

## ArevaEPRDCPEm Resource

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**From:** WELLS Russell (AREVA) [Russell.Wells@areva.com]  
**Sent:** Thursday, March 31, 2011 6:05 PM  
**To:** Tesfaye, Getachew  
**Cc:** GUCWA Len (EXTERNAL AREVA); BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 11  
**Attachments:** RAI 111 Supplement 11 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the response on April 1, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 6 to the response on April 14, 2009 to address 2 of the remaining questions. AREVA NP submitted Supplement 7 to the response on June 23, 2009 to provide a revised response date. AREVA NP submitted Supplement 8 to the response on December 18, 2009 to provide a revised response date. AREVA NP submitted Supplement 9 to the response on April 22, 2010 to provide a revised response date. AREVA NP submitted Supplement 10 to the response on May 20, 2010 to provide a revised response to the one remaining question.

The attached file, "RAI 111 Supplement 11 Response US EPR DC.pdf" provides technically correct and complete revised responses to Questions 06.02.02-9, 06.02.02-10, 06.02.02-11, 06.02.02-12, 06.02.02-13, and 06.02.02-14 that were previously answered.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 111 Question 6.02.02-10.

The following table indicates the respective pages in the response document, "RAI 111 Supplement 11 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111 — 06.02.02-9	2	3
RAI 111 — 06.02.02-10	4	4
RAI 111 — 06.02.02-11	5	5
RAI 111 — 06.02.02-12	6	6
RAI 111 — 06.02.02-13	7	7
RAI 111 — 06.02.02-14	8	8

This concludes the formal AREVA NP response to RAI 111, and there are no questions from this RAI for which AREVA NP has not provided responses.

*Sincerely,*

*Russ Wells*  
*U.S. EPR Design Certification Licensing Manager*  
*AREVA NP, Inc.*

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

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434-942-6375 (cell)

Fax: 434-382-3884

[Russell.Wells@Areva.com](mailto:Russell.Wells@Areva.com)

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**From:** BRYAN Martin (EXT)

**Sent:** Thursday, May 20, 2010 3:30 PM

**To:** Tesfaye, Getachew

**Cc:** DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); GUCWA Len T (EXT)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 10

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the response on April 1, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 6 to the response on April 14, 2009 to address 2 of the remaining questions. AREVA NP submitted Supplement 7 to the response on June 23, 2009 to provide a revised response date. AREVA NP submitted Supplement 8 to the response on December 18, 2009 to provide a revised response date. AREVA NP submitted Supplement 9 to the response on April 22, 2010 to provide a revised response date.

The attached file, "RAI 111 Supplement 10 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining portions of the 1 remaining question. Included in the attached file are superseded responses to parts of Question 06.02.02-8 that were previously answered. Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 111 Question 06.02.02-8 part K.

The following table indicates the respective pages in the response document, "RAI 111 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 111-06.02.02— 8	2	21

This concludes the formal AREVA NP response to RAI 111, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Martin (Marty) C. Bryan  
U.S. EPR Design Certification Licensing Manager  
AREVA NP Inc.  
Tel: (434) 832-3016  
702 561-3528 cell  
[Martin.Bryan.ext@areva.com](mailto:Martin.Bryan.ext@areva.com)

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**From:** BRYAN Martin (EXT)  
**Sent:** Thursday, April 22, 2010 6:17 PM  
**To:** 'Getachew.Tesfaye@nrc.gov'  
**Cc:** DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); GUCWA Len T (EXT)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the response on April 1, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 6 to the response on April 14, 2009 to address 2 of the remaining questions. AREVA NP submitted Supplement 7 to the response on June 23, 2009 to provide a revised response date. AREVA NP submitted Supplement 8 to the response on December 18, 2009 to provide a revised response date.

Responses to the remaining RAI 111 questions are dependent upon the results of ongoing GSI-191 evaluations for demonstrating sump strainer performance. Because of these ongoing activities, AREVA NP is not providing a response at this time.

The schedule for technically correct and complete responses to the remaining questions has been revised and is provided below.

