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NRC:12:054

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Closure Plan for U.S. EPR Civil/Structural Open Items

Ref. 1 Letter, A. W. Robinson (AREVA NP Inc.) to Document Control Desk (NRC), "U.S. EPR Design Certification Schedule for Response to Open Items," NRC:12:024, May 10, 2012.

A Project Integration Meeting was held between AREVA NP Inc. (AREVA NP) and the NRC on June 20, 2012. During this meeting, a number of key areas were identified where additional interaction between AREVA NP and the NRC would be beneficial to describe open item closure plans that support the Phase 4 schedule in Reference 1. A public meeting was held in Rockville, Maryland on August 21, 2012 to discuss AREVA NP plans for resolution of Civil/Structural related open items.

A Civil/Structural open item closure plan is enclosed with this letter based on the presentation and resulting NRC feedback received during the August 21, 2012 public meeting. The plan provides a resolution path to closure for completing each response, NRC/AREVA NP interaction opportunities, and a schedule for submitting final responses.

AREVA NP will keep NRC staff informed throughout the preparation and submittal of the responses to the Civil/Structural open items, including providing a draft response for discussion prior to submittal of final information. AREVA NP also proposes periodic interactions to discuss the technical information provided as part of this closure plan prior to the finalization of the information.

If you have any questions related to this information, please contact Darrell Gardner by telephone at (704) 805-2355 or by e-mail at darrell.gardner@areva.com.

Sincerely,

A handwritten signature in black ink, appearing to read 'Pedro Salas'.

Pedro Salas, Director
Regulatory Affairs
AREVA NP Inc.

Enclosures

cc: A. Snyder
Docket 52-020

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NRC

Closure Plan for U.S. EPR Civil/Structural Open Items

1 Introduction

During the August 21, 2012 public meeting, AREVA NP provided a resolution plan and schedule for closure of Civil/Structural open items to support completion of the NRC Phase 4 review milestone. This plan documents the details of the AREVA NP Closure Plan for the U.S. EPR Civil/Structural Open Items and provides a resolution approach for closure, interaction opportunities for NRC staff to provide feedback during the closure process, and the schedule for providing final responses for open items.

The following provides the planned responses for the open item RAIs.

2 Planned Response Approach for Each RAI Question

2.1 Civil Design

2.1.1 RAI 155, Questions 03.08.01-24 and 03.08.04-06 – Critical Sections

- Critical sections have been identified using the selection methodology described in U.S. EPR FSAR, Tier 2, Appendix 3E.
- Critical sections will be designed using zero period acceleration (ZPA) from SASSI subtraction method results.
- Confirm design results are bounding the direct method ZPAs.
- Report results in accordance with U.S. EPR FSAR, Tier 2 Appendix 3E template.

2.1.2 RAI-370, Question 03.07.01-27– OBE/SSE Damping

- AREVA NP will use the following damping approach for ISRS and Structural Analysis:
 - U.S. EPR Standard Design Certification.
 - Operating basis earthquake (OBE) damping with un-cracked section properties and safe shutdown earthquake (SSE) damping with out-of-plane cracked section properties for In-Structure Response Spectra (ISRS) generation.
 - SSE damping with out-of-plane cracked section properties for all structural analysis.
 - OBE damping for high frequency motion.

2.1.3 RAI-370, Question 03.07.02-64 – Nuclear Auxiliary Building interaction with Category I Structures

- AREVA NP will address hysteretic response of side soil springs by performing a study of a case with hysteretic response based on passive earth pressure coefficients to limit movement away from the Nuclear Island (NI).

- The methodology for calculating the Nuclear Auxiliary Building (NAB) static and dynamic bearing pressure will be reevaluated, and third party geotechnical assistance will be obtained to address bearing pressure at corners and edges.

2.1.4 RAI-376, Question 03.08.05-31 – Stability (Bearing Pressure)

- AREVA NP will reevaluate the methodology for determining static and dynamic bearing pressures; third party geotechnical assistance will be obtained.
- AREVA NP will update bearing pressure results in the U.S. EPR FSAR.

2.1.5 RAI-489, Question 03.07.02-75 – SASSI Method

- AREVA NP will run SASSI direct method dynamic analysis (Nuclear Island, Emergency Power Generating Building, and Essential Service Water Building).
- The SASSI direct method results will be compared with subtraction method results to determine downstream effects.
- If subtraction method results bound the direct method results, subtraction method results will be used in downstream work.
- If not bounded, justification will be provided or reanalysis will be performed.
 - A schedule will be provided for downstream effects if this is required.

2.1.6 RAI-541, Question 02-3 – Wind/Hurricane Missiles

- A hurricane wind speed of 230 mph (same as tornado wind speed) will be used.
- The missile calculation will be updated based on the new wind speeds.
- The revised hurricane wind speed and hurricane missile criteria will be updated in a revision to U.S. EPR FSAR, Tier 2, Section 3.5.

