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52-20

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, Gary Peters (AREVA Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Annual Report for the U.S. EPR Design Certification," NRC:16:027, November 14, 2016.

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, 2016 and September 30, 2017 for the LBLOCA evaluation model is provided in Attachment A. The summary of the changes and error corrections made between October 1, 2016 and September 30, 2017 for the SBLOCA evaluation model is provided in Attachment B.

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**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,

A handwritten signature in black ink that reads "Gary Peters". The signature is written in a cursive style with a large, prominent "P".

Gary Peters, Director  
Licensing & Regulatory Affairs  
AREVA Inc.

cc: Docket 52-020

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

There were no changes or errors reported in the LBLOCA evaluation model for the period of October 1, 2016 to September 30, 2017. The estimated effect on peak cladding temperature is summarized in Table A1.

The LBLOCA evaluation model for the U.S. EPR design is described in the topical report ANP-10278PA. The primary computer code in the LBLOCA evaluation model is S-RELAP5.

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

Plant Name: U.S. EPR Standard Design Certification

Evaluation Model: RLBLOCA (ANP-10278PA)

Initial Peak Cladding Temperature (PCT) = 1780°F

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

A report of changes and errors in the SBLOCA evaluation model for the period of October 1, 2016 to September 30, 2017 is presented below. The estimated effect on peak cladding temperature is summarized in Table B1.

1. The M5<sup>®</sup> swelling and rupture model (SRM) is used in several of the AREVA LOCA methodologies. The SRM was approved by the NRC in the early 2000s as part of the M5<sup>®</sup> Licensing Topical Report, BAW-10227, Rev. 1 (P)(A). Additional M5<sup>®</sup> cladding rupture test data has been obtained since the model's approval. Upon review of the data and the SRM's use in LOCA analysis, it was determined that certain aspects of the model would be impacted. Following the same approach as the original model, an updated M5<sup>®</sup> SRM was developed to take into account the updated test database. The model changes do not change the predicted occurrence or conditions at the time of rupture, but would impact the post-rupture cladding characteristics for certain rupture temperatures. However, as the modified values in the updated M5<sup>®</sup> SRM are at rupture temperatures above the calculated PCT of the U.S. EPR SBLOCA analysis, the estimated PCT impact is 0 °F.

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 M5® LOCA Swelling and Rupture Model (SRM) Update	$\Delta$ PCT =	+0°F	+0°F
Sum of 10 CFR 50.46 Changes for this Reporting Period	$\Delta$ 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.