## ArevaEPRDCPEm Resource

**From:** BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
**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
**Attachments:** RAI 111 Revised Response Suppl 10 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.

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 Included in the attached file are superseded responses to parts of Question 06.02.02-8 that were previously answered.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

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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.

| Question # | Response Date |
|---|---|
| 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

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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
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 reevaluating 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
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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**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
Licensing Manager, U.S. EPR Design Certification
**AREVA NP Inc.**
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Lynchburg, VA 24506-0935
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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
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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 |
|---|---|---|
| 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
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

---

**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
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

---

**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
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

---

**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
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
**AREVA NP, Inc.**
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA  24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

---

**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 |
| RAI 111 — 06.02.02-11 | 39 | 39 |
| RAI 111 — 06.02.02-12 | 40 | 40 |
| RAI 111 — 06.02.02-13 | 41 | 41 |
| RAI 111 — 06.02.02-14 | 42 | 42 |
| RAI 111 — 06.02.02-15 | 43 | 43 |
| 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 |
| 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 |

| Question # | Response Date |
|---|---|
| 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*
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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:** 1432

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**Response to**

**Request for Additional Information No. 111 (1446, 1471, 1508), Supplement 10**

**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 06.02.02-8:**

In ANP-10293, dated February 2008, the applicant assesses the U.S. EPR design with respect to RG 1.82 Revision 3 (November 2003). All reference material, used in development of ANP-10293, was published prior to September 2004. Since September 2004, substantial experimental and analytical work has been performed to address the resolution of GSI-191. In December 2004, in an effort to aid resolution of Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on PWR Sump Performance," (issued in September 1996), the NRC staff evaluated industry guidance to resolve GSI-191 that was submitted through NEI. The NEI submission, as approved in accordance with the staff safety evaluation, provides an acceptable overall guidance methodology for evaluation of emergency core cooling system (ECCS) performance following any postulated accident for which ECCS recirculation is required, with specific attention given to the potential for debris accumulation that could impede or prevent the ECCS from performing its intended safety functions.

The applicants' submittal (FSAR) and the subsequent technical report (ANP-10293) provided the staff with a high level overview of sump design features and selected results. However, in accordance with available guidance, more details are needed on AREVAs methods and evaluation techniques, selected to meet NRC's regulations, in order to complete an evaluation of emergency core cooling system (ECCS) performance following any postulated accident for which ECCS recirculation is required, with specific attention given to the potential for debris accumulation that could impede or prevent the ECCS from performing its intended safety functions. As such, several areas require additional information or clarification and form the basis for the following RAIs.

In each area below, the level of detail provided should include a summary, with information needed to address the area, description of the methodology used to reach the conclusion, basis for methods and key assumptions not consistent with NRC-approved guidance, and sufficient information to show correct application of any NRC-approved guidance.

RAI-SRP 6.2.2-SPCV-01

A. Thin Bed effect
   AREVA states, in ANP-10293, that no relevant thin-bed effects were observed during AREVA performed strainer validation testing. In addition, AREVA states they will evaluate additional empirical data to further assess the presence or lack of thin-bed effects. ANP-10293 also states in section 3.2.3, under test conditions, a uniform debris bed was formed in all cases on the ECCS sump strainer. Thin-bed effect is discussed in RG 1.82 and NRC SE on NEI 04-07 GR. Thin-bed effect refers to the debris bed condition in a fibrous/particulate bed of debris whereby a relatively high head loss can occur because of a relatively thin layer of debris, by itself or embedded as a stratified layer within other debris, because the bed porosity is dominated by the particulate, and the bed porosity approached that of the corresponding particulate sludge. The latest staff criteria for thin-beds are addressed in "Review Guidance for Strainer Head Loss and Vortexing" (ADAMS ML080230038).

   1. What is the calculated thickness of the EPR fiber debris bed? Provide analysis inputs and assumptions. Explain the basis for how these analysis inputs and assumptions are conservative.

2. Does U.S. EPR design have the potential to develop a thin-bed as described in NEI GR and RG 1.82?
3. For those plants that can substantiate that the formation of a thin bed which can collect particulate debris will not occur, the staff finds that coating debris should be sized based on plant specific analyses for debris generated from within the ZOI and from outside the ZOI, or that a default area equivalent to the area of the sump-screen openings, be used for coatings size. Provide details of analysis, as applicable.
4. The testing methodology and guidance on thin beds has improved over the last few years. For thin bed testing, please describe how particulate and fiber debris additions were sequenced. Describe basis for methods and key assumptions not consistent with NRC-approved guidance (e.g. NRC SE on NEI 04-07 GR and Review Guidance for Strainer Head Loss and Vortexing).

B. Break Selection
ANP-10293, states the hot leg is the limiting break location but does not provide justification.

1. Describe and provide the basis for the break selection criteria used in the evaluation.
2. Discuss the basis for reaching the conclusion that break size(s) and location(s) chosen present the greatest challenge to post-accident sump performance.

C. Debris Generation/Zone of Influence (excluding coatings)
ANP-10293 Section 3.1.1.1 states AREVA selected a ZOI that corresponds to a sphere with a radius of seven pipe diameters but does not provide justification.

