ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Thursday, May 12, 2011 5:59 PM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (EXTERNAL AREVA); WILLIAMSON Rick (AREVA); BREDEL Daniel (AREVA); Miernicki, Michael; BENNETT Kathy (AREVA); DELANO Karen (AREVA); HALLINGER Pat (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); WILLIFORD Dennis (AREVA)
Subject: Draft Revised Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Question 03.08.01-06
Attachments: RAI 155 Question 03.08.01-6 Response US EPR DC - DRAFT.pdf

Getachew

Attached is a draft of a revised response to RAI No. 155, FSAR Ch 3, Question 03.08.01-06.

The final response to Question 03.08.01-06 was submitted in RAI 155 Supplement 8, April 21, 2010. To address NRC comments received during the U.S. EPR FSAR Section 3.8 audit held February 14 – 17, 2011, the response to Question 03.08.01-06 is being revised.

Let me know if the staff has questions or if the draft response can be sent as a final response.

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
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Monday, May 02, 2011 7:26 AM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 11

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining 24 questions. AREVA NP submitted Supplement 5 to the response on July 31, 2009, to address 11 of the remaining 16 questions. AREVA NP submitted Supplement 6 to the response on

October 30, 2009, to provide new dates for 5 of the remaining 5 questions. AREVA NP submitted Supplement 7 to the response on January 28, 2010, to answer 1 of the remaining 5 questions and provide a new date for 1 of the remaining 5 questions. AREVA NP submitted Supplement 8 to the response on April21, 2010, to answer 2 of the remaining 4 questions. AREVA NP submitted a revised schedule for Questions 03.08.01-24 and 03.08.04-06 in Supplements 9 and 10 on June 24, 2010 and February 11, 2011, respectively.

Due to changes in the schedule for FSAR Sections 3.7 and 3.8 as discussed with NRC, the schedule for Questions 03.08.01-24 and 03.08.04-06 is being revised.

The schedule for the technically correct and complete response to the remaining questions is provided below.

Question #	Response Date
RAI 155 — 03.08.01-24	**December 28, 2011**
RAI 155 — 03.08.04-06	**December 28, 2011**

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
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)
Sent: Friday, February 11, 2011 2:32 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 10

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining 24 questions. AREVA NP submitted Supplement 5 to the response on July 31, 2009, to address 11 of the remaining 16 questions. AREVA NP submitted Supplement 6 to the response on October 30, 2009, to provide new dates for 5 of the remaining 5 questions. AREVA NP submitted Supplement 7 to the response on January 28, 2010, to answer 1 of the remaining 5 questions and provide a new date for 1 of the remaining 5 questions. AREVA NP submitted Supplement 8 to the response on April 21, 2010, to answer 2 of the remaining 4 questions. On June 24, 2010, AREVA NP submitted Supplement 9 to provide a revised schedule for Questions 03.08.01-24 and 03.08.04-06.

The schedule for Questions 03.08.01-24 and 03.08.04-06 has been changed.

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

Question #	Response Date
RAI 155 — 03.08.01-24	July 22, 2011
RAI 155 — 03.08.04-06	July 22, 2011

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

From: BRYAN Martin (EXT)
Sent: Thursday, June 24, 2010 1:02 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); VAN NOY Mark (EXT); CORNELL Veronica (External RS/NB); RYAN Tom (RS/NB); GARDNER Darrell (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining 24 questions. AREVA NP submitted Supplement 5 to the response on July 31, 2009, to address 11 of the remaining 16 questions. AREVA NP submitted Supplement 6 to the response on October 30, 2009, to provide new dates for 5 of the remaining 5 questions. AREVA NP submitted Supplement 7 to the response on January 28, 2010, to answer 1 of the remaining 5 questions and provide a new date for 1 of the remaining 5 questions. AREVA NP submitted Supplement 8 to the response on April 21, 2010, to answer 2 of the remaining 4 questions.

Based upon the civil/structural re-planning activities and revised RