



November 23, 2015  
NRC:15:044

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

**10 CFR 50.46 Annual Report for the U.S. EPR Design Certification**

- Ref. 1: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Application for Standard Design Certification of the U.S. EPR (Project No. 733)," NRC:07:070, December 11, 2007.
- Ref. 2: Letter, Getachew Tesfaye (NRC) to Sandra M. Sloan (AREVA NP Inc.), "AREVA NP Inc. – Acceptance of the Application for Standard Design Certification of the U.S. EPR," February 25, 2008.
- Ref. 3: Letter, Pedro Salas (AREVA Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Annual Report for the U.S. EPR Design Certification," NRC:14:060, November 12, 2014.

AREVA Inc. (AREVA) submitted the application for a Standard Design Certification of the U.S. EPR design in Reference 1. The NRC accepted the application for review in Reference 2. In accordance with 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Reactors," AREVA is submitting this annual report of the emergency core cooling system (ECCS) evaluation model changes and errors for the U.S. EPR Standard Design (Docket 52-020). The previous annual report was submitted in Reference 3.

This report addresses two evaluation models: one for the large break loss of coolant accident (LBLOCA), and one for the small break loss of coolant accident (SBLOCA). The summary of the changes and error corrections made between October 1, 2014 and September 30, 2015 for the LBLOCA evaluation model is provided in Attachment A. The summary of the changes and error corrections made between October 1, 2014 and September 30, 2015 for the SBLOCA evaluation model is provided in Attachment B.

The information included in this letter is generic and applies to all Combined License (COL) applications referencing the U.S. EPR Design Certification as of the date of this letter. The COL applicants are hereby notified (by copy of this letter) of the changes and errors in the U.S. EPR evaluation models as required by 10 CFR 50.46(a)(3)(iii).

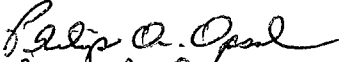
**AREVA INC.**

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If you have any questions related to this submittal please contact Nathan Hottle, Product Licensing Manager, by telephone at 434-832-3864 or by e-mail at [Nathan.Hottle@areva.com](mailto:Nathan.Hottle@areva.com).

Sincerely,

  
Paul A. Opsal

For Gayle Elliott, Interim Director  
Licensing & Regulatory Affairs  
AREVA Inc.

cc: Docket 52-020

**Attachment A:  
Large Break Loss of Coolant Accident (LBLOCA) Evaluation Model**

A report of changes and errors in the LBLOCA evaluation model (EM) for the period of October 1, 2014 to September 30, 2015 is presented below. The estimated effect on peak cladding temperature is summarized in Table A1.

The NRC-approved LBLOCA evaluation model for the U.S. EPR design is ANP-10278PA, Revision 1.

1. A reanalysis of LBLOCA was performed during the reporting period to incorporate all of the existing EM changes and corrections. Reference A1 identified the changes that were incorporated into the revised analysis and provided the results of the reanalysis in the form of revised U.S. EPR FSAR pages. The revised analysis establishes a new baseline analysis of record for future reporting under 10 CFR 50.46.

The new maximum PCT value for the U.S. EPR RLBLOCA is 1780°F (Reference A1).

2. It was discovered during the RLBLOCA reanalysis that the core exit junction modeling was insufficient by itself to prevent non-physical flow behavior and top-down quench for several cases. ANP-10287PA, Revision 1 includes an SER condition that "if a topdown quench occurs, the model will be justified or corrected to remove top quench."

A modification to the steady-state base deck was made to prevent a possible top-down quench and eliminate any possible non-physical flow behavior. The abrupt area option flag for the junctions that connect the exit of the core to the upper plenum region was changed to provide consistency among all junctions between the core exit and the upper plenum. Additionally, the reverse form loss coefficient for the hot channel-to-upper plenum and central core-to-upper plenum junctions was increased during the reflood phase of the transient.

The modification made to prevent top-down quench was included in the RLBLOCA reanalysis (Reference A1). It was stated in Reference A1 that this error correction would be reported in the October 1, 2014 to September 30, 2015 10 CFR 50.46 report for the U.S. EPR (this report).

Ref. A1: Letter, Pedro Salas (AREVA Inc.) to Document Control Desk (NRC), "FSAR Changes Due to LBLOCA Reanalysis Results for the U.S. EPR Design Certification," NRC:14:071, December 19, 2014.

**Table A1 LBLOCA Margin Summary Sheet – Annual Report**

Plant Name: U.S. EPR Standard Design Certification

Evaluation Model: RLBLOCA (ANP-10278PA Revision 1)

Initial Peak Cladding Temperature (PCT) = 1695°F

		<u>Net PCT Effect</u>	<u>Absolute PCT Effect</u>
A.	Prior 10 CFR 50.46 Changes or Error Corrections – previous Years	$\Delta PCT = +107^\circ F$	$+275^\circ F$
B.	Current 10 CFR 50.46 Changes – This Report		
	Smooth area assumption on core exit junction	$\Delta PCT = +0^\circ F$	$+0^\circ F$
	Sum of 10 CFR 50.46 Changes for this Reporting Period	$\Delta PCT = +0^\circ F$	$+0^\circ F$
C.	RLBLOCA Reanalysis (accounts for all changes and error corrections)	New Baseline PCT = 1780°F	

The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of PCT impact for changes and errors identified since this analysis is less than 2200°F.

**Attachment B**  
**Small Break Loss of Coolant Accident (SBLOCA) Evaluation Model**

There were no changes or errors reported in the SBLOCA evaluation model for the period of October 1, 2014 to September 30, 2015. The estimated effect on peak cladding temperature is summarized in Table B1.

The SBLOCA evaluation model for the U.S. EPR design is described in the topical report ANP-10263PA and in the topical report EMF-2328PA. The primary computer code in the SBLOCA evaluation model is S-RELAP5.

**Table B1 SBLOCA Margin Summary Sheet – Annual Report**

Plant Name: U.S. EPR Standard Design Certification

Evaluation Model: SBLOCA (ANP-10263PA and EMF-2328PA)

Initial Peak Cladding Temperature (PCT) = 1638°F

			<u>Net PCT Effect</u>	<u>Absolute PCT Effect</u>
A.	Prior 10 CFR 50.46 Changes or Error Corrections – previous Years	$\Delta$ PCT =	+2°F	+266°F
B.	Current 10 CFR 50.46 Changes – This Report (no changes or errors)	$\Delta$ PCT =	0°F	0°F
	Estimate of PCT (unchanged)	=	1640°F	

The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of PCT impact for changes and errors identified since this analysis is less than 2200°F.