1. Describe the methodology AREVA used to determine the ZOI for generating debris. Identify which debris analyses used approved methodology default values. For materials with ZOIs not defined in the guidance report/SE, or if using other than default values, discuss methods to determine ZOI and the basis for each.
2. Provide destruction ZOIs and the basis for the ZOIs for each applicable debris constituent. How does AREVA account for two phase jet effects (see SE on NEI GR, section 3.4.2.2)?
3. Identify if destruction testing was conducted to determine ZOIs. If such testing has not been previously submitted to the NRC for review or information, describe the test procedure and results with reference to the test reports(s).
4. Provide the quantity of each debris type generated for each break location evaluated. If more than four break locations were evaluated, provide data for the four most limiting locations.
5. In ANP-10293 AREVA states that reflective metal insulation (RMI) is used extensively on RCS components (section 2.5) and makes up a portion of the debris source term (Table 3-1). In addition, FSAR section 6.3.2.2.2 claims RMI is not subject to transport to the SIS sumps.
   a. Describe testing or evaluations that show that the EPR selected RMI insulation, once it has been damaged by the LOCA, will not become debris that will cause potential plugging of the screens.

b. Verify that the same degradation for the RMI as described in the NEI 04-07 SE exists in the U.S. EPR or identify what the degradation would be. Describe the impact of the degradation on the debris loading.

c. Did AREVA conduct testing with RMI as part of their limiting fiber and particulate (and chemical) case? If so, what amount of RMI was present on the strainer surface?

d. Is there any chemical residual associated with the RMI that could impact the screen blockage or the downstream blockage in the core? If so, what is the impact to the screens and to the core blockage?

e. Is there any fiber insulation or particulate encased in RMI that could contribute to the debris? If so, are the configurations qualified for jet impingement? Provide the qualification details.

6. Are there any other objects or devices in the zone of influence that can be damaged by jet impingement and contribute to the debris (e.g., cable insulation, instrumentation, hot/cold leg temperature instrumentation and associated insulation, nuclear instrumentation, signs, caulking, fire barrier material…)?

D. Debris Characteristics

In ANP-10293, AREVA states the assessment of the ECCS sump strainer blockage is conservatively bounded by the assumption that all available insulation and debris within the ZOI is transported to the IRWST. In addition, AREVA states bounding assumptions were assumed for debris. AREVA does not provide a listing of these assumptions to assess if these assumptions are bounding and conservative.

1. Provide the assumed size distribution for each type of debris.

2. Provide bulk densities (i.e., including voids between the fibers/particles) and material densities (i.e., the density of the microscopic fibers/particles themselves) for fibrous and particulate debris.

3. If mainly relying on calculations (limited testing), provide assumed specific surface areas for fibrous and particulate debris.

4. Provide the technical basis for any debris characterization assumptions that deviate from NRC-approved guidance.

5. Section 2.5 of ANP-10293, states jet impact resistant, cassette type encapsulated mineral wool is used as RCS insulation. In section 3 the debris source term (Table 3-1) lists mineral wool in cassettes, in fiber glass cloth protected by stainless steel, and in mattress around auxiliary pipes protected by stainless steel sheet. Mineral wool may be manufactured using a number of materials with varying characteristics. What specific type of mineral wool was selected when conducting head loss testing? What type of mineral wool is specified for installation in U.S. EPR? Clarify and differences between tested condition and U.S. EPR design, as applicable.

E. Latent Debris

AREVA assumed 110 lb of latent debris in the analysis. AREVA states the value is conservative and is based upon operating experience and sampling performed on operating plants. No further characterization of the debris was provided.

1. Provide the methodology used to estimate quantity and composition of latent debris.

2. Provide the basis for assumptions used in the evaluation.
3. Provide results of the latent debris evaluation, including amount of latent debris types and physical data for latent debris as requested for other debris under D. above (debris characteristics).
4. Provide amount of sacrificial strainer surface area allotted to miscellaneous latent debris.
5. Specifically, provide a description of programmatic controls to maintain the latent debris fiber source term into the future to ensure assumptions and conclusions regarding inability to form a thin bed of fibrous debris remain valid.

F. Debris Transport
Debris transport analysis estimates the fraction of debris that would be transported from debris sources within containment to the sump suction strainers. AREVA states that conservative bounding assumptions are employed. These assumptions and/or analysis were not provided to assess whether they are conservative or bounding.

1. According to FSAR Chapter 6.3, trash racks and weirs are considered components of IRWST. When AREVA states in ANP 10293 that all debris in ZOI is transported to IRWST, does this include trash racks and weirs or does it indicate all debris enters the water of the IRWST?
2. In ANP 10293, Section 3.0, AREVA states, “It was assumed that all dislodged material is transported to the IRWST and that all of this material is deposited on the strainer of one ECCS train, What debris is included in the term dislodged material? What material is excluded? How is this approach conservative? Is it consistent with NRC guidance?
3. Describe the methodology used to analyze debris transport during the blowdown, washdown (as applicable), and recirculation phases of an accident.
4. Provide the technical basis for assumptions and methods used in the analysis that deviate from the approved guidance.
5. Provide a summary of, and supporting basis for, any credit taken for debris interceptors such as weirs, curbs, baskets, trash racks etc.
6. State whether fine debris (individual fibers and fine particulates) were assumed to settle and provide basis for any settling credited.
7. Provide the calculated debris transport fractions and the total quantities of each type of debris transported to the IRWST water.
8. In ANP-10293 Section 3.1.1.2 “Debris Transport Scenarios” latent debris, paint chips, and metal debris are assumed to settle out within the loop area or the IRWST. Settling prior to reaching the strainer represents a non-conservative assumption unless the settling can be shown to be representative of actual plant conditions. Provide basis for crediting settling. Provide a description of the scaling analysis used to justify settling, if used, during head-loss testing.
9. In ANP 10293, AREVA states 1) ”Debris which passes through the retaining baskets will not encounter any turbulence due to IRWST size.” and 2) “…suspended particulates were not directly considered downstream of retaining basket.” (see page

A-19 of ANP-10293). Describe testing or analytical tools used to validate these inputs and assumptions.

10. What Non Safety systems, in containment, may be in operation during a LOCA that could contribute to debris transport to either the heavy floor or IRWST? For example, containment spray is a non-safety system and may be placed in service. When this system operates post-LOCA (operator action), assess its potential impact on debris transport.

G. Coatings Evaluation
Please provide adequate discussion and justification for coatings debris generation (ZOI determination and unqualified coatings), characteristics, transport analysis, and assumptions.

1. The staff position (SE on NEI GR) on ZOI for destruction of coatings is 10D unless plant specific analysis was conducted which is based upon experimental data over the range of pressures and temperatures of concern using coating samples correlated to EPR specified coatings. Based on either approach, what is EPRs worst case coatings ZOI volume and coating debris quantity and characterization of this coating debris?