2.1.7 RAI-547, Question 03.07.02-78 – Modeling Techniques and Stability

- AREVA NP will clarify the description of basemat analysis methodology and results by adding figures and enhancing the text.
- AREVA NP will update U.S. EPR FSAR, Tier 2, Section 3.8.5.4.2 and review other subsections of 3.8 to verify consistency between the sections.
- AREVA NP will perform basemat reanalysis or supplementary analyses to address the effect of different passive pressure curves.
- AREVA NP will provide a comparison of design loads based on SASSI versus sliding bearing pressure for a set of critical walls.
- AREVA NP will clarify tendon gallery modeling and bearing pressures considering “delta pressures” developed due to postulated sliding.
- AREVA NP will clarify description of bearing pressure profiles on the sidewalls and provide additional figures as requested.

- AREVA NP will reevaluate the methodology for determining static and dynamic bearing pressures; third party assistance will be obtained.

2.1.8 Interaction Opportunities

AREVA NP proposes the following interactions to support the above issues closure:

- NRC inspection of the SASSI software code in January 2013.
- NRC audit of Dynamic Model Results and Seismic Analysis in January 2013.
- NRC audit of first set of Critical Section Calculations in February 2013.
- NRC audit of second set of Critical Section Calculations in April 2013.
- NRC audit of last set of Critical Section Calculations in July 2013.
- NRC audit of Section 3.7 Calculations in March 2013.

AREVA NP proposes that audit interactions also include identification of Tier 2* material by NRC staff. Additionally, AREVA NP is reviewing the possibility of an Electronic Reading Room to support proposed technical audits.

2.2 Fuel Racks

2.2.1 RAI-445, Question 03.08.04-15 – Fuel Rack Design

- Sketches of the new fuel rack design showing the lateral supports will be provided.
- The basis for eliminating seismic amplification will be included.
- The gap dimensions will be added to the U.S. EPR FSAR.
- The effect of the varying gaps between rack modules because of erection tolerances will be investigated.

2.2.2 RAI-445, Question 03.08.04-19 – Fuel Rack Design

- The whole pool model will be modified to incorporate a simplified representation of the fuel assembly inside all the tube cells.
- The analysis will be performed using the bounding time history set one.
- The whole pool model run results will be evaluated and compared with the same run case where the fuel assemblies were modeled as added density to the tubes.
- The rack legs design evaluation for the seismic load combination will be summarized.

2.2.3 RAI-445, Question 03.08.04-20 – Fuel Rack Design

- Seismic analysis of the fuel racks based on the latest seismic inputs will be performed.
- Rack(s) with the maximum stresses from among all 17 racks of each of the 15 whole pool analyses cases based on examination of the maximum stress in the simplified racks in the

multi-rack whole pool analysis models will be identified and analyzed in detail. The impact on the fuel assemblies located inside the new and spent fuel racks will be included.

2.2.4 RAI-445, Question 03.08.04-21 – Fuel Rack Design

- Results of stress analysis of fuel rack elements will be provided.
- Detailed finite element model for the new fuel storage racks with constraints at bumper locations will be developed.
- Either equivalent static or response spectra (per RG 1.92) analysis will be performed.
- Seismic impact loads on fuel assemblies will be compared against allowable impact loads on fuel assemblies.

2.2.5 RAI-445, Question 03.08.04-27 – Fuel Rack Design

- Thermo-mechanical analysis of fuel rack elements will be performed.

2.2.6 Interaction Opportunities

- AREVA NP will be ready for an NRC Fuel Rack audit in June 2013.

2.3 Aircraft Impact Analysis Inspection

- AREVA NP can support the NRC aircraft impact analysis inspection during the 2nd quarter of 2013.

2.4 Cask Transfer Loading Hall Structural Loads

- Questions related to the Cask Transfer Facility are identified in RAI 525. The resolution plan and schedule for responses to these RAIs were discussed with NRC staff in a public meeting September 13, 2012. AREVA NP can support an audit of the Loading Hall structural loads in April 2013.

2.5 Seismic Margins

(to be provided later)

3 Information Submittal Dates

AREVA NP will provide draft information for discussion prior to submittal of final information. The proposed schedule for responses to the open item questions is provided in Table A-1.

Table A-1: Submittal Dates for Response to RAI Open Items

RAI	Question No.	Topic/Subject	Draft to NRC	Final to NRC
155	03.08.01-24	Critical Sections	6/30/2013	8/30/2013
155	03.08.04-06	Critical Sections	6/30/2013	8/30/2013
370	03.07.01-27	OBE/SSE Damping	11/15/2012	1/17/2013
370	03.07.02-64	NAB II/I	3/21/2013	5/21/2013
376	03.08.05-31	Stability	6/30/2013	8/30/2013
445	03.08.04-15	Fuel Racks	5/28/2013	6/28/2013
445	03.08.04-19	Fuel Racks	5/28/2013	6/28/2013
445	03.08.04-20	Fuel Racks	5/28/2013	6/28/2013
445	03.08.04-21	Fuel Racks	5/28/2013	6/28/2013
445	03.08.04-27	Fuel Racks	5/28/2013	6/28/2013
455	19-341	Seismic Margins	5/30/2013	7/30/2013
489	03.07.02-75	SASSI Method	12/21/2012	1/31/2013
541	02-3	Wind/Hurricane	6/13/2013	7/16/2013
547	03.07.02-76	Dynamic/Static Model Compatibility	10/9/2012 A	11/29/2012
547	03.07.02-77	ASR induced concrete degradation	9/14/2012 A	10/4/2012 A
547	03.07.02-78	Modeling techniques, stability	3/7/2013	4/30/2013