AREVA

March 28, 2014
NRC:14:013

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

10 CFR 50.46 30 Day 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 NP Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Report for the U.S. EPR Design Certification," NRC:13:083, November 26, 2013.

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. The most recent 10 CFR 50.46 annual report was submitted in Reference 3. In accordance with 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Reactors," AREVA is submitting this 30 day report of the emergency core cooling system (ECCS) evaluation model changes and errors for the U.S. EPR Standard Design (Docket 52-020).

This report addresses two evaluation models: one for the small break loss of coolant accident (SBLOCA), and one for the large break loss of coolant accident (LBLOCA). The summary of the changes and errors identified since September 30, 2013 for the LBLOCA evaluation model is provided in Attachment A. The summary of the changes and errors identified since September 30, 2013 for the SBLOCA evaluation model is provided in Attachment B. Only a single error has been identified for the LBLOCA and SBLOCA evaluation models since September 30, 2013. The impact of the error for both the LBLOCA and SBLOCA evaluation model is greater than 50 degrees F (and thus is considered significant by the regulation) and thus this report is provided within 30 days from the determination of the peak cladding temperature (PCT) impact.

The regulation 10 CFR 50.46(a)(3)(ii) states "If the change or error is significant, the applicant or licensee shall provide this report within 30 days and include with the report a proposed schedule for providing a reanalysis or taking other action as may be needed to show compliance with § 50.46 requirements." AREVA has concluded that the RLBLOCA will be reanalyzed since the change in PCT from the base analysis is +107 degrees F. The reanalysis will be completed by August 24, 2015 and the U.S. EPR FSAR Tier 2 will be updated to reflect the reanalysis. AREVA has concluded that no reanalysis is required for SBLOCA to show compliance with § 50.46 requirements since the change in peak cladding temperature (PCT) from the base analysis is -18 degrees F.

AREVA INC.

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This letter contains one commitment. This commitment will be completed by August 25, 2015.

1. The U.S. EPR FSAR Tier 2 will be updated to reflect the reanalysis of the LBLOCA.

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).

If you have any questions related to this information, please contact Len Gucwa by telephone at (434) 832-3466 or by e-mail at Len.Gucwa.ext@Areva.com.

Sincerely,

Pedro Salas, Director
Regulatory Affairs
AREVA Inc.

cc: G. F. Wunder
J. P. Segala
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 since September 30, 2013 is presented below. Only a single error has been identified in this period.

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

1. The U.S. EPR has an axial economizer in the secondary side of the steam generator (SG) which partitions the downcomer into two sides. At power, the main feedwater (MFW) injects solely onto the cold side (downside) of the SG tube bundle, establishing a recirculation pattern in the SG in which more of the recirculated flow from the separator goes to the hot side. In order to obtain that flow distribution in the S-RELAP5 SG model, k-factors are adjusted in some of the junctions. A split downcomer was also modeled.

   It was concluded in 2011 that this modeling resulted in a non-physical circulation pattern in the bundle region of SG following reactor trip and termination of MFW. An adjustment was made to change the loss coefficients in the SG downcomer to reduce the non-physical behavior. This change was reported for 2011 in Reference A1.

   In late 2013, the U.S. EPR project became aware (through European colleagues) that experimental information existed which demonstrated that the original flow pattern (which was thought in 2011 to be non-physical) was correct. The previous adjustment (in 2011) to the loss coefficients has been reversed.

The estimated impact of this change on the LBLOCA analyses for the U.S. EPR plant is +79°F on the calculated peak cladding temperature. This is a reversal of the original PCT impact assessment made in 2011 (Reference A1).

Ref. A1: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Report for the U.S. EPR Design Certification," NRC:11:119, December 16, 2011.

Table A1 LBLOCA Margin Summary Sheet – 30 Day Report

Plant Name: U.S. EPR Standard Design Certification

Evaluation Model: RLBLOCA (ANP-10278P, Revision 1)

Initial Peak Cladding Temperature (PCT) = 1695°F

			Net PCT Effect	Absolute PCT Effect
A.	Prior 10 CFR 50.46 Changes or Error Corrections –previous Years	ΔPCT =	+28°F	+186°F
B	Current 10 CFR 50.46 Changes – This Report			
	Steam Generator Loss Coefficient at low power	ΔPCT =	+79°F	+79°F
	Sum of 10 CFR 50.46 Changes for this Reporting Period	ΔPCT =	+79°F	+79°F
	Estimate of PCT including changes and errors	=	1802°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.

The sum of the absolute values of the errors is greater than 50°F for this report.

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

A report of changes and errors in the SBLOCA evaluation model (EM) for the period since September 30, 2013 is presented below. Only a single error has been identified in this period.

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.

1. The U.S. EPR has an axial economizer in the secondary side of the steam generator (SG) which partitions the downcomer into two sides. At power, the main feedwater (MFW) injects solely onto the cold side (downside) of the SG tube bundle, establishing a recirculation pattern in the SG in which more of the recirculated flow from the separator goes to the hot side. In order to obtain that flow distribution in the S-RELAP5 SG model, k-factors are adjusted in some of the junctions. A split downcomer was also modeled.

   It was concluded in 2011 that this modeling resulted in a non-physical circulation pattern in the bundle region of SG following reactor trip and termination of MFW. An adjustment was made to change the loss coefficients in the SG downcomer to reduce the non-physical behavior. This change was reported for 2011 in Reference B1.

   In late 2013, the U.S. EPR project became aware (through European colleagues) that experimental information existed which demonstrated that the original flow pattern (which was thought in 2011 to be non-physical) was correct. The previous adjustment (in 2011) to the loss coefficients has been reversed.

The estimated impact of this change on the SBLOCA analyses for the U.S. EPR plant is +108°F on the calculated peak cladding temperature. This is a reversal of the original PCT impact assessment made in 2011(Reference B1 and as modified in Reference B2).

Ref. B1: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Report for the U.S. EPR Design Certification," NRC:11:119, December 16, 2011.

Ref. B2: Letter, Pedro Salas (AREVA NP Inc.) to Document Control Desk (NRC), "10 CFR 50.46 Report for the U.S. EPR Design Certification," NRC:12:059, November 30, 2012.

Table B1 SBLOCA Margin Summary Sheet – 30 Day Report

Plant Name: U.S. EPR Standard Design Certification

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

Initial Peak Cladding Temperature (PCT) = 1638°F

			Net PCT Effect	Absolute PCT Effect
A.	Prior 10 CFR 50.46 Changes or Error Corrections –previous Years	ΔPCT =	-126°F	+138°F
B	Current 10 CFR 50.46 Changes – This Report			
	Steam Generator Loss Coefficient at low power	ΔPCT =	+108°F	+108°F
	Sum of 10 CFR 50.46 Changes for this Reporting Period	ΔPCT =	+108°F	+108°F
	Estimate of PCT including changes and errors	=	1620°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.

The sum of the absolute values of the errors is greater than 50°F for this report.

bcc: NRC:14:013
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