2. SE on NEI GR requires 100% failure of non qualified coatings inside or outside the ZOI. How are unqualified coatings accounted for in the debris source term for EPR?

3. The debris source term in Table 3-1 of ANP 10293 lists 110 lb of paint chips (separate from latent debris). What is the basis for treating this source term debris as "chips", how are these chips characterised? How is this characterization consistent with recent NRC guidance documents? Does this amount include qualified and unqualified coatings within the ZOI for destruction of coatings? Does it include all unqualified coatings outside the ZOI for destruction of coatings?

H. Head Loss
Please provide additional information related to head loss determinations.

1. Meeting RG 1.82 Regulatory Position 1.3.4.5 requires the head loss caused by debris blocking the sump strainers to be estimated from empirical data. ANP-10293 states in section 3.2.1 that debris addition equivalent to approximately 1/20 of the debris postulated for a LBLOCA was added to a test loop. Table 3-1 lists 1230 $ft^3$ of mineral wool assumed in the evaluation. 1/20 of 1230 $ft^3$ = 62 $ft^3$ of mineral wool. Explain why only 6.2 $ft^3$ of mineral wool was added? In addition, 220 lb of microporous insulation was assumed in the analysis but only 8.3 lb was used versus 11 lb (1/20 * 220 = 11). Explain the basis for selecting 8.3 lb? Are these values conservative? How large was the heavy floor? This affects the flow velocity and debris settling. What was the debris size distribution in the experiments and how does it correspond to the debris size expected at the plant? The debris size affects debris settling and debris retention by the trash racks. How much debris was retained on the heavy floor and by the trash racks in the experiments? The debris was added to a separate mixing chamber and not directly to the heavy floor, as in the plant. How much of the debris remained in the mixing chamber without reaching the heavy floor? Much more data is needed about the tests in order to assess their validity.

2. Provide information on how the test debris was prepared and how the debris was prototypical or conservative with respect to the plant design. For example, In ANP-

10293 section 3.2.2, AREVA states "…part of the mineral wool would still contain binder…which would reduce the amount of fine debris available for transport". The GR and SE require the 100% of mineral wool to be reduced to small fines – which is the basic constituent – an individual fiber. How was debris added, diluted during addition?

3. Per ANP 10293, maximum sump screen approach velocities of 0.8 inches/sec are assumed in the analysis. What is the basis for selecting this value as conservative and what method was used to determine this value? How does the approach velocity used in the analysis differ from the tested condition? Provide basis for any differences.
4. What is the assumed approach velocity of the fluid transiting from the heavy floor to the trash racks in the analysis? What is the basis for selecting this value as conservative and what method was used to determine this value? How does the approach velocity used in the analysis differ from the tested condition? Provide basis for any differences.
5. Describe the constituent parts of the debris bed? Is the bed stratified or mixed?
6. What amounts, sizes, and types of particulate material are assumed to reach the retaining basket? What is the basis for this assumption?
7. What amounts (if any) and types of particulate material is assumed to reach the sump screen? What is the basis for this assumption?
8. AREVA reports that a strainer testing program validates the design of the EPR ECCS recirculation system. If the testing procedure has not been previously submitted to the NRC for review or information, please provide a copy of the test procedure and completed test report(s). Did the test include chemical effects?
9. AREVA indicated that Alden labs independently concluded that the test loop scaling was conservative and is likely to provide conservative test results. If ALDENs report has not been previously submitted to the NRC for review or information, describe the extent of their review process (to include what was not reviewed by ALDEN) and basis for their conclusions, with reference to the any report(s).
10. AREVA describes test scaling in ANP 10293. Discuss key scaling inputs described and why they are conservative for debris and velocity scaling.
11. In ANP-10293 section 3.2.3, the report states that the head loss across the strainers – with conservative assumptions - only reached about 3% of the design value. Explain conditions and 'conservative' assumptions that resulted in 3% head loss and list the design value. How does this compare with the 0.15 psi head loss @ 2.2 psi design value discussed in the same section? (0.15 psi >> 3% of 2.2 psi)
12. Provide the minimum submergence of the strainer under loss of coolant accident conditions. If submergence is not greater than head loss, an evaluation of the acceptability of this circumstance should be included.
13. Provide a summary of the methodology, assumptions and results of the vortexing evaluation to include design considerations for the reduction of vortexing. Provide bases for key assumptions such as minimum submergence, fluid temperature, and flow rate (velocity).
14. Provide the basis for the strainer design maximum head loss.

15. Describe significant margins and conservatisms used in the head loss and vortexing calculations.
16. Provide a summary of the methodology, assumptions, bases for the assumptions, and results for the clean strainer head loss calculation.
17. Provide a summary of the methodology, assumptions, bases for the assumptions, and results for the debris head loss analysis on the strainer.
18. Provide a summary of the methodology, assumptions, bases for the assumptions, and results for the clean retaining basket head loss calculation.
19. Provide a summary of the methodology, assumptions, bases for the assumptions, and results for the debris head loss analysis on the retaining basket.
20. State whether temperature/viscosity was used to scale the results of the head loss tests to actual plant conditions. If scaling was used, provide the basis for concluding that boreholes or other differential-pressure induced effects did not affect the morphology of the test debris bed.
21. State whether containment accident pressure was credited in evaluating whether flashing would occur across the strainer surface, and if so, summarize the methodology used to determine the available containment pressure.
22. How is operation of the non-safety related injection systems (containment spray system (CSS)) considered in the head loss assessment or testing?
23. In ANP 10293 Areva states “Even without crediting debris hold-up by the retaining baskets, the installed strainer has sufficient area to accommodate the maximum amount of debris and still operate within its design envelope?” Please define what is meant by maximum amount of debris and specify the design envelope. For debris, include characteristics such as source, sizing and amount of fiber, particulate and other debris on strainer surface and the corresponding head loss.
24. If the all retaining baskets were deemed inoperable during power operation (loss of filtering function), will the strainer design and performance support continued power operation?
25. If all the strainers were deemed inoperable (loss of filtering function) during power operation, will the retaining baskets design and performance support continued power operation?