<b>Question #</b>	<b>Response Date</b>
RAI 111—06.02.02-8A3	May 20, 2010
RAI 111—06.02.02-8A4	May 20, 2010
RAI 111—06.02.02-8G	May 20, 2010

Sincerely,

Martin (Marty) C. Bryan  
U.S. EPR Design Certification Licensing Manager  
AREVA NP Inc.  
Tel: (434) 832-3016  
702 561-3528 cell  
[Martin.Bryan.ext@areva.com](mailto:Martin.Bryan.ext@areva.com)

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**From:** Pederson Ronda M (AREVA NP INC)  
**Sent:** Friday, December 18, 2009 3:22 PM  
**To:** 'Tesfaye, Getachew'  
**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); GUCWA Len T (EXT)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the response on April 1, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 6 to the response on April 14, 2009 to address 2 of the remaining questions. AREVA NP submitted Supplement 7 to the response on June 23, 2009 to provide a revised response date.

Responses to the remaining RAI 111 questions are dependent upon the results of ongoing GSI-191 head loss testing, which will demonstrate sump strainer performance. Because additional testing is planned, AREVA NP is not providing a response at this time.

The schedule for technically correct and complete responses to the remaining questions has been revised and is provided below.

Question #	Response Date
RAI 111—06.02.02-8A3	April 22, 2010
RAI 111—06.02.02-8A4	April 22, 2010
RAI 111—06.02.02-8G	April 22, 2010

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

**AREVA NP Inc.**

An AREVA and Siemens company

3315 Old Forest Road

Lynchburg, VA 24506-0935

Phone: 434-832-3694

Cell: 434-841-8788

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Tuesday, June 23, 2009 5:03 PM

**To:** 'Getachew Tesfaye'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KAY Jim (AREVA NP INC); GUCWA Len T (EXT)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the

response on April 1, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 6 to the response on April 14, 2009 to address 2 of the remaining questions.

The NRC conducted an audit on April 22-23, 2009 of supporting documentation for the U.S. EPR design with respect to GSI-191. Based on comments made by the NRC staff, AREVA NP is re-evaluating the design for consistency with NRC-approved guidance contained in NEI 04-07. Therefore, AREVA NP is not providing a response at this time.

The schedule for technically correct and complete responses to the remaining questions has been revised and is provided below.

Question #	Response Date
RAI 111—06.02.02-8A3	December 18, 2009
RAI 111—06.02.02-8A4	December 18, 2009
RAI 111—06.02.02-8G	December 18, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Tuesday, April 14, 2009 6:24 PM

**To:** 'Getachew Tesfaye'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KAY Jim (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 6

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 5 to the response on April 1, 2009 to address portions of 2 of the remaining questions.

The attached file, "RAI 111 Supplement 6 Response US EPR DC.pdf" provides a technically correct and complete response to 2 of the remaining questions, as committed.

The following table indicates the respective page in the response document, "RAI 111 Supplement 6 Response US EPR DC.pdf," that contains AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111—06.02.02-9	2	2
RAI 111—06.02.02-11	3	3

The schedule for technically correct and complete responses to the remaining questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8G	June 23, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification  
**AREVA NP Inc.**

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3315 Old Forest Road  
Lynchburg, VA 24506-0935  
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Cell: 434-841-8788

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Wednesday, April 01, 2009 3:23 PM

**To:** 'Getachew Tesfaye'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KAY Jim (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, Supplement 5

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 4 to the response on March 10, 2009 to address portions of 1 of the remaining questions.

The attached file, "RAI 111 Supplement 5 Response US EPR DC.pdf" provides a technically correct and complete response to portions of 2 of the remaining questions, as committed. Appended to this file is the affected page of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 111 Question 06.02.02-17.

The following table indicates the respective pages in the response document, "RAI 111 Supplement 5 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111—06.02.02-8C.1	2	4
RAI 111—06.02.02-8C.2	2	4
RAI 111—06.02.02-8C.5b	2	4
RAI 111—06.02.02-8C.5e	2	5
RAI 111—06.02.02-8K14	2	6
RAI 111—06.02.02-17.1	7	7

The schedule for technically correct and complete responses to the remaining questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

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**AREVA NP Inc.**

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Wednesday, March 11, 2009 10:57 AM

**To:** 'Getachew Tesfaye'

**Cc:** DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, Supplement 4

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. AREVA NP submitted Supplement 1 to the response on January 27, 2009 to address portions of 2 of the remaining questions. AREVA NP submitted Supplement 2 to the response on February 11, 2009 to address portions of 1 of the remaining questions. AREVA NP submitted Supplement 3 to the response on February 27, 2009 to address portions of 1 of the remaining questions.

