

## ArevaEPRDCPEm Resource

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**From:** Canova, Michael  
**Sent:** Tuesday, July 09, 2013 1:48 PM  
**To:** WILLIFORD Dennis (AREVA)  
**Cc:** Clark, Phyllis; Snyder, Amy; Segala, John; ArevaEPRDCPEm Resource  
**Subject:** U.S. EPR Design Certification PRA Audit Plan - week of 7/15/13  
**Attachments:** ML13162A293 - Regulatory Audit Plan for PRA Level 1 And Level 2 Audits Supporting U S EPR FSAR Chapter 19 .pdf

Per you request.

*Mike Canova*

**Project Manager**

Licensing Branch 1

Division of New Reactor Licensing

Office of New Reactors

301-415-0737

**Hearing Identifier:** AREVA\_EPR\_DC\_RAIs  
**Email Number:** 4567

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**Subject:** U.S. EPR Design Certification PRA Audit Plan - week of 7/15/13  
**Sent Date:** 7/9/2013 1:48:16 PM  
**Received Date:** 7/9/2013 1:48:54 PM  
**From:** Canova, Michael

**Created By:** Michael.Canova@nrc.gov

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"Clark, Phyllis" <Phyllis.Clark@nrc.gov>  
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Tracking Status: None

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MESSAGE	169	7/9/2013 1:48:54 PM
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**U.S. NUCLEAR REGULATORY COMMISSION REGULATORY AUDIT OF PROBABILISTIC RISK ASSESSMENT, PRA-BASED SMA ACCIDENT SEQUENCES, EXTERNAL EVENTS RISK EVALUATION, KEY SOURCES OF UNCERTAINTY, D-RAP LIST, SECURITY TARGET SET, AND DESIGN CHANGES FOR U.S. EPR FINAL SAFETY ANALYSIS REPORT  
CHAPTER 19**

**U.S. EPR DESIGN CERTIFICATION  
Docket No. 52-020**

**AUDIT PLAN**

**APPLICANT:** AREVA NP, Inc.

**APPLICANT CONTACTS:** Dennis Williford  
David Noxon

**DURATION:**

**Part 1**  
June 17, 2013, 1:00 P.M. - 5:00 P.M.  
June 18, 2013, 8:00 A.M. - 5:00 P.M.  
June 19, 2013, 8:00 A.M. - 5:00 P.M.  
June 20, 2013, 8:00 A.M. - 4:00 P.M.

**Part 2**  
July 15, 2013, 1:00 P.M. - 5:00 P.M.  
July 16, 2013, 8:00 A.M. - 5:00 P.M.  
July 17, 2013, 8:00 A.M. - 5:00 P.M.  
July 18, 2013, 8:00 A.M. - 4:00 P.M.

**Part 3 (Follow-up Audits)**  
Various times from June 20, 2013, to September 30, 2013, when the staff will examine PRA-related documents remotely

**LOCATION:** AREVA NP, Inc.  
Solomon Pond Park  
400 Donald Lynch Boulevard  
Marlborough, MA 01752

**REVIEWERS:** Hanh Phan (NRO, Audit Lead)  
Anne-Marie Grady (NRO)  
Marie Pohida (NRO)  
Malcolm Patterson (NRO)  
Jason Schaperow (NRO)  
Tanya Ford (NRO, Project Manager for Part 1)  
Phyllis Clark (NRO, Project Manager for Part 2)

**BACKGROUND**

AREVA NP, Inc. (AREVA) submitted by a letter dated December 11, 2007, to the U.S. Nuclear Regulatory Commission (NRC) a Final Safety Analysis Report (FSAR) for its Design Certification

(DC) application of the U.S. EPR design, accessible by Agencywide Documents Access and Management System (ADAMS) Accession No. ML073520305. The NRC staff initiated this design certification review on March 19, 2008. Recently, AREVA has updated its models for the U.S. EPR probabilistic risk assessment (PRA) as well as documents to account for recent design modifications and to address staff findings during the safety evaluation review. To facilitate the NRC staff's evaluation of PRA changes and results and to complete its safety review of U.S. EPR FSAR Chapter 19, the staff is planning an audit which includes:

- **Part 1:** A four-day regulatory audit, which will be carried out at AREVA's facilities in Marlborough, MA, from June 17 through 20, 2013, to examine the Level 1 at-power PRA, PRA-based SMA accident sequences, design changes, PRA-related information (i.e., D-RAP list), security target set, and RAI 524.
- **Part 2:** A four-day regulatory audit, which will be carried out at AREVA's facilities in Marlborough, MA, from July 15 through 18, 2013, to examine the Level 2 PRA, low-power and shutdown Levels 1 and 2 PRA, external events risk evaluation, key sources of uncertainty/assumptions, and uncertainty and sensitivity analyses.
- **Part 3:** Follow-up audits, if necessary, will be carried out at the NRC Headquarters. The staff will examine PRA-related electronic documents via AREVA's Electronic Reading Room from June 21, 2013, through September 30, 2013.

## **PURPOSE**

The purpose of this audit is for staff to: (1) gain an understanding of AREVA's updated U.S. EPR Level 1 PRA models and to review documentation related to PRA and (2) evaluate the process/procedures used by AREVA to assess U.S. EPR design modifications for PRA impact. The audit will consist of reviewing the differences between AREVA's current PRA Revision 1 and its previous PRA Revision 0. The audit will also consist of reviewing a sample of design changes to evaluate AREVA's process for reviewing design changes for PRA impact. To the extent applicable, the audit will examine information/documentation that is related to the Level 1 full power and shutdown PRA models.

## **REGULATORY AUDIT BASIS**

An audit is needed to evaluate and identify detailed information related to the applicant's submittals in direct support of the safety conclusions that need to be made regarding Chapter 19 of the U.S. EPR FSAR.

10 CFR 52.47(a)(27) states that a DC application must contain an FSAR that includes a description of the design-specific PRA and its results.

The NRC staff must have sufficient information to ensure that acceptable risk and adequate assurance of safety can be documented in the NRC staff's safety evaluation report (SER).

## **REGULATORY AUDIT SCOPE**

The specific scope of this audit will include reviewing impacts of the PRA update on the following:

- Level 1 internal events PRA
- Level 1 internal floods PRA

- Level 1 internal fire PRA
- Level 1 low-power and shutdown PRA
- Level 2 at-power PRA
- Level 2 low-power and shutdown PRA
- PRA-based SMA accident sequences
- External events risk evaluation
- Key sources of uncertainty
- PRA maintenance and design changes
- D-RAP list
- Security target set

In addition, the staff will audit AREVA's response to RAI 524, Question 06.02.02-127, "Loss of CAP." For each of the items mentioned above, this audit will focus on the following areas:

- Differences between the PRA Revision in 2009 and PRA Revision in 2013 (i.e., accident sequences, cutsets, importance ranking, insights, conclusions, etc.)
- Modification to the databases of failure rates, human actions, etc.
- Modification to the event trees
- Modification to the system analysis
- Modification to the key assumptions
- Adjustment to scenarios and models

#### **DOCUMENTS/INFORMATION NECESSARY FOR THE AUDIT**

The following documents are to be made available to the NRC staff in English:

<b>Document Number</b>	<b>Title</b>
51-7011201	Human Reliability Analysis for Level 1 and 2 PRA
51-9010790	Chemical and Volume Control System Analysis
51-9003971	RCS Depressurization System Analysis
51-9005688	Extra Borating Systems Analysis
51-9006847	Startup & Shutdown System
51-9006913	Main Feedwater System Analysis
51-9006934	Essential Service Water System Analysis
51-9007050	Emergency Feedwater System Analysis
51-9007333	Main Steam Supply System Analysis
51-9007369	Protection System (PS) PRA System Analysis
51-9007565	SIS/RHR System Analysis
51-9007625	Reactor Coolant Pump Seal LOCA System Analysis
51-9007671	Closed Cooling Water System Analysis
51-9007677	Electrical Power System Analysis
51-9007701	Safeguards Building HVAC Systems Analysis
51-9007932	Component Cooling Water System Analysis
51-9008083	Analysis of Common Cause Events
51-9008215	Analysis of Failure Events