I. NPSH

The applicant in Table 3-2 of ANP-10293 provides the NPSH assessment. More details are necessary for the staff to reach a conclusion.

1. Provide applicable pump flow rates, the total recirculation sump flow rate, sump temperature(s), and minimum containment water level and describe the assumptions used in the calculations for the above parameters and the sources/bases of the assumptions.
2. Provide the basis for the NPSH Required values, e.g., three percent head drop or other criterion.
3. Describe how friction and other flow losses are addressed.

4. Describe the operational status for each ECCS and all other pumps whose suction source is the sump, before and after the initiation of recirculation.

5. Describe the single failure assumptions relevant to pump operation and sump performance.

6. Describe how the containment sump water level is determined.

7. Describe how the level in the retaining basket is determined (calculated) or measured.

8. The retaining baskets possibly constitute hold-up volumes should fibers and particulates "coat" the basket mesh. What is the hold-up volume created from the top of the lowest operating level of the retaining baskets to the spill-over level, and is this hold-up volume explicitly considered in the NPSH calculation?

9. Provide assumptions that are included in the analysis to ensure a minimum (conservative) water level is used in determining NPSH margin.

10. Describe whether and how the following volumes have been accounted for in pool level calculations: empty spray pipe, water droplets, hold up in retaining basket and heavy floor, condensation and holdup on horizontal and vertical surfaces. If any are not accounted for, explain why.

11. Provide assumptions (and their bases) as to what equipment will displace water resulting in higher pool level.

12. Provide assumptions made that minimize the containment accident pressure and maximize the sump water temperature.

13. Specify the containment accident pressure (value and units) selected in the NPSH analysis.

J. Upstream Effects
AREVA provided a limited discussion on holdup or choke points, resulting in the following questions.

1. Summarize the evaluation of flowpaths from the postulated break locations (include potential for washdown, as applicable) to identify potential choke points in the flow field upstream of the sump.

2. In several instances, ANP-10293 refers to an annular space that drains to the IRWST. Define the annular space, as used in ANP-10293, and the annular space flowpaths that route water and debris to the IRWST. Describe how blockage of this flowpath has been evaluated, including likelihood of blockage and amount of expected holdup.

3. Summarize measures taken to mitigate potential choke points

4. Summarize evaluation of water holdup at installed curbs, debris interceptors or a full retaining basket.

5. Describe how potential blockage of reactor cavity and refueling cavity drains has been evaluated, including likelihood of blockage and amount of expected holdup.

6. The trash racks form a potential blockage point for all flow in the recirculation system (less that from the annular space). The grid pattern of the trash racks - 4" x 4" - combined with the heavy floor opening size, may sustain complete blockage. Given

the stated debris source term analyzed in DCD chapter 6 and ANP 10293, combined with the undocumented effects of the rupture and convection foils, address whether there is enough large debris to theoretically cover the entire set of trash rack openings? Provide an evaluation that shows that the 4"x4" grating will not become blocked to such an extent that prevents adequate water supply/head to ECCS pumps.

K. DCD Section 6.2 and 6.3 and ANP-10293 questions related to GSI-191.

1. No data sheets were provided in Tier 2 of the DCD on the Retaining baskets either as a separate data sheet or as part of the IRWST design parameters data sheet. The baskets are fully contained within the IRWST. If the baskets are credited in debris management for long term core cooling, provide detailed specifications and arrangement within IRWST to allow assessment.

2. No data sheet was provided in Tier 2 of DCD for trash racks/weir installed over the four heavy floor openings as a separate data sheet or as part of the IRWST design parameters data sheet. If these racks/weirs are credited in debris management for long term core cooling, provide listing of specifications. (Note: FSAR 6.3.2.2.2 considers trash racks and weirs as "…components of the IRWST.")

3. FSAR Section 6.3.2.2.2 discusses buffering solution. Please clarify how chemical buffer (TSP) is arranged within the boundary perimeter of the weir/trash rack.

4. Provide a listing or diagram of all the potential pathways that water and steam exiting the limiting break is routed or returned to the IRWST, post accident. What, if any, paths do not have trash/debris racks? What paths, if any, do not go to a retaining basket?

5. Does water from the limiting break location (a single hot leg), that spills out onto the heavy floor and eventually flows to the IRWST, drain to the IRWST via all four heavy floor openings (via the trash racks)? Or, is the break waters access to the IRWST restricted or constrained to the one heavy floor opening/trash rack that is contained by the structures/components in the loop compartment with the break? Are there any components that are required to operate/actuate in order to allow break water (water spilling from the pipe break onto the heavy floor in one RCS loop vault area) to access all four heavy floor openings to the IRWST?

6. Describe how water spilling out of a break near the pressurizer (within pressurizer compartment) reaches the IRWST?

7. There are four retaining baskets within the IRWST. During a LOCA, baskets receive water flow as it spills through openings from the heavy floor above. Two of the four retaining baskets are split into two compartments, with the smaller compartment dedicated to receive water from the "annular space". What amount of retaining basket surface area is available and credited (for each retaining basket) for flow from the heavy floor. What amount of retaining basket surface area is available or dedicated to the flow from the annular space? In the two compartment retaining basket, is there a common surface area that is credited for heavy floor flow and annular space flow?

8. In ANP-10293 the basket compartment designed for annular space flow has a reduced volume as compared to the other compartment (heavy floor flow) and the

other two retaining baskets – 530 ft3 vs. 1766 ft3 and 3000 ft3, respectively. Is the 3000 ft3 a total volume for two baskets or does each basket have 3000 ft3?

9. Per ANP-10293, each of the retaining baskets has approximately the same screen surface area for screening out debris. Please provide a sketch or drawings that outline how these baskets and subcompartments, as applicable, are arranged and highlight credited surface areas used to perform their design functions. What is the minimum basket volume and surface area needed to support flow from the heavy floor? What is the minimum basket volume and surface area needed to support flow into the compartment dedicated to annular flow? Provide the basis for these volumes and surface areas.