The attached file, "RAI 111 Supplement 4 Response US EPR DC.pdf" provides a technically correct and complete response to portions of 1 of the remaining 4 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 111 Supplement 4 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
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RAI 111—06.02.02-8I.3	2	4
RAI 111—06.02.02-8I.7-10	4	6
RAI 111—06.02.02-8J1	7	7
RAI 111—06.02.02-8K1	8	8
RAI 111—06.02.02-8K2	8	8
RAI 111—06.02.02-8K6	8	8
RAI 111—06.02.02-8K10	9	9

The schedule for technically correct and complete responses to the remaining 4 questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8C1	April 1, 2009
RAI 111—06.02.02-8C2	April 1, 2009
RAI 111—06.02.02-8C5b	April 1, 2009
RAI 111—06.02.02-8C5e	April 1, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-8K14	April 1, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009
RAI 111—06.02.02-17.1	April 1, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

**AREVA NP Inc.**

An AREVA and Siemens company

3315 Old Forest Road

Lynchburg, VA 24506-0935

Phone: 434-832-3694

Cell: 434-841-8788

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Friday, February 27, 2009 5:05 PM

**To:** 'Getachew Tesfaye'

**Cc:** KAY Jim (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, Supplement 3

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. The attached file, "RAI 111 Supplement 3 Response US EPR DC.pdf" provides a technically correct and complete response to portions of 1 question, as committed.



The following table indicates the respective pages in the response document, "RAI 111 Supplement 3 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111—06.02.02-8D2	2	3
RAI 111—06.02.02-8D4	2	3
RAI 111—06.02.02-8H13	2	3
RAI 111—06.02.02-8H15-19	2	5

The schedule for technically correct and complete responses to the remaining RAI No. 111 questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8C1	April 1, 2009
RAI 111—06.02.02-8C2	April 1, 2009
RAI 111—06.02.02-8C5b	April 1, 2009
RAI 111—06.02.02-8C5e	April 1, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-8I.3	March 15, 2009
RAI 111—06.02.02-8I.7-10	March 15, 2009
RAI 111—06.02.02-8J1	March 15, 2009
RAI 111—06.02.02-8K1	March 15, 2009
RAI 111—06.02.02-8K2	March 15, 2009
RAI 111—06.02.02-8K6	March 15, 2009
RAI 111—06.02.02-8K10	March 15, 2009
RAI 111—06.02.02-8K14	April 1, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009
RAI 111—06.02.02-17.1	April 1, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

**AREVA NP Inc.**

An AREVA and Siemens company

3315 Old Forest Road

Lynchburg, VA 24506-0935

Phone: 434-832-3694

Cell: 434-841-8788

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**From:** Pederson Ronda M (AREVA NP INC)

**Sent:** Wednesday, February 11, 2009 5:05 PM

**To:** 'Getachew Tesfaye'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); KAY Jim (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, Supplement 2

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. The attached file, "RAI 111 Supp 2 Response US EPR DC.pdf" provides a technically correct and complete response to portions of 1 question, as committed.

The following table indicates the respective pages in the response document, "RAI 111 Supp 2 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111—06.02.02-8E1	2	3
RAI 111—06.02.02-8E4	2	3

The schedule for technically correct and complete responses to the remaining RAI No. 111 questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8C1	April 1, 2009
RAI 111—06.02.02-8C2	April 1, 2009
RAI 111—06.02.02-8C5b	April 1, 2009
RAI 111—06.02.02-8C5e	April 1, 2009
RAI 111—06.02.02-8D2	March 1, 2009
RAI 111—06.02.02-8D4	March 1, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-8H13	March 1, 2009
RAI 111—06.02.02-8H15-19	March 1, 2009
RAI 111—06.02.02-8I.3	March 15, 2009
RAI 111—06.02.02-8I.7-10	March 15, 2009
RAI 111—06.02.02-8J1	March 15, 2009
RAI 111—06.02.02-8K1	March 15, 2009
RAI 111—06.02.02-8K2	March 15, 2009
RAI 111—06.02.02-8K6	March 15, 2009
RAI 111—06.02.02-8K10	March 15, 2009
RAI 111—06.02.02-8K14	April 1, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009
RAI 111—06.02.02-17.1	April 1, 2009

