March 18, 2010

APPLICANT: AREVA NP, Inc.

SUBJECT: SUMMARY OF DECEMBER 14 -15, 2009, OPEN AND CLOSED MEETING WITH AREVA NP INC., TO DISCUSS U.S. EPR FINAL SAFETY ANALYSIS REPORT SECTION 3.7 and 3.8 REQUESTS FOR ADDITIONAL INFORMATION

On December 14-15, 2009, an open and closed meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of AREVA NP, Inc., at the AREVA NP office in Charlotte, NC. The purpose of the meeting was to discuss U.S. EPR Final Safety Analysis Report (FSAR) Section 3.7 and 3.8 requests for additional information (RAIs), and supporting analyses, in order to determine a path forward for resolving the outstanding RAI issues. A meeting agenda is provided as Enclosure 1 and a list of attendees is provided as Enclosure 2. AREVA NP provided a presentation entitled, "Meeting to Discuss the Status of NRC Review of U.S. EPR FSAR Sections 3.7 and 3.8, and the Associated RAI Responses." A non-proprietary version of this presentation can be accessed through the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML100210433. This system provides text and image files of NRC public documents.

AREVA NP opened the public portion of the meeting by making their presentation, which included an update on the progress of the development of the new soil-structure interaction analysis model. This presentation also included a summary of the current RAI response status, and a schedule for resolving outstanding RAIs within the overall timeline of the design certification process. This schedule proposed that a number of RAI responses, and RAI reconciliation tasks which were created as a result of performing the new civil-structural finite element analysis, become confirmatory items, or open items in the NRC staff's Phase 2 Safety Evaluation Report with Open Items, so as not to impact the current review schedule. In addition, AREVA NP made a technical presentation on new analyses undertaken to address some of the outstanding RAIs and other design changes. The new analyses/design methodologies presented by AREVA NP include the following:

1. A new 3-D FEM-SSI dynamic analysis of the Nuclear Island (NI) Common Basemat Structure.

2. The original set of 12 soil profiles in the FSAR has been reduced to include only bounding cases and a new site-specific case.

3. An updated Certified Seismic Design Response Spectrum to include high frequency content.

4. A new design basis for Seismic Category II structures, and II/I interaction issues.

5. A new evaluation to assess sliding and overturning stability of the structures, as well as a new approach to address soil differential settlements.

Following the AREVA NP presentation and subsequent discussion, a public comment period was conducted. Once the public portion of the meeting concluded, the meeting attendees divided into two teams to discuss separately, issues related to FSAR Sections 3.7 and 3.8 and the corresponding unresolved RAIs. Details of these discussions pertaining to FSAR Section 3.7 and 3.8 are summarized on Enclosures 3 and 4, respectively. Noted on these enclosures are items where the existing analytical methodology will still be used, but results may change and items where resolution of the item involves or is affected by an analytical methodology change. Also indicated on these enclosures, is an agreed-on path forward for resolution of each item, and the next steps to be taken in the review in order to accomplish this resolution. Enclosures 5 and 6 list the documents made available for NRC review during the closed portion of the meeting.

The meeting concluded with the NRC staff summarizing in an open meeting session, the issues discussed, and key outcomes of the meeting. The following items were noted by NRC staff:

1. The new analyses/design methodologies presented by AREVA NP during the meeting may impact resolved RAI responses as well as unresolved RAIs, and cause additional follow-up RAIs to be generated. AREVA NP recognized the need to reconcile and update all resolved and unresolved RAIs that are affected by the new analyses/design methodologies.

2. NRC will evaluate scheduling and other implications generated by the changes noted above including evaluations of AREVA NP's suggestion that some of the RAIs impacted by the new analyses can be dispositioned as Phase 2 open items or as confirmatory items.

3. For FSAR Section 3.7 fifteen RAIs were topics for discussion during the meeting. Most of these will require a follow up RAI and prompt resolution by AREVA including completion of the new Finite element SSI analysis. In addition as a result of staff's review of calculations presented by AREVA at the meeting, additional new RAIs will be issued to address staff's concern raised during this review.

4. A path for resolution was agreed upon for 18 of 27 listed key unresolved RAIs related to FSAR Section 3.8 that were judged by the staff to be most significant and/or potentially difficult to resolve. Of the remaining nine RAIs, eight require further review by NRC to determine their regulatory basis, and one was resolved during the discussions.

5. The path forward for resolution of outstanding RAIs requires increased NRC-AREVA NP interactions (e.g., audits and teleconferences).

Members of the public were present at the open portions of the meeting. There were no comments from the public.

Please direct any inquires concerning this meeting to Michael Miernicki at 301-415-2304, or Michael.Miernicki@nrc.gov.