10. The basket compartment receiving flow from the annular space is lower in height and is designed to minimize water retention in the annular space. What is the expected water retention in the annular space? What is the expected debris loading into the annular space? How is it transported to IRWST? What is the makeup of this debris loading – fiber, particulate? What are expected flow rates? What happens if the annular space compartment screen surface areas are clogged? Where does it overflow? Can the annular space water bypass the retaining basket compartment screens? Can debris from the heavy floor clog credited screen surface area from the annular compartment?

11. Table 6.3-4—IRWST Design Parameters lists ceiling area, wall area, and bottom area. Please explain the area difference between the IRWST bottom ~ 5800 $ft^2$ and the ceiling ~ 1800 $ft^2$.

12. Describe any access to the IRWST water surface or subsurface, during a LOCA, other than through the four trash rack protected heavy floor openings and the annular space drains. Assess potential debris entry into the IRWST through these access points and its impact on sump strainer head loss.

13. In section 2.3.3, "IRWST (ECCS) Sump Strainers, AREVA states a bounding approach was used for sizing the ECCS Strainer. What are the inputs and assumptions selected to size the strainer to achieve a conservative bounding design?

14. FSAR Section 6.2.1 specifies installation of rupture and convection foils. In a response to Question 6.2.1-07a AREVA states: The rupture and convection foils are made of austenitic steel with an intermediate layer of plastic to establish the compartmental atmospheric seal during normal plant operation. Upon rupture, how are the foil materials accounted for regarding their potential to transport and block or clog recirculation water flowpaths to the IRWST leading to water holdup (upstream effects) and possible contribution to strainer head loss or NPSH concerns.

15. Per FSAR section 6.3.2.2.2, the IRWST is connected to the core spreading area by pipes and valves. During a LBLOCA, how is IRWST single failure protection achieved with respect to these IRWST valves and piping components? If a valve or valve(s) were to open, what is the resultant change in IRWST tank level? Would this tank level support NPSH requirements?

16. Meeting RG 1.82 RP 1.1.1.12 requires the downstream effects of the debris passing the sump screen (e.g., damage to the pumps or blockage of flow through the fuel assemblies) to be assessed. The Technical Report ANP-10293 revision 0 states that the components handling IRWST water post-accident include a requirement of being

capable of handling particulates of 0.09 inches or less (Appendix A, item 1.1.1.12) or 0.08 x 0.08 inches or less (Section 3.1.1.6). Why is this requirement not included in the FSAR?

**Response to Question 06.02.02-8 (A) - Thin Bed Effect**

The evaluation of potential thin bed effects on the U.S. EPR debris retention system is based on testing.

1. The previous Response to Question 06.02.02-8 (A.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.6 and E.7).
2. The previous Response to Question 06.02.02-8 (A.2) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.6 and E.7).
3. The Response to Question 06.02.02-8 (A.3) is provided in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6) and Appendix E (Section E.5).
4. The Response to Question 06.02.02-8 (A.4) is provided in Technical Report ANP-10293, Revision 1, Appendix E (Section E.5).

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (B) - Break Selection**

1. The previous Response to Question 06.02.02-8 (B.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.4 and C.5).
2. The previous Response to Question 06.02.02-8 (B.2) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.4 and C.5).

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (C) - Debris Generation/Zone of Influence (excluding coatings)**

1. The previous Response to Question 06.02.02-8 (C.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.4 and C.5).

2. The previous Response to Question 06.02.02-8 (C.2) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.4 and C.5).

4. The previous Response to Question 06.02.02-8 (C.4) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Section C.6).

5.a. The previous Response to Question 06.02.02-8 (C.5.a) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.5, E.6, and E.7).

b. The previous Response to Question 06.02.02-8 (C.5.b) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.5 and C.6).

c. The previous Response to Question 06.02.02-8 (C.5.c) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.5, E.6, and E.7).

6. The previous Response to Question 06.02.02-8 (C.6) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C. Appendix C identifies the debris generated from the zone of influence (ZOI). For the U.S. EPR design, there are no other known objects or devices in the ZOI that can be damaged by jet impingement and contribute to the debris.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (D) - Debris Characteristics**

1. The previous Response to Question 06.02.02-8 (D.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6) and Appendix E (Sections E.4 and E.5).
2. The previous Response to Question 06.02.02-8 (D.2) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6) and Appendix E (Sections E.4 and E.5).
3. The previous Response to Question 06.02.02-8 (D.3) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6).
4. The previous Response to Question 06.02.02-8 (D.4) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C. There are no known debris characterization assumptions that deviate from NRC-approved guidance. NEI 04-07, "Pressurized Water Reactor Sump Performance Methodology Evaluation," (Section 3.4.3 on Quantification of Debris Characteristics) adopts either small fines or large pieces as distributions for debris material. Both small fines and large pieces are represented in the U.S. EPR debris source and test program. The debris used in the tests conservatively bounds what is expected to be transported from a postulated loss of coolant accident (LOCA) event for the U.S. EPR design.
5. The previous Response to Question 06.02.02-8 (D.5) is superseded by details in Technical Report ANP-10293, Revision 1 (Sections 2.0 and 3.0). Mineral wool is not included in the debris source term because it is not used in the U.S. EPR design.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (E) - Latent Debris**

1. The previous Response to Question 06.02.02-8 (E.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6).

2. The previous Response to Question 06.02.02-8 (E.2) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2 and C.4).
3. The previous Response to Question 06.02.02-8 (E.3) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6) and Appendix E (Sections E.4 and E.5).
4. The previous Response to Question 06.02.02-8 (E.4) is superseded by details in Technical Report ANP-10293, Revision 1. The U.S. EPR strainer design does not describe a specific strainer surface area for collecting the miscellaneous latent debris. The strainer design is conservative and is based on a defense-in-depth strategy. The results of strainer performance testing showed a negligible emergency core cooling system (ECCS) strainer head loss using a design basis debris load. The tested strainer head loss was shown to be approximately one tenth of the design basis strainer head loss. Therefore, there is a substantial margin in the strainer design and it will function as intended with the assumed quantities of latent debris.