Sincerely,

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

**AREVA NP Inc.**

An AREVA and Siemens company

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Cell: 434-841-8788

**From:** WELLS Russell D (AREVA NP INC)  
**Sent:** Tuesday, January 27, 2009 6:07 PM  
**To:** 'Getachew Tesfaye'  
**Cc:** Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)  
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6, Supplement 1

Getachew,

AREVA NP Inc. provided responses to 6 of the 10 questions of RAI No. 111 on December 3, 2008. The attached file, "RAI 111 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to portions of 2 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 111 Supplement 1 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111—06.02.02-8I.13	2	2
RAI 111—06.02.02-8K11	3	3
RAI 111—06.02.02-17.2	4	4

The schedule for technically correct and complete responses to the remaining RAI No. 111 questions is unchanged and is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8C1	April 1, 2009
RAI 111—06.02.02-8C2	April 1, 2009
RAI 111—06.02.02-8C5b	April 1, 2009
RAI 111—06.02.02-8C5e	April 1, 2009
RAI 111—06.02.02-8D2	March 1, 2009
RAI 111—06.02.02-8D4	March 1, 2009
RAI 111—06.02.02-8E1	February 15, 2009
RAI 111—06.02.02-8E4	February 15, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-8H13	March 1, 2009
RAI 111—06.02.02-8H15-19	March 1, 2009
RAI 111—06.02.02-8I.3	March 15, 2009
RAI 111—06.02.02-8I.7-10	March 15, 2009
RAI 111—06.02.02-8J1	March 15, 2009
RAI 111—06.02.02-8K1	March 15, 2009
RAI 111—06.02.02-8K2	March 15, 2009
RAI 111—06.02.02-8K6	March 15, 2009
RAI 111—06.02.02-8K10	March 15, 2009
RAI 111—06.02.02-8K14	April 1, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009
RAI 111—06.02.02-17.1	April 1, 2009

Sincerely,

(Russ Wells on behalf of)

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

New Plants Deployment

**AREVA NP, Inc.**

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**From:** WELLS Russell D (AREVA NP INC)

**Sent:** Wednesday, December 03, 2008 6:14 PM

**To:** 'Getachew Tesfaye'

**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); Pederson Ronda M (AREVA NP INC)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 111, FSAR Ch 6

Getachew,

The proprietary and non-proprietary versions of the response to RAI No. 111 are submitted via AREVA NP Inc. letter, "Response to U.S. EPR Design Certification Application RAI No. 111" NRC 08:094, dated December 3, 2008. An affidavit to support withholding of information from public disclosure, per 10CFR2.390(b), is provided as an enclosure to that letter.

The following table indicates the respective pages in the response document, "Response to U.S. EPR Design Certification Application RAI No. 111," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 111 — 06.02.02-8 A-K	2	36
RAI 111 — 06.02.02-9	37	37
RAI 111 — 06.02.02-10	38	38
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RAI 111 — 06.02.02-12	40	40
RAI 111 — 06.02.02-13	41	41
RAI 111 — 06.02.02-14	42	42
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RAI 111 — 06.02.02-16	44	44
RAI 111 — 06.02.02-17	45	45

The schedule for technically correct and complete responses to the remaining RAI No. 111 questions is provided below:

Question #	Response Date
RAI 111—06.02.02-8A3	June 23, 2009
RAI 111—06.02.02-8A4	June 23, 2009
RAI 111—06.02.02-8C1	April 1, 2009
RAI 111—06.02.02-8C2	April 1, 2009
RAI 111—06.02.02-8C5b	April 1, 2009
RAI 111—06.02.02-8C5e	April 1, 2009
RAI 111—06.02.02-8D2	March 1, 2009
RAI 111—06.02.02-8D4	March 1, 2009