/RA/

Michael J. Miernicki, Senior Project Manager
EPR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-020

Enclosures:
1. Agenda
2. List of Attendees
3. Section 3.7 Topics
4. Section 3.8 Topics
5. Document list Section 3.7
6. Document list Section 3.8

cc: See next page

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Please direct any inquires concerning this meeting to Michael Miernicki at 301-415-2304, or Michael.Miernicki@nrc.gov.

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AGENDA

MEETING WITH AREVA NP TO DISCUSS THE STATUS OF NRC REVIEW OF U.S. EPR FSAR SECTIONS 3.7 AND 3.8, AND THE ASSOCIATED RAI RESPONSES

Monday, December 14, 2009

Time	Topic	Led by
Open Session		
1:00 p.m.	Introductions / Agenda Review	NRC/AREVA
1:10 p.m.	Background Discussion and Meeting Objectives	NRC
1:25 p.m.	Review of Open RAIs and Response Schedule	AREVA
1:50 p.m.	Opportunity for Public Comment	NRC
2:00 p.m.	Break	
Closed Session Begins (Proprietary)		
2:10 p.m.	Break into two NRC teams for Review of FSAR Sections 3.7 and 3.8 RAIs, and Analyses	NRC
6:00 p.m.	Adjourn	

Tuesday, December 15, 2009

Time	Topic	Led by
Closed Session Continues (Proprietary)		
8:00 a.m.	Continue Review of FSAR Section 3.7 and 3.8 RAIs, and Analyses	NRC
12:00 p.m.	Lunch break	
12:45 p.m.	Continue Review	NRC
Open Session Begins		
4:00 p.m.	Summary of RAI Review discussions	NRC/AREVA
4:30 p.m.	Discuss Plans and Schedule for Additional Reviews	NRC/AREVA
4:50 p.m.	Opportunity for Public Comment	NRC
5:00 p.m.	Adjourn	

Note - Closed session times listed are approximate, and for planning purposes only. Adjustments may be made as necessary during the meeting

Public Meeting with AREVA NP Regarding U.S. EPR
FSAR Section 3.7 and 3.8 RAI Responses

December 14-15, 2009
Charlotte, NC

Name	Organization
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Manas Chakravorty	NRC
Kim Hawkins	NRC
Getachew Tesfaye	NRC
Jim Xu	NRC
David Foster	Numark
Carl Costantino	Numark
Brian McIntyre	Areva NP
Kelli Voelsing	Areva NP
Michael Hoskins	Areva NP
Mark Van Noy	Areva NP
Sandra Sloan	Areva NP
Phil Hammond	Areva NP
Todd Oswald	Areva NP
Hikaru Ogasawara	MNES
Ronda Pederson	Areva NP
Nawar Alchaar	Areva NP
Joe Harrold	Areva NP
Joseph Braverman	BNL
Manuel Miranda	BNL
Tim Schmitt	Areva NP
Calvin Wong	Areva NP
Aejaz Ali	Areva NP
Bill Hovis	Areva NP
Bill Alumbaugh	Areva NP
Jack Deimitz	Areva NP
Damon Reigles	Bechtel
Chris McGaughy	Areva NP
Kent Daschke	URS/MNES

Section 3.7 Topics
NRC-AREVA Meeting
14-15 December 2009

Topic	RAI Question	Additional Information Needed	Group*	Next Step
Seismic Category II Structural Design Basis	3.7.2-53 & 56	Details of analysis and design methodology for establishing LFRS with a controlled collapse zone	Group 2	NRC to provide supplemental RAI
Damping in RCS non-linear analysis	3.7.1-22	Explanation provided at meeting is OK	Group 1	NRC to provide supplement RAI requesting additional information
Cable Tray Damping Values	3.7.1-23	Additional information is needed on tray configuration, consistency of notes on revised FSAR table, and applicability of test results for three directional excitation	Group 1	NRC to provide supplementary RAI
Embedment Effects	3.7.1-26 & 3.7.2-503	Will be addressed upon completion of new Finite element NI SSI MTR SASSI analysis	Group 2	RAIs will remain open
Basemat Flexibility	3.7.2-45	Will be addressed upon completion of new Finite element NI SSI MTR SASSI analysis	Group 2	NRC to provide supplemental RAI
Flexible walls and floors	3.7.2-46	Will be addressed upon completion of new Finite element NI SSI MTR SASSI analysis	Group 2	RAI will remain open
Frequency Transmission Characteristics of Soil Layers in Embedment Model	Meeting Item	Further justification required regarding ability of soil layers to transmit appropriate ground motion high frequency content	Group 2	Address in Open RAI 3.7.1-26 Response
Compatibility of ANSYS and SASSI FE Models	Meeting Item	SASSI model is based on large ANSYS FE model. Demonstrate the two models are dynamically equivalent	Group 2	Address in Open RAI 3.7.1-26 Response
Impact of Mat Thickness on New Seismic Analysis	Meeting Item	In new FEM seismic analysis, the mat is modeled as thin plate/shell elements. The actual thickness varies creating changes in the centerline elevation. Describe impact of neglecting man thickness relative to determining the correct seismic input elevation and also the effect on bending results in the mat and attached walls.	Group 2	NRC to provide supplemental RAI
V&V of the MTR/SASSI Code	Meeting Item	Provide QA process and benchmark problems used to verify and validate the MTR/SASSI code	Group 2	NRC to review process in follow up audit