   In addition to the conservative strainer design, the defense-in-depth strategy provides four retaining baskets to collect debris entering the in-containment refueling water storage tank (IRWST). The retaining baskets function as independent, sacrificial, prescreening components upstream of the ECCS strainers. The retaining baskets are sized to capture the bulk of all incoming debris, removing the debris burden from ECCS strainers and allowing them to function with substantial margin.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (F) - Debris Transport**

2. The previous Response to Question 06.02.02-8 (F.2) is superseded by details in Technical Report ANP-10293, Revision 1 (Section 3.0). The term “dislodged material”, now called “LOCA related debris,” refers to the total debris source indicated in Technical Report ANP-10293, Revision 1, Table 3.1-1. The LOCA-related debris for the debris source term is not excluded from entering the IRWST. This approach is conservative. For example, the Technical Report ANP-10293, Revision 1, Table 3.1-1 total debris source is assumed to enter one heavy floor opening and pass into one retaining basket. Any debris that reaches the one ECCS strainer will result in the maximum expected debris loading. Credit is not taken for other ECCS train flow paths through additional heavy floor openings and retaining baskets that could capture debris during the LOCA event and lessen the impact on strainer clogging.

4. The previous Response to Question 06.02.02-8 (F.4) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix A (Section 1.3.3). The U.S. EPR design does not deviate from the guidance in R.G. 1.82, Section 1.3.3. Specifically:
   - The U.S. EPR analysis conforms to R.G. 1.82, Subsections 1.3.3.1, 1.3.3.2, 1,3,3,3, 1.3.3.5, 1.3.3.6, 1.3.3.8, and 1.3.3.9.
   - R.G. 1.82, Subsections 1.3.3.4 and 1.3.3.7 are not applicable to the U.S. EPR design.

5. The previous Response to Question 06.02.02-8 (F.5) is superseded by details in Technical Report ANP-10293, Revision 1 (Sections 3.1.1 and 3.1.4). The U.S. EPR design includes the following installed multiple barriers (debris interceptors) that limit the amount of postaccident debris reaching the ECCS strainers:

   - Weirs around the heavy floor openings promote settling of debris on the reactor coolant system (RCS) loop area floor.
   - Trash racks above the heavy floor openings prevent large debris from being transported to the IRWST.
   - Retaining baskets below the heavy floor openings capture the remaining debris contained in weir overflow.

   Although these three barriers are part of the U.S. EPR design, testing with only the strainer and retaining basket shows that the strainer head loss remains below the design value, even when the maximum amount of debris is introduced in the test loop.

6. The previous Response to Question 06.02.02-8 (F.6) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix A (Section 1.3.3.6) and Appendix E (Section E.3 and E.6). Fine debris is not assumed to settle in the IRWST. To prevent debris settling during strainer performance testing, the test flume recirculation loop contained prototypical miniflow lines. The miniflow lines provided a discharge flow and resulting turbulence along the flume floor to preclude debris settling, thus conservatively promoting debris transport to the strainer. The test plan provided for pre-mixing debris before adding it to the test facility and sequencing the debris additions. Following testing and flume draindown, there was a small amount of residual debris that settled on the flume floor between the retaining basket and strainer. Based on the very low strainer head loss, test provisions to keep the debris suspended, and testing conservatisms, the debris observed on the flume floor is considered to have no significant impact on the strainer test results.

8. The previous Response to Question 06.02.02-8 (F.8) is superseded by details in Technical Report ANP-10293, Revision 1 (Section 3.1.1) and Appendix E (Sections E.6 and E.7). For strainer testing, a scaling analysis for settling was unnecessary because settling is not credited.

9. The previous Response to Question 06.02.02-8 (F.9) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix A (Section 1.3.3.6).

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (G) - Coatings**

1. The Response to Question 06.02.02-8 (G.1) is provided in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, C.5, and C.6).
2. The Response to Question 06.02.02-8 (G.2) is provided in Technical Report ANP-10293, Revision 1, Appendix C (Sections C.2, C.4, and C.5).

3. The Response to Question 06.02.02-8 (G.3) is provided in Technical Report ANP-10293, Revision 1, Section 3.1.2 and Appendix C (Sections C.2, C.4, and C.5).

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (H) - Head Loss**

1. The previous Response to Question 06.02.02-8 (H.1) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix A (Sections 1.3.4.5) and Appendix E (Sections E.5, E.6, and E.7).
2. The previous Response to Question 06.02.02-8 (H.2) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.0 and Appendix E (Sections E.3, E.4, and E.5).
3. The previous Response to Question 06.02.02-8 (H.3) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix A (Section 1.3.3.3) and Appendix E (Section E.3).
4. The previous Response to Question 06.02.02-8 (H.4) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Section E.3).
5. The previous Response to Question 06.02.02-8 (H.5) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.5, E.6, and E.7).
6. The previous Response to Question 06.02.02-8 (H.6) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.0, Appendix C (Sections C.2, C.4, C.5, and C.6) and Appendix E (Sections E.4 and E.5). The debris source term is conservatively assumed to reach only one retaining basket.
7. The previous Response to Question 06.02.02-8 (H.7) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Sections E.4 and E.5). For testing, 100 percent of particulate material is assumed to reach the sump screen (i.e., strainer) based on the particulate material being smaller than the screen perforation size of the retaining basket and strainer. The types of particulate are latent dirt and dust, microtherm, and coatings.
8. The previous Response to Question 06.02.02-8 (H.8) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E. The U.S. EPR strainer test procedure was provided for NRC review during an audit. Testing included chemical effects.
9. The previous Response to Question 06.02.02-8 (H.9) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.0 and Appendix E.
10. The previous Response to Question 06.02.02-8 (H.10) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix E (Section E.3).
11. The previous Response to Question 06.02.02-8 (H.11) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.1.4 and Appendix E (Sections E.3, E.6, and E.7).
12. The previous Response to Question 06.02.02-8 (H.12) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.2.2 and Appendix E (Sections E.6 and E.7). The minimum submergence of the strainer is approximately 2.1 feet under LOCA conditions based on the following:
    - Bottom of IRWST: elevation -6.15 m (-20.18 ft).

