September 11, 2008

Ms. Sandra Sloan
Manager
AREVA NP, Inc.
3315 Old Forest Road
P.O. Box 10935
Lynchburg,VA 24506-0935

SUBJECT: NRC SUPPORTING DOCUMENT EXAMINATION FOR THE AREVA NP, INC. U.S. EVOLUTIONARY PRESSURIZED REACTOR DESIGN CERTIFICATION APPLICATION CHAPTER 19 REVIEW (DOCKET NO. 52-020)

Dear Ms. Sloan

Over the course of several days in April and May 2008, the U.S. Nuclear Regulatory Commission (NRC) staff examined supporting documents related to Chapter 19 of the AREVA NP, Inc. (AREVA) U.S. Evolutionary Pressurized Reactor (U.S. EPR) design certification application at the AREVA facility in Rockville, Maryland. The enclosed report presents the details of that activity.

The NRC staff looked at dozens of documents that describe the U.S. EPR probabilistic risk assessment and severe accident analysis. These documents are first-tier references in Chapter 19 of the docketed U.S. EPR Final Safety Analysis Report (FSAR) and include a level of detail beyond that which is required in the FSAR. However, examining such information allows the staff to conduct its review more efficiently. Specifically, the staff gains a better understanding of the basis underlying the formal application and identifies areas where additional information should be submitted to allow a licensing decision on the application.

As a result of the supporting document examination, the staff wrote several Requests for Additional Information to ensure that information needed for the staff's safety decision is properly included in the U.S. EPR docket file. These questions have been sent to AREVA as RAIs 6, 7,8 and 14(ADAMS Accession Numbers ML 081610751 ML081610591, ML081640034, and ML081640053 respectively

In accordance with Section 2.390, "Public inspections, exemptions, requests for withholding," of Title 10 of the *Code of Federal Regulations* Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter, and its enclosures will be made available for public inspection at the NRC's Public Document Room, located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland, and via the Agencywide Documents Access and Management System Public Electronic Reading Room on the Internet at the NRC Web site, http://www.nrc.gov/reading-rm/adams.html.

If you have any questions regarding this matter, please contact me at 301-415-3361.

Sincerely,
/RA/

Getachew Tesfaye, Sr. Project Manager
EPR Project Branch
Division of New Reactor Licensing
Office of New Reactors

Docket No.: 52-020

Enclosure:
As stated

cc: see next page

If you have any questions regarding this matter, please contact me at 301-415-3361.

Sincerely,

/RA/

Getachew Tesfaye Peter C. Hearn, Sr. Project Manager
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Office of New Reactors

Docket No.: 52-020

Enclosure:
As stated

cc: see next page

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DATE	7/18/08	7/22/08	7/28/08	08/11 /08	8/11/08

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*see previous concurrence page

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS

Audit Report No:	05200020-2008-001
Organization:	AREVA NP, Inc.
Applicant Contacts:	Ronda Pederson Deputy Licensing Manager AREVA NP Inc. 3315 Old Forrest Road P.O. Box 10935 Lynchburg, VA, 24506-0935
Nuclear Industry:	AREVA NP, Inc., designs, builds, and starts up nuclear steam supply systems and supplies fuel, engineering services, and replacement components to U.S. nuclear utilities. AREVA NP Inc. is one of the three major regions under AREVA NP. The other major regions include France (AREVA NP SAS) and Germany (AREVA NP GmbH).
Dates:	April 21, 22, 28, and 30; May 15, 20, and 28, 2008
NRC Staff:	Getachew Tesfaye, Lead Project Manager, DNRL/NRO Peter Hearn, Senior Project Manager, DNRL/NRO John Rycyna, Project Manager, DNRL/NRO Theresa Clark, Reliability and Risk Engineer, SPLA/DSRA/NRO Hanh Phan, Reliability and Risk Engineer, SPLA/DSRA/NRO Edward Fuller, Senior Reliability and Risk Engineer, SPLB/DSRA/NRO Jim Xu, Structural Engineer, SEB2/DE/NRO Hernando Candra, Structural Engineer, SEB2/DE/NRO Walton Jensen, Senior Reactor Engineer, SPCV/DSRA/NRO Yung-Hsien (James) Chang, Human Factors Engineer, DRA/RES
NRC Contractors:	Mohsen Khatib-Rahbar, Energy Research, Inc. (ERI) Roy Karimi, ERI James Fulford, Consultant to ERI
NRC Management:	Lynn Mrowca, Chief, SPLA/DSRA/NRO