<b>Document Number</b>	<b>Title</b>
51-9009468	Initiating Events Notebook
51-9009649	Level 1 Success Criteria Notebook
51-9012385	Level 1 Accident Sequence Analysis Notebook
51-9012863	Severe Accident Heat Removal System Analysis
51-9024338	Containment Isolation System Analysis
51-9032754	Low Power Shutdown (LPSD) PRA Notebook
51-9046450	System Modeling Approach
51-9052197	Internal Flooding Report
51-9058854	Internal Fires Report
New	Level 1 Results and Changes Summary
New	Level 2 Results and Changes Summary
51-9029738	Phenomenological Evaluation No. 1 – Induced Rupture of the Reactor System Pressure Boundary
51-9031685	Phenomenological Evaluation No. 2 – Fuel Coolant Interactions
51-9051373	Phenomenological Evaluation No. 3 - In-Vessel Core Recovery
51-9031684	Phenomenological Evaluation No. 4 – Phenomena at Vessel Failure
51-9053436	Phenomenological Evaluation No. 5 – Hydrogen Deflagration, Flame Acceleration and Deflagration-to Detonation Transition
51-9036131	Phenomenological Evaluation No. 6 – Long Term Containment Challenges
51-9052359	Phenomenological Evaluation No. 7 – Level 2 Equipment Survivability
51-9026335	Design Certification – Level 2 PRA Supporting Severe Accident Analysis
51-9056391	PRA Source Term Methodology and Identification of Key Uncertainties
51-9056390	PRA Containment Event Tree Structure, Quantification and Sensitivity/Uncertainty Analysis
51-9036482	PRA Design Certification Level 2 for Shutdown States

- Procedure(s) used to assess all U.S. EPR design changes for PRA impact (including documentation that implements the procedure).
- List of U.S. EPR design changes up until the PRA update and list of design changes since the update to present.
- List of key sources of uncertainty and key assumptions, which drive the PRA models and results.

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**SPECIAL REQUESTS**

The NRC staff also requests the following while at AREVA’s site:

- Searchable electronic copies of the documents listed above
- AREVA personnel to address NRC staff’s questions on requested documents
- All documents should indicate relevant changes (i.e., redline-strikeout versions are preferred)
- An up-to-date version of the U.S. EPR PRA computer model and an AREVA analyst qualified to exercise the model as needed by the NRC staff to support the audit

- A private room with speakerphone to contact NRC headquarters for teleconferences and NRC staff caucus
- Secure ethernet access to the internet for members of the NRC audit team

## **AUDIT ACTIVITIES AND DELIVERABLES**

The NRC audit team is expected to consist of six individuals covering the technical areas identified in the PRA. The task assignments are shown in Table 1 for Part 1 of the audit and Table 2 for Part 2 of the audit. Depending upon how much effort is needed in a given area, NRC team members may be reassigned to ensure adequate coverage of important technical elements.

The NRC staff acknowledges the proprietary nature of the information requested. It will be handled appropriately throughout the audit. NRC staff will not remove hard copy or electronic files from the audit site(s).

An audit report will be generated after completion of the audit. The audit outcome will be used to identify additional information needed for making regulatory decisions. The audit will assist the NRC staff in the issuance of further RAs (if necessary) for the licensing review of FSAR Chapter 19 of the U.S. EPR design certification application and in preparation of the NRC staff's final SER.

The proposed agendas for Part 1 and Part 2 of the audit are presented in Attachments A and B, respectively. If necessary, any circumstances related to the conductance of the audit will be communicated to Tanya Ford (NRC) at 301-415-1194 or [Tanya.Ford@nrc.gov](mailto:Tanya.Ford@nrc.gov).