- Minimum IRWST level during LOCA: elevation: -3.11 m (-10.2 ft).
- Strainer maximum height: 2.4 m (7.8 ft).
- Elevation of strainer top structure: -6.15 m elevation + 2.4 m = -3.75 m elevation (-12.3 ft).
- Strainer submergence: -3.11 m elevation – (-3.75 m) = 0.64 m elevation (2.1 ft).

Strainer submergence is greater than the head loss observed in strainer testing.

14. The previous Response to Question 06.02.02-8 (H.14) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.1.1 and Appendix E (Sections E.6 and E.7). The strainer maximum design head loss is based on providing a conservative design approach where the U.S EPR debris source is assumed to enter only one retaining basket. The debris entering the retaining basket is filtered. Some debris passes through the retaining basket filter and is transported to one strainer where it is filtered. This results in the strainer functioning with a conservative head loss margin, as shown by testing.

16. The previous Response to Question 06.02.02-8 (H.16) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C and Appendix E. Strainer head loss is based on the U.S. EPR debris source term and strainer testing.

17. The previous Response to Question 06.02.02-8 (H.17) is superseded by details in Technical Report ANP-10293, Revision 1, Appendix C and Appendix E. Strainer head loss is based on the U.S. EPR debris source term and strainer testing.

20. The previous Response to Question 06.02.02-8 (H.20) is superseded by details in Technical Report ANP-10293, Revision 1 and Appendix E (Sections E.3, E.6, and E.7). Temperature and viscosity were not used to scale the results of the head loss tests to actual plant conditions. Strainer testing was conservative using a water temperature of approximately 120°F. The head losses through the debris bed depend on the temperature of the water in the IRWST, with lower temperatures having more head loss impact. For the accident, temperatures increase up to approximately 100°C (212°F) for the short term and decrease in the long term. A lower temperature of approximately 120°F was used for strainer testing to produce conservative test results.

22. The previous Response to Question 06.02.02-8 (H.22) is superseded by the following response. The operation of the non-safety-related containment spray system (CSS) is not considered in the head loss assessment or testing. Refer to the Response to Question 06.02.02-8 (F.10) for additional information.

23. The previous Response to Question 06.02.02-8 (H.23) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.1 and Appendix E (Sections E.5, E.6, and E.7).

24. The previous Response to Question 06.02.02-8 (H.24) is superseded by the following revised response. For a condition with the retaining baskets being declared inoperable, continued power operation may not be possible. Testing was conservatively conducted with one strainer and retaining basket combination using a full debris load. Although the plant design consists of four separate sump strainers, the retaining baskets are integral parts of the overall debris mitigation system.

25. The previous Response to Question 06.02.02-8 (H.25) is superseded by the following revised response. For a condition with the strainers being declared inoperable, continued power operation would not be permitted.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (I) – NPSH**

1. The previous Response to Question 06.02.02-8 (I.1) is superseded by details in Technical Report ANP-10293, Revision 1. The technical documents that provide the details of pump flow rates, total recirculation flow rate, sump temperature, and minimum containment water level are available for NRC inspection.
2. The previous Response to Question 06.02.02-8 (I.2) is superseded by details in Technical Report ANP-10293, Revision 1. The technical documents that provide the details of pump net positive suction head (NPSH) values are available for NRC inspection.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (J) – Upstream Effects**

4. The previous Response to Question 06.02.02-8 (J.4) is superseded by details in Technical Report ANP-10293, Revision 1, Section 3.1 and Appendix E (Sections E.5, E.6, and E.7).

   The LOCA water level on the heavy floor is limited to the two-inch height of the weirs surrounding the heavy floor openings, plus the slight increase in level attributable to the water flow over the weirs. Following a LOCA, only smaller and lighter debris materials reach the weirs, where they become deposited in front of the weirs. Because of the small size of the debris transported to the weirs, there is no buildup of “debris dams” higher than the weirs. Because there are four independent pathways through the heavy floor for water to drain back to the IRWST, complete blockage of the pathways to the IRWST via the trash racks is not credible.

   Using the U.S. EPR debris source term, strainer testing was conducted without the weir and trash rack installed to conservatively challenge the function of the retaining basket and strainer. Testing showed the level in the retaining basket is self-regulating and increases as the lower portion of the basket fills with debris. As debris enters the retaining basket, the water level can increase and overflow the retaining basket.

   Water holdup on the heavy floor and in the retaining baskets does not impact the satisfactory operation of the ECCS.

6. The previous Response to Question 06.02.02-8 (J.6) is superseded by the following response.

   The trash racks are designed so that the return path cannot be blocked by the U.S. EPR debris source. The shape and large area of the four trash racks, their diverse locations on the heavy floor, and their mesh size (4 in. x 4 in. grating) prevent the trash racks from becoming completely clogged by debris. In the region were the break flow drops on the heavy floor, the water flow is turbulent and the debris moves radially away from this region. With increasing distance the flow velocities decrease, causing debris to settle on the floor, beginning with the heaviest materials. The deposited debris acts as additional obstacles in the flow path and as retention devices for smaller debris. Considering their large surface area and the low flow velocity, the larger debris settles around the floor opening but does not block the trash rack. In the event of a LOCA, there are four trash racks (and four corresponding flow paths) in the heavy floor to accept the return flow to the IRWST. With the existence of four trash racks (and four corresponding flow paths) in the heavy floor, blockage of the required LOCA return flow to the IRWST is not credible.

Refer to the Response to Question 06.02.02-8 (K.14) for information concerning effects of rupture and convection foils.