Question #	Response Date
RAI 111—06.02.02-8E1	February 15, 2009
RAI 111—06.02.02-8E4	February 15, 2009
RAI 111—06.02.02-8G	June 23, 2009
RAI 111—06.02.02-8H13	March 1, 2009
RAI 111—06.02.02-8H15-19	March 1, 2009
RAI 111—06.02.02-8I.3	March 15, 2009
RAI 111—06.02.02-8I.7-10	March 15, 2009
RAI 111—06.02.02-8I.13	February 1, 2009
RAI 111—06.02.02-8J1	March 15, 2009
RAI 111—06.02.02-8K1	March 15, 2009
RAI 111—06.02.02-8K2	March 15, 2009
RAI 111—06.02.02-8K6	March 15, 2009
RAI 111—06.02.02-8K10	March 15, 2009
RAI 111—06.02.02-8K11	February 1, 2009
RAI 111—06.02.02-8K14	April 1, 2009
RAI 111—06.02.02-9	April 15, 2009
RAI 111—06.02.02-11	April 15, 2009
RAI 111—06.02.02-17.1	April 1, 2009
RAI 111—06.02.02-17.2	February 1, 2009

Sincerely,

(Russ Wells on behalf of )

*Ronda Pederson*

[ronda.pederson@areva.com](mailto:ronda.pederson@areva.com)

Licensing Manager, U.S. EPR Design Certification

New Plants Deployment

**AREVA NP Inc.**

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**From:** Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]

**Sent:** Monday, November 03, 2008 4:31 PM

**To:** ZZ-DL-A-USEPR-DL

**Cc:** Clinton Ashley; Walton Jensen; Christopher Jackson; Charles Hammer; David Terao; Michael Miernicki; Joseph Colaccino; John Rycyna; James Steckel

**Subject:** U.S. EPR Design Certification Application RAI No. 111 (1446, 1471,1508), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 20, 2008, and discussed with your staff on November 3, 2008. Draft RAI Questions 06.02.02-8(C)(7) was deleted as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,

Getachew Tesfaye  
Sr. Project Manager  
NRO/DNRL/NARP  
(301) 415-3361

**Hearing Identifier:** AREVA\_EPR\_DC\_RAIs  
**Email Number:** 2799

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**Return Notification:** No

**Reply Requested:** No

**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

**Response to**

**Request for Additional Information No. 111 (1446, 1471, 1508), Supplement 11**

**11/03/2008**

**U. S. EPR Standard Design Certification**

**AREVA NP Inc.**

**Docket No. 52-020**

**SRP Section: 06.02.02 - Containment Heat Removal Systems**

**Application Section: FSAR Ch. 6**

**QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects)  
(SPCV)**

**QUESTIONS for Component Integrity, Performance, and Testing Branch 1  
(AP1000/EPR Projects) (CIB1)**



**Question 06.02.02-9:**

Provide the limiting characterization and properties of ECCS post-LOCA debris laden recirculation water including the content of latent debris, chemicals, coatings, and other solids. Address the abrasiveness of the debris laden fluid on the wetted ex-vessel downstream components. Also, include the additional amounts of debris and the larger pieces of debris that could be ingested downstream as a result of possible use of the non-safety back flush system.

**Response to Question 06.02.02-9:**

This response supersedes the original Response to RAI 111, Supplement 6, Question 06.02.02-9 submitted on April 14, 2009.

In Technical Report ANP-10293P, Appendix G, the ex-vessel evaluation establishes the debris constituents of the emergency core cooling system (ECCS) post-loss of coolant accident (LOCA) fluid as 100 percent of the microtherm, 100 percent of the coating particles, and 70 percent of the latent debris (particulate and fiber) generated during a large break LOCA (LBLOCA).

Table 06.02.02-9-1 lists the debris content of the post-LOCA fluid used for confirmatory tests to verify adequate operation of ECCS components for a minimum of 30 days.

The post-LOCA fluid does not contain highly abrasive debris like concrete, reflective metal insulation (RMI), or broken glasses. Wetted ex-vessel downstream components are not susceptible to abrasive wear. As described in the Response to Question 06.02.02-10, ITAAC items will verify acceptable post-LOCA performance of ex-vessel downstream components.