ENCLOSURE

1.0 AUDIT SUMMARY

Over the course of several days in April and May 2008, U.S. Nuclear Regulatory Commission (NRC) staff examined supporting documents related to Chapter 19 of the AREVA NP, Inc. (AREVA) U.S. Evolutionary Pressurized Reactor (U.S. EPR) design certification (DC) application at the AREVA facility in Rockville, Maryland. The NRC staff looked at dozens of documents that describe the U.S. EPR probabilistic risk assessment and severe accident analysis. These documents are first-tier references in Chapter 19 of the docketed U.S. EPR Final Safety Analysis Report (FSAR) and include a level of detail higher than is required in the FSAR. However, examining such information allows the staff to conduct its review more efficiently. Specifically, the staff gains a better understanding of the basis underlying the formal application and identifies areas where additional information should be submitted to allow a licensing decision on the application.

The bases for the examination were:

- Title 10 of the *Code of Federal Regulations* (10 CFR), Section 52.47, "Contents of Applications"
  - (a)(8): The information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs (f)(1)(xii), (f)(2)(ix), and (f)(3)(v).
  - (a)(23): For light-water reactor [LWR] designs, a description and analysis of design features for the prevention and mitigation of severe accidents, e.g., challenges to containment integrity caused by core-concrete interaction, steam explosion, high-pressure core melt ejection, hydrogen combustion, and containment bypass.
  - (a)(27): A description of the design-specific PRA and its results.

- 10 CFR 50.9, "Completeness and Accuracy of Information."

- Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Sections C.I.17, "Quality Assurance," and C.I.19, "Probabilistic Risk Assessment and Severe Accident Evaluation"

- NUREG-0800, "Standard Review Plan," Sections 17.4, "Reliability Assurance Program (RAP)," and 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors"

As a result of the supporting document examination, the staff wrote several Requests for Additional Information (RAI) to ensure that information needed for the staff's safety decision is properly included in the U.S. EPR docket file. These questions have been sent to AREVA as RAI 6, 7, 8, and 14. The staff will refer to the FSAR, RAI responses, and the enclosed report, but not to the detailed documents reviewed at AREVA's site, in its safety evaluation of the U.S. EPR.

2.0 STATUS OF PREVIOUS AUDITS

There were no previous NRC supporting document examinations in support of the U.S. EPR FSAR Chapter 19 Review.

3.0 AUDIT RESULTS

3.1 Documents Examined

AREVA made the following documents available at its Rockville, Maryland, facility for examination by the NRC staff:

- U.S. EPR PRA - RCS Depressurization System PRA System Analysis
- U.S. EPR PRA - Extra Borating PRA Systems Analysis
- U.S. EPR PRA - Start-up and Shutdown PRA System Analysis
- U.S. EPR PRA - Main Feedwater PRA System Analysis
- U.S. EPR PRA - Essential Service Water System (ESWS) PRA System Analysis
- U.S. EPR PRA - Emergency Feedwater System (EFWS) PRA System Analysis
- U.S. EPR PRA - Demineralized Water Distribution System PRA System Analysis
- U.S. EPR PRA - Main Steam Supply System (MSSS) PRA Systems Analysis
- U.S. EPR PRA - Protection System (PS) PRA System Analysis
- U.S. EPR PRA - SIS/RHR System PRA System Analysis
- U.S. EPR PRA - Reactor Coolant Pump Seal LOCA PRA System Analysis
- U.S. EPR PRA - Closed Cooling Water (PGC) PRA System Analysis
- U.S. EPR PRA - Electrical Power System PRA System Analysis
- U.S. EPR PRA - Safeguards Building HVAC (QK\QN\SAC) PRA Systems Analysis
- U.S. EPR PRA - Component Cooling Water System (CCWS) PRA System Analysis
- U.S. EPR PRA - Chemical and Volume Control System (CVCS) PRA System Analysis
- U.S. EPR PRA - Severe Accident Heat Removal System (SAHRS) PRA System Analysis
- U.S. EPR PRA - Containment Isolation System PRA System Analysis
- Analysis of Common Cause Events for the U.S. EPR Design Certification
- Analysis of Failure Events for the U.S. EPR Design Certification
- U.S. EPR PRA - Initiating Events Notebook
- U.S. EPR PRA - Level 1 Success Criteria Notebook
- U.S. EPR PRA - Level 1 Accident Sequence Analysis Notebook
- Human Reliability Analysis (HRA)
- U.S. EPR PRA - Based Seismic Margins Assessment
- U.S. EPR PRA - Low Power Shutdown (LPSD) PRA Notebook
- U.S. EPR Design Certification High Energy Line Break (HELB) Analysis
- U.S. EPR PRA - System Modeling Approach
- U.S. EPR PRA - Internal Flooding Report
- U.S. EPR PRA - Level 1 Quantification Results Report
- U.S. EPR PRA - Internal Fires Report
- MAAP [Modular Accident Analysis Program] 4.0.7 Justification for Level 1 PRA Analysis
- EPR Design Certification Core Damage End State Definition
- U.S. EPR Design Certification-Level 2 PRA Supporting Severe Accident Analysis
- U.S. EPR Design Certification Containment Fragility Phenomenological Evaluation
- Phenomenological Evaluation No. 1 - Induced Rupture of the Reactor System Pressure Boundary
- U.S. EPR PRA - Phenomenological Evaluation No. 4 - Phenomena at Vessel Failure