Topic	RAI Question	Additional Information Needed	Group*	Next Step
Requirements for COL Applicant	Meeting Item	Provide the steps the COL applicant will need to go through to reconcile site with revised EPR SSI analysis	Group 2	NRC to provide supplemental RAI
SSE Damping for ISRS Generation	3.7.2-25	Insufficient number of cases provided to justify use of 7% damping for ISRS generation. Will be further addressed upon completion of new Finite element NI SSI MTR SASSI analysis and completion of critical section design	Group 2	NRC to provide supplemental RAI
Basis of accepting 10% increase in ISRS and structural design load	3.7.2-47 & 48	Not addressed fully – Awaiting response	N/A	RAI will remain open
Stability Analysis	3.7.2-39	Justification needed for assuming full passive pressure used in sliding stability calculation and to support the use of shear key in contributing to sliding resistance	Group 2	NRC to proved supplemental RAI
Validity of EPGB/ESWB site specific analysis criteria	3.7.2-60	Approach will be validated by new Finite element NI embedded SSI MTR SASSI analysis	Group 2	RAI is open. NRC to follow up when a complete response is available
Simplified seismic subsystem analysis method	3.7.3-25	Further clarification was provided at the meeting	N/A	NRC will review AREVA's response in light of clarifications provided at the meeting and determine if further supplementary RAI is necessary
II/I Subsystem interaction	3.7.3-32	Seismic Category II design/acceptable interaction is not well defined	N/A	NRC to provide supplemental RAI

***Group Definitions:**
Group 1: uses existing analysis methodology
Group 2: uses new analysis methodology

Section 3.8 Topics
NRC-AREVA Meeting
15 December 2009

Topic	RAI Question	Additional Information Needed	Group*	Path for Resolution/Next Steps
Applicable Codes, Standards, and Specifications	3.8.3-3	Basis for using ACI 349-06	N/A	Follow up RAI When?
Design and Analysis Procedures	3.8.1-2	Lateral load and overturning moment from the RB internal structure used in the analysis and design of the haunch wall and NI basemat	Group 2	AREVA respond to RAI 283 (Feb. 25, 2010)
	3.8.1-9	Technical basis for only considering uncracked section properties in the static analysis for loads other than the thermal loading case	Group 1	AREVA respond to RAI 335 (schedule TBD)
	3.8.1-28	Justification for the use of seismic modification factors in equivalent static analyses	Group 1	Follow up RAI When?
	3.8.2-1, -2, -3, -4, -5, -6 and -8	Analysis and design of the equipment hatch, air locks, fuel transfer tube, closure for the construction opening, electrical penetration, and high energy piping penetrations	TBD	NRC to follow up (especially w/r/t regulatory basis for procurement items)
	3.8.3-10	Justification for the use of the 100-40-40 method based on ASCE 4-98	N/A	Follow up RAI When?
	3.8.1-20 and -24, 3.8.3-15, and 3.8.4-6	Design of critical sections	Group 1	AREVA to respond to RAI 155
	3.8.3-17	Seismic analysis and design methods, and acceptance criteria applied to Seismic Category II structures	Group 2	Follow up RAI When?
	3.8.4-1	Design information for the NAV and RWPB radwaste structures comparable to that provided for other Category I structures	TBD	NRC to identify regulatory basis

Topic	RAI Question	Additional Information Needed	Group*	Path for Resolution/Next Steps
	3.8.4-5	Design and analysis procedures for the spent fuel pool and racks	N/A	AREVA respond to RAI 335 (Schedule TBD) AREVA to confirm TN tech report or revised FSAR Tier 2, Chapter 9 addresses SRP 3.8.4 App. D and other elements
	3.8.5-4	General procedures applicable to Seismic Category I foundations	Group 2	Follow up RAI When?
	3.8.5-5.	ANSYS static model used to analyze and design the NI basemat foundation	Group 2	Follow up RAI When?
	3.8.5-6	Source and justification for the equation used to determine soil spring values. Justification for the constants A and B, and other constants used in the equation	Group 2	Follow up RAI When?
	3.8.5-7	Use of tri-linear springs in the analysis of the foundation and common basemat NI structure	Group 2	Follow up RAI When?
	3.8.5-8	The analysis used to evaluate the soil bearing pressures, sliding, and overturning due to seismic events	Group 2	Follow up RAI When?
Structural Acceptance Criteria	3.8.5-11	Calculations of differential settlement for the NI foundation basemat and how the effects were considered in the design of the NI structures	Group 2	Follow up RAI When?
Material, Quality Control, and Special Construction Techniques	3.8.5-15	Studies performed to provide limitations to the construction process to ensure relatively uniform loads over the plan area	Group 2	Follow up RAI When?
Testing and Inservice Surveillance Requirements	3.8.1-12	Justification that ISI program satisfies RG 1.90.	N/A	Resolved through meeting discussion.