The back flushing system is designed to supply water to the inclined strainers to facilitate the detachment of debris. The amount of debris ingested into the ECCS is dependent on, or limited by, the sump screen hole size, ratio of open-to-close area of the screen, the fluid approach velocity to the screen, and the screen geometry. Large debris pieces like RMI and other miscellaneous debris listed in Technical Report ANP-10293P, Table G.2-2, are not expected to reach the ECCS strainers. With the strainer hole size constraint and absence of large pieces of debris on the strainers, the back flushing system is not expected to facilitate ingestion of larger debris downstream of the ECCS strainers.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Table 06.02.02-9-1—Post-LOCA Fluid Constituents**

<b>Debris</b>	<b>Amount</b>	<b>Concentration (ppm)</b>
Microtherm (ft <sup>3</sup> )	1.00	19
Qualified Epoxy Coatings (lbm)	126.30	38
Qualified IOZ Coatings (lbm)	958.70	291
Unqualified Coatings (lbm)	250.00	76
Latent Particulates (lbm)	89.25	27
Latent Fiber (lbm)	15.75	5

**Question 06.02.02-10:**

For the limiting debris laden recirculation water conditions, provide the results of a detailed evaluation of the plugging and wear of the ex-vessel downstream ECCS flow path components for their necessary mission time. Describe the plugging and wear models used and their bases. Address all individual components including: piping, valve disks and seats, pump wear rings, pump bearings and seals, pump rotors and shafts, and heat exchanger tubes and shells. Also include the effects of individual equipment strainers, cyclone separators, branch lines, pump recirculation lines, and other components that may become plugged. Provide the limiting assumptions included in the evaluation to address possible variations in operational lineup and use of various systems (e.g., use of either HPSI or MHSI versus using only LPSI for hot leg injection or use of only one train versus multiple trains of ECCS flow).

**Response to Question 06.02.02-10:**

This response supersedes the original Response to RAI 111, Question 06.02.02-10 submitted on December 3, 2008.

Technical Report ANP-10293P, Revision 3, "U.S. EPR Design Features to Address GSI-191," Appendix G, Section G.3.5 provides additional details.

U.S. EPR FSAR Tier 1, Section 2.2.3 and Table 2.2.3-3 will be revised to include ITAAC Items 7.11, 7.12, and 7.13 to verify acceptable post-loss of coolant accident (LOCA) performance of ex-vessel downstream components.

**FSAR Impact:**

U.S. EPR FSAR Tier 1, Section 2.2.3 and Table 2.2.3-3 will be revised as described in the response and indicated on the enclosed markup.

**Question 06.02.02-11:**

For the limiting debris laden recirculation water conditions, provide an evaluation of changes in system or equipment operation caused by wear of components (e.g., increased pump vibration due to shaft wear or the increase of pump internal bypass flow that decreases performance and may further accelerate internal wear.) Assess whether the system or component flow resistance changes or alters flow balances as a result of wear. Assess whether the system piping vibration response changes due to wear such that system integrity or its safety function may be affected. Address the capability to isolate components under debris laden conditions, including pump seals that encounter excessive wear, such that they will not leak excessively. Include those components in the non-safety SAHRS and CSS that may leak and require isolation as a result of ingesting debris laden water. Address whether leakage through pump seals or other components could increase local dose rates so that credited operator actions, if any, would not be met.

**Response to Question 06.02.02-11:**

This response supersedes the original Response to RAI 111, Supplement 6, Question 06.02.02-11 submitted on April 14, 2009.

The emergency core cooling system (ECCS) pump vendor will, as a minimum, provide mechanical performance (pump vibration, rotor dynamics, and bearing load) tests and/or analyses to confirm acceptable mechanical performance for a minimum of 30 days of post-loss of coolant accident (LOCA) operation. No credited operator action is needed for ECCS operation.

Technical Report ANP-10293P, Revision 3, "U.S. EPR Design Features to Address GSI-191," Appendix G, Section G.3.5 provides additional details.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 06.02.02-12:**

Provide the design features of the mechanical seals of the ECCS pumps that will ensure their long term performance with debris laden water containing solid particles greater than 0.08 inches. The ANP-10293 report paragraph 3.1.1.6 states that the downstream components (e.g., ECCS pumps) are designed to accommodate fluid with solid particles having dimensions of 0.08 x 0.08 inches or less. However, the square mesh screen openings of 0.08 x 0.08 inches can allow solid particles that have a major dimension as large as 0.113 inches to pass through on the diagonal. In addition, longer needle-like particles, i.e., metal whiskers, and significantly larger deformable particles can also penetrate the screen. The ECCS pumps have single mechanical seals that could potentially be damaged by particles that have major dimensions greater than 0.08 inches.