- Phenomenological Evaluation No. 2 - Fuel Coolant Interactions
- Phenomenological Evaluation No. 6 - Long Term Containment Challenges
- U.S. EPR Design Certification Level 2 for Shutdown States
- Human Action Modeling in the Level 2 PRA
- Phenomenological Evaluation No. 3 In-Vessel Core Recovery
- Phenomenological Evaluation No. 7 - Level 2 Equipment Survivability
- Phenomenological Evaluation No. 5 - Hydrogen Deflagration, Flame Acceleration, and Deflagration-to-Detonation Transition
- U.S. EPR PRA - Containment Event Tree Structure Quantification and Sensitivity/Uncertainty Analysis
- U.S. EPR PRA - Source Term Methodology and Identification of Key Uncertainties
- Level 2 PRA - Introduction, Scope And Methodology
- OL3 [Olkiluoto 3] Severe Accidents Thermal-Mechanical Study of SG [Steam Generator] Tubes for Relevant Core Melt Accidents
- OL3 Severe Accidents Synthesis of RCS [Reactor Coolant System] Material High Temperature Properties
- U.S. EPR MAAP 4.07 Severe Accident Source Term Analysis
- Seismic Fragilities for U.S. EPR
- U.S. EPR Design RAP [Reliability Assurance Program]
- Fire Hazard Analysis
- Flooding Analysis for Reactor Building Annulus

3.2 Interaction with AREVA Staff

On April 21, April 22, and May 28, 2008, AREVA engineers were available at the Rockville, Maryland, facility. The NRC staff interviewed the AREVA engineers to gain a better understanding of how the supporting documents were used by AREVA in developing the application and reaching the conclusions in the application. In a meeting on May 28, 2008, AREVA staff presented an overview of the severe accident document hierarchy, the functioning of the severe accident heat removal system (SAHRS), and the severe accident issue resolution process.

Additionally, entrance and exit meetings were held for the first two days of the document examination when AREVA engineers and managers were present. In the entrance meeting on April 21, 2008, the NRC team discussed the scope of the examination, outlined the documents to be examined, and established interfaces with AREVA's staff and management involved in the U.S. EPR DC application development. AREVA staff also presented an overview of the document hierarchy and the development of the Level 2 PRA. In the exit meeting on April 22, 2008, the NRC team discussed the activities conducted with representatives of AREVA's management and staff.

The NRC staff did not retain any of AREVA's documents from these presentations and relied on their personal notes and interactions to develop issues for resolution (see section 3.3 below).

3.3 Issue Resolution

As a result of the supporting document examination, the staff identified various issues with the underlying analyses used to develop the U.S. EPR FSAR, as well as information useful to clarify

the discussion in the FSAR. To ensure that the docketed material supporting the U.S. EPR DC application is complete, the staff wrote several RAIs on these issues. Over 75 questions have been sent to AREVA as RAIs 6, 7, 8, and 14. The staff will refer to the FSAR, RAI responses, and this report, but not to the detailed documents reviewed at AREVA's site, in its safety evaluation of the U.S. EPR.

3.4 Conclusions

The staff's examination of supporting documents for the U.S. EPR PRA and severe accident analyses allowed the staff to conduct its review of the U.S. EPR FSAR more efficiently. Specifically, the staff gained a better understanding of the basis underlying the formal application and identified areas where additional information should be submitted to allow a licensing decision on the application.

4.0 PRINCIPLE LIST OF AREVA STAFF CONTACTED

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David Noxon	Licensing Lead Engineer
Bill Szymczak	PRA Supervisor
Vesna Dimitrijevic	Level 1 PRA Engineer
David Gerlitz	Level 2 PRA Engineer
Vincent Cordoliani	Level 1 PRA Engineer
Bob Prior	Level 2 PRA Engineer
Robert Martin	Severe Accident Engineer
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