***Group Definitions**
Group 1: Uses existing methodology, but results may change.
Group 2: Involves or is affected by a methodology change.

NRC Audit, December 14-15, 2009

List of Civil/Structural Calculations (Seismic Analysis Group)

Section 3.7

DC Calculations

1. AREVA Calc. No. 32-5062562-004, "Standard Stick Model Development for US EPR Design Certifications."
2. AREVA Calc. No. 32-9025669-004, "US EPR Standard Plant Nuclear Island Soil-Structure Interaction Analysis."
3. AREVA Calc. No. 32-9066466-000, "US EPR Standard Plant Spent Fuel Pool Floor Slab Response Spectra."
4. AREVA Calc. No. 32-9061549-002, "US EPR Standard Plant DCD 3.7 Supporting Documentation."
5. AREVA Calc. No. 32-9109090-000, "NRC Confirmatory Analysis-Structural Analysis of the DC EPR Reactor Building Internal Structure."
6. AREVA Calc. No. 32-9051947-001, "US EPR Standard Plant Nuclear Island Parametric Seismic Studies."
7. AREVA Calc No. 32-9023633-002, "US EPR RCS Loop Seismic Analysis."
8. AREVA Calc. no. 32-9011967-004, "US EPR Standard Plant Structureal
9. Loads – Seismic Loads."

RAI Calculations

1. AREVA Calc. No. 32-7001503-000, "Natural Vibration Frequencies of the U.S. EPR IRWST Basemant."
2. AREVA Calc. No. 32-7002098-000, "accuracy of the U.S. EPR EPGB and ESWB Finite Element Models."
3. AREVA Calc. No. 32-7002407-000, "Comparison of Building SSI Analysis Results using AREVA SASSI and Bechtel SASSI2000 in Response to DC RAI 248 Question 3.7.2-43."
4. AREVA Calc. No. 32-7002417-000, "Methodology for the Determination of Fundamental Frequencies of Walls and Slabs in US EPR™ NI Common Basemat Structures."

AREVA/SC Solutions Calculations

1. AREVA Calc. No. 32-9086091-000, "US EPR Standard Plant Nuclear Island Embedded EPR SSI Analysis."
2. AREVA Calc. No. 32-9085806-000, "US EPR Standard Plant Nuclear Island, SASSI Embedded Model for Soft Soil Sites."
3. AREVA Calc. No. 32-9085873-000, "US EPR Standard Plant Nuclear Island, SASSI Embedded Model for Stiff Soil to Hard Rock Sites."
4. AREVA Calc. No. 32-9110155-000, "US EPR™ Standard Nuclear Plant, Seismic SSI Analysis of Detailed EPR™ Model."
5. AREVA Calc. No. 32-9109591-000, "US EPR™ Standard Plant Nuclear Island, Seismic Stability Analysis of I Foundation."

NRC Audit, December 14-15, 2009

Document List for Civil/Structural

Section 3.8

General Documents

1. AREVA Document No. 115-9005578-007, "System Design Requirements Document for EPR Standard Plant Structures"

2. AREVA Document No. 51-9112213-000, "ACI 349 Code Reconciliation"

Calculations

1. AREVA Calc. No. 32-9022315-003, "US EPR Standard Plant Structural Loads – Soil Spring Loads on Nuclear Island Basemat"

2. AREVA Calc. No. 32-9059628-002, "Seismic Interaction Between Nuclear Island and Nuclear Auxiliary Building"

3. AREVA Calc. No. 32-9108190-001, "US EPR Standard Plant DC General Design – Selection of Critical Sections"

4. AREVA Calc. No. 32-9110009-000, "US EPR Standard DC Containment Design – Thermal Moment Modification Factor for Mesh Refinement and Cracking of Concrete"

5. AREVA Calc. No. 32-9111791-000, "Parametric Study of the Reactor Containment Building"

6. AREVA Calc. No. 32-9113186-000, "Comparison of Inter-Story Shears and Overtuning Moments from the Static FEM of the US EPR and the Dynamic Stick Model"

RAIs

1. RAI 155 and Supplements 1, 2, 3, 4, and 5

2. RAI 190 and Supplement 1

3. RAI 248 and Supplement 1 and 2

4. RAI 283 and Supplement 1

5. RAI 306

6. RAI 335

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