**Response to Question 06.02.02-12:**

This response supersedes the original Response to RAI 111, Question 06.02.02-10 that was submitted on December 3, 2008.

The emergency core cooling system (ECCS) pump vendor will, as a minimum, provide mechanical seal assembly performance test and/or analysis to confirm acceptable seal performance for a minimum of 30 days of post-loss of coolant accident (LOCA) operation.

Technical Report ANP-10293P, Revision 3, "U.S. EPR Design Features to Address GSI-191," Appendix G, Section G.3.5 provides additional details.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 06.02.02-13:**

Address the effects of debris, chemicals, and gases in the ECCS recirculation water on instrument tubing connected to the ECCS piping and on the accuracy of instruments strapped to the outside of the ECCS piping. Instrument tubing will not function properly if plugged, and strapped-on instruments make use of the velocity of sound through the fluid medium, which could be affected by the type and quantity of suspended debris, chemical composition, and presence of gases.

**Response to Question 06.02.02-13:**

This response supersedes the original Response to RAI 111, Question 06.02.02-10 submitted on December 3, 2008.

The U.S. EPR design does not have instruments strapped onto the emergency core cooling system (ECCS) piping. Tests performed for the three-tiered debris retention design of the ECCS recirculation system show a negligible amount of debris transported downstream of the in-containment refueling water storage tank (IRWST) strainers. There is no impact on the proper function and accuracy of instrument tubing connected to the ECCS piping.

Instrument tubes are typically tapped off the top or side of the ECCS piping and will not be blocked by debris, which will settle on the bottom of the pipes.

Gas entrainment does not impact the U.S. EPR design. Refer to Technical Report ANP-10293P, Section 3.2.2 for more information.

Chemical precipitates do not significantly impact the ECCS functions (see Reference 1).

**References:**

1. U.S. Nuclear Regulatory Commission memorandum to Michael L. Scott from Ervin L. Geiger, "Basis for Excluding Chemical-Effects Phenomenon from WCAP-16406-P Ex-Vessel Downstream Evaluations," (ADAMS Accession No. ML093160100), January 21, 2010.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

**Question 06.02.02-14:**

Address the effects of ECCS flow velocities which could be less than the minimum value required to prevent settling of suspended debris in the downstream flow path. For flow velocities less than the required minimum value (e.g. during system flow initiation or realignment), could significant debris settlement occur that would restrict necessary system core cooling flow?

**Response to Question 06.02.02-14:**

This response supersedes the original Response to RAI 111, Question 06.02.02-10 submitted on December 3, 2008.

Analysis to evaluate plugging of emergency core cooling system (ECCS) valves, pipes, and orifices will be performed to confirm that overall system resistance/pressure drop across the ECCS is consistent with the safety analysis results for 30 days of post-loss of coolant accident (LOCA) operation.

As described in the Response to Question 06.02.02-10, U.S. EPR FSAR Tier 1, Section 2.2.3, ITAAC Item 7.13 will confirm that overall system resistance/pressure drop is consistent with safety analysis results for 30 days of ECCS operation.

Technical Report ANP-10293P, Revision 3, "U.S. EPR Design Features to Address GSI-191," Appendix G, Section G.3.5 provides additional details.

**FSAR Impact:**

The U.S. EPR FSAR will not be changed as a result of this question.

# U.S. EPR Final Safety Analysis Report Markups



**5.0 Electrical Power Design Features**

5.1 The components designated as Class 1E in Table 2.2.3-2 are powered from the Class 1E division as listed in Table 2.2.3-2 in a normal or alternate feed condition.

~~5.25.2 Valves listed in Table 2.2.3-2 fail as-is on loss of power.~~ Deleted.

**6.0 Environmental Qualifications**

6.1 Components in Table 2.2.3-2, that are designated as harsh environment, will perform the function listed in Table 2.2.3-1 in the environments that exist during and following design basis events.