**Table 1 – Part 1 Audit Reviewer Assignments**

No.	Technical Elements	Reviewers and Assignments			
		Hanh Phan	Anne-Marie Grady	Malcolm Patterson	Tanya Ford
1	Internal Events PRA	<b>S</b>	<b>P</b>	<b>S</b>	
2	Internal Floods PRA	<b>P</b>	<b>S</b>		
3	Internal Fire PRA	<b>P</b>	<b>S</b>		
4	PRA-based SMA Accident Sequences		<b>S</b>	<b>P</b>	
5	PRA Maintenance and Design Changes			<b>P</b>	<b>S</b>
6	D-RAP List		<b>S</b>	<b>P</b>	
7	Security Target Set		<b>S</b>	<b>P</b>	
8	RAI 524, Question 06.02.02-127 “Loss of CAP”	<b>P</b>	<b>S</b>		

**Table 2 – Part 2 Audit Reviewer Assignments**

No.	Technical Elements	Reviewers and Assignments				
		Hanh Phan	Anne-Marie Grady	Jason Schaperow	Marie Pohida	Phyllis Clark
1	Level 2 PRA		<b>P</b>	<b>S</b>		<b>S</b>
2	Low-Power and Shutdown (Level 1 and Level 2 PRA)				<b>P</b>	
3	External Events Evaluation	<b>S</b>			<b>P</b>	
4	Uncertainty and Sensitivity Analyses	<b>P</b>				
5	Key Sources of Uncertainty and Key Assumptions	<b>P</b>				

**P** - Primary Responsibility

**S** - Secondary Responsibility

Note: Participants from Part 1 of the audit may return for Part 2 to complete their reviews, if necessary.

**ATTACHMENT A**

**U.S. EPR FSAR Chapter 19 PRA Regulatory Audit – Part 1  
June 17 – 20, 2013  
AREVA NP, Inc., Marlborough, MA**

**AUDIT AGENDA**

**Monday, June 17, 2013:**

1:00 P.M. – 1:30 P.M. Part 1 Introductions/Entrance Meeting..... [NRC/AREVA NP]  
1:30 P.M. – 2:00 P.M. Overview of U.S. EPR FSAR Chapter 19..... [AREVA NP]  
2:00 P.M. – 4:30 P.M. NRC Audit of PRA Models/Documents..... [AREVA NP]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Tuesday, June 18, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents.....[NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 4:00 P.M. NRC Audit of Models/Documents.....[NRC/AREVA NP]  
4:00 P.M. – 4:30 P.M. NRC Staff Caucus..... [NRC]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Wednesday, June 19, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 4:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
4:00 P.M. – 4:30 P.M. NRC Staff Caucus..... [NRC]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Thursday, June 20, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents.....[NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 2:00 P.M. NRC Audit of PRA Models/Documents.....[NRC/AREVA NP]  
2:00 P.M. – 3:00 P.M. NRC Staff Caucus..... [NRC]  
3:00 P.M. – 4:00 P.M. Part 1 Exit Meeting ..... [NRC/AREVA NP]  
4:00 P.M. Adjourn

**ATTACHMENT B**

**U.S. EPR FSAR Chapter 19 PRA Regulatory Audit – Part 2  
July 15 – 18, 2013  
AREVA NP, Inc., Marlborough, MA**

**AUDIT AGENDA**

**Monday, July 15, 2013:**

1:00 P.M. – 1:30 P.M. Part 2 Introductions/Entrance Meeting..... [NRC/AREVA NP]  
1:30 P.M. – 2:00 P.M. Overview of U.S. EPR Level 2 PRA..... [AREVA NP]  
2:00 P.M. – 4:30 P.M. NRC Audit of PRA Models/Documents..... [AREVA NP]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Tuesday, July 16, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 4:00 P.M. NRC Audit of Models/Documents..... [NRC/AREVA NP]  
4:00 P.M. – 4:30 P.M. NRC Staff Caucus..... [NRC]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Wednesday, July 17, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 4:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
4:00 P.M. – 4:30 P.M. NRC Staff Caucus..... [NRC]  
4:30 P.M. – 5:00 P.M. Summary of the Day and Action Items..... [NRC/AREVA NP]  
5:00 P.M. Adjourn

**Thursday, July 18, 2013:**

8:00 A.M. – 12:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
12:00 P.M. – 1:00 P.M. Lunch  
1:00 P.M. – 2:00 P.M. NRC Audit of PRA Models/Documents..... [NRC/AREVA NP]  
2:00 P.M. – 3:00 P.M. NRC Staff Caucus..... [NRC]  
3:00 P.M. – 4:00 P.M. Part 2 Exit Meeting ..... [NRC/AREVA NP]  
4:00 P.M. Adjourn