.3-98, "Structural Welding Code – Sheet Steel," American Welding Society, 1998.

8. ANSI/AISC-N690-1994, AISC "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities," American National Standards Institute/American Institute of Steel Construction, with Supplement 2, October 2004.

9. NUREG-0484, "Methodology for Combining Dynamic Responses," U.S. Nuclear Regulatory Commission, May 1980.

Question 03.09.02-4

Table 3A-1—HVAC Ductwork Load Combinations[5]

Question 03.09.02-4

Service Level	Category	Load Combination (see Section 3A.2.2.1)	Stress Criteria
A	Normal Condition	DW+NOPD+FML+EL+L+T+W	See 3A.2.4
B	Not Required		
C	Emergency Condition	DW+NOPD+FML+EL+SL+ADL+W	See 3A.2.4
D	Not required unless DPD is applicable		

Table 3A-2—HVAC Support and Restraint Load Combinations[5]

Question 03.09.02-4

Service Level	Category	Load Combination (see Section 3A.2.2.1)	Stress Criteria
A	Normal Condition	DW+NOPD+EL+L+T	See 3A.2.4
B	Not Required		
C	Emergency Condition	DW+NOPD+EL+SL+ADL	See 3A.2.4
D	Not required unless DPD is applicable		

Table 3A-3—Deflection Limits[1,2]

Service Level	Deflection Limit
A[3]	$d_{all} \leq 0.6\ d_{max}$
B[3]	$d_{all} \leq 0.6\ d_{max}$
C[4]	$d_{all} \leq 0.9\ d_{max}$
D[4]	$d_{all} \leq 0.9\ d_{max}$

Notes:

1. If particular equipment design criteria require more restrictive limits on deflections, those requirements will be stated in the applicable equipment section of Reference 2.

2. Deflections are limited to prevent transmission of excessive load to other components such as filter frames, coils, bearings, and access doors.

3. Deflections are limited to values that prevent buckling in primary load carrying elements.

4. Deflections are limited to values as described in AA-4323 of Reference 2.

Question 03.09.02-4

5. Loads due to dynamic events are combined considering the time phasing of the events (i.e., whether the loads are consistent in time). When the time phasing relationship can be established, dynamic loads may be combined by the square-root-sum-of-the-squares (SRSS) method, provided it is demonstrated that the non-exceedance criteria given in NUREG-0484 (Reference 9) are met. When the time phasing relationship cannot be established or when the non-exceedance criteria in

Reference 9 are not met, dynamic loads are combined by absolute sum. Safe shutdown earthquake (SSE) and high-energy line break loads—loss-of-coolant accident (LOCA) and secondary side rupture—are always combined using the SRSS method.

Question 03.09.02-4