**FSAR Impact:**

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

**Response to Question 06.02.02-8 (K) - DCD Section 6.2 and 6.3 and ANP-10293 questions related to GSI-191**

1. The previous Response to Question 06.02.02-8 (K.1) is superseded by the following response. The data sheets that provide the details of the retention baskets are available for NRC inspection. Refer to Technical Report ANP-10293, Revision 1, Figure 2-3 for the retention basket arrangement within the IRWST. Retaining basket design parameters will be added to U.S. EPR FSAR Tier 2, Table 6.3-4.
2. The previous Response to Question 06.02.02-8 (K.2) is superseded by the following response. The data sheet that provides the details of the trash racks is available for NRC inspection. Trash rack design parameters will be added to U.S. EPR FSAR Tier 2, Table 6.3-4.
3. The previous Response to Question 06.02.02-8 (K.3) is superseded by details provided in Technical Report ANP-10293, Revision 1, Section 2.2. The tri-sodium phosphate (TSP) baskets are located in the containment heavy floor opening below the IRWST trash racks. Technical Report ANP-10293, Revision 1, Figure 2-1 shows the location of the TSP basket in the heavy floor opening and its relation to the ECCS sump blockage mitigation design features.

6. The previous Response to Question 06.02.02-8 (K.6) is superseded by the following response.

   The following provides the LOCA flow path from a pressurizer surge line break to the IRWST:

   - The postulated break in the pressurizer surge line occurs between containment elevations 49 feet and 21 feet.
   - The fluid from the surge line break flows though the openings in the intermediate floors below the elevation 49 feet slab to the opening in the floor above the pressurizer relief tank (PRT) at the 17 feet elevation and into the PRT room. Fluid is released from the

PRT room through the door separating the PRT room from the steam generator blowdown (SGBD) room. The two doors and/or door ways from the SGBD room to the annular space include a flooding berm to preclude flooding into the annular area and to contain the surge line break fluid in the PRT and SGBD rooms.

– Wall openings are provided in the SGBD room walls at four locations to route the surge line break fluid out of the SGBD tank room and into the reactor coolant pump (RCP) loop areas of the heavy floor.

– Once the LOCA water is routed to the RCP loop areas on the heavy floor, it flows through the four IRWST trash racks and the TSP baskets below each trash rack and into the IRWST.

9. The previous Response to Question 06.02.02-8 (K.9) is superseded by the following response. Refer to the Response to Question 06.02.02-8 (K.1). The minimum volume and area requirements for the retaining baskets needed to support the heavy floor are 1589 $ft^3$ and 721 $ft^2$, respectively. The minimum volume and area requirements for the smaller compartment of the double compartment retaining basket needed to support the annular space are 530 $ft^3$ and 269 $ft^2$, respectively. These size requirements are based on collecting the debris generated in one retaining basket.

10. The previous Response to Question 06.02.02-8 (K.10) is superseded by the following response. The expected water retention in the annular space is 120 $m^3$ (refer to the Response to Question 06.02.02-8 (J.1).

    The water reaching the annular space is essentially condensation from released steam. Because the U.S. EPR design does not use a CSS for design basis accident mitigation, the amount of LOCA water reaching the annular space is minimal.

    The majority of the LOCA generated debris will transport directly to the containment heavy floor. A limited amount of latent debris can be transported to the annular space from condensation effects. The U.S. EPR debris generation evaluation adopts a latent debris amount of 200 pounds, of which 85 percent is considered particulate and 15 percent is considered fiber. To challenge retaining basket performance, the entire U.S. EPR debris source term, including latent debris, is added to one retaining basket during testing. The results of testing showed no significant negative impact to strainer performance. The effects of a small amount of latent debris reaching the retaining basket from the annular area are bounded by the favorable test results.

    In the unlikely event that the retaining basket screen area becomes clogged from annular area latent debris, the retaining basket water will overflow (bypass) into the surrounding IRWST water. The annular space water cannot bypass the retaining basket compartment screen. For the U.S EPR design, debris from the heavy floor cannot clog credited screen surface area from the annular compartment.

13. The previous Response to Question 06.02.02-8 (K.13) is superseded by details in Technical Report ANP-10293, Revision 1, Section 2.3.3, Appendix C, and Appendix E.

15. The previous Response to Question 06.02.02-8 (K.15) is superseded by the Response to RAI 212, Supplement 1, Question 06.02.02-23.

**FSAR Impact:**

The U.S. EPR FSAR Tier 2, Section 6.3, Table 6.3-4 will be revised as described in the response and indicated on the enclosed markup.

# U.S. EPR Final Safety Analysis Report Markups

**Table 6.3-4—IRWST Design Parameters**
**Sheet 2 of 2**

| | |
|---|---|
| Sump | 484.4 $ft^2$ |
| Water depth (approximate) | 12.3 ft |
| **IRWST Retaining Baskets** | |
| **Double Compartment Retaining Baskets** | |
| Number | 2 |
| Material | Austenitic stainless steel |
| Design Pressure | 75 psig |
| Design Temperature | 320°F |
| Opening size | 0.08 x 0.08 in |
| Diameter of Wire | 0.03 in |
| Total screen area large compartment (approx. min.) | 721 $ft^2$ |
| Total screen area small compartment (approx. min.) | 269 $ft^2$ |
| Total Volume large compartment (approx. min.) | 1589 $ft^3$ |
| Total Volume small compartment (approx. min.) | 530 $ft^3$ |
| **Single Compartment Retaining Baskets** | |
| Number | 2 |
| Material | Austenitic stainless steel |
| Design Pressure | 75 psig |
| Design Temperature | 320°F |
| Opening size | 0.08 x 0.08 in |
| Diameter of Wire | 0.03 in |
| Total screen area (approx. min.) | 721 $ft^2$ |
| Total Volume (approx. min.) | 1589 $ft^3$ |
| **IRWST Trash Racks** | |
| Number | 4 |
| Material | Austenitic stainless steel |
| Design Pressure | 75 psig |
| Design Temperature | 320°F |
| Opening size (approx.) | 4.0 in x 4.0 in |