**7.0 Equipment and System Performance**

7.1 The SIS/RHRS heat exchangers listed in Table 2.2.3-1 have the capacity to transfer the design heat load to the component cooling water system.

7.2 The accumulators listed in Table 2.2.3-1 provide a storage volume.

7.3 Each accumulator line has a minimum head loss coefficient ( $fL/D + K$ ).

7.4 The pumps listed in Table 2.2.3-1 have net positive suction head available (NPSHA) that is greater than net positive suction head required (NPSHR) at system run-out flow.

7.5 The SIS/RHRS delivers water to the reactor coolant system for core cooling.

7.6 The SIS/RHRS delivers water to the reactor coolant system within the system run-out flow rate and pump shutoff head for core cooling due to design basis events.

7.7 Class 1E valves listed in Table 2.2.3-2 can perform the function listed in Table 2.2.3-1 under system operating conditions.

7.8 The SIS/RHRS provides for flow testing of the SIS/RHRS pumps during plant operation.

7.9 Safety injection pumped flow will be delivered to the RCS before the maximum elapsed time.

7.10 Each LHSI pump delivers water at the required flow rate to its respective hot leg of the reactor coolant system.

7.11 LHSI pump and MHSI pump provide safety injection flow to the RCS during post-LOCA operation.

7.12 LHSI heat exchanger cools the post-LOCA fluid for a minimum of 30 days.

7.13 LHSI and MHSI systems provide safety injection flow to the RCS during post-LOCA operation.

**8.0 Inspections, Tests, Analyses, and Acceptance Criteria**

Table 2.2.3-3 lists the SIS/RHRS ITAAC.

↑  
06.02.02-10

**Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC (8 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
7.8	The SIS/RHRS has provisions to allow flow testing of the SIS/RHRS pumps during plant operation.	Testing for flow of the <u>as-built</u> SIS/RHRS pumps through the flow test line will be performed.	The flow test line allows the <u>as-built</u> SIS/RHRS pumps to deliver the following flow rates: a. MHSI pump: Flow rate per pump is greater than or equal to 480 gpm. b. LHSI pump: Flow rate per pump is greater than or equal to 1760 gpm.
7.9	Safety injection pumped flow will be delivered to the RCS before the maximum elapsed time.	Tests will be performed to determine the <u>as-built</u> safety injection pumped flow delivery time.	Time for <u>as-built</u> safety injection flow to reach full flow does not exceed 15 seconds with offsite power available or 40 seconds with loss of offsite power.
7.10	Each LHSI pump delivers water at the required flow rate to its respective hot leg of the reactor coolant system.	Testing will be performed to demonstrate that each <u>as-built</u> LHSI pump delivers the required flow to its respective hot leg of the RCS.	Each <u>as-built</u> LHSI pump delivers a flow rate greater than or equal to 1720 gpm to its respective hot leg of the RCS at an equivalent RCS pressure of 69.27 psia.
7.11	<u>LHSI pump and MHSI pump provide safety injection flow to the RCS during post-LOCA operation.</u>	<u>Type tests, analyses, or a combination of type tests and analyses for LHSI and MHSI pumps will be performed.</u>	<u>Test results confirm that the LHSI and MHSI pumps are capable of providing their required safety injection flow for a minimum of 30 days of continuous post-LOCA operation.</u>
7.12	<u>LHSI heat exchanger cools the post-LOCA fluid for a minimum of 30 days.</u>	<u>Type tests, analyses, or a combination of type tests and analyses for heat exchanger performance will be provided by the vendor.</u>	<u>Analysis confirms that tube plugging and failure due to abrasive wear will not degrade the performance of the heat exchanger below the 30-day acceptance criteria.</u>

↑  
06.02.02-10

**Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC (8 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
7.13	<u>LHSI and MHSI systems provide safety injection flow to the RCS during post-LOCA operation.</u>	<u>Analysis of plugging and wear of valves and orifices will be performed.</u>	<u>Analysis confirms that pressure drop/overall system resistance across ECCS is consistent with safety analysis results for 30 days of post-LOCA operation. Analysis also confirms that wear rates are acceptable for 30 days of post-LOCA operation based on provided equipment specification.</u>

↑  
06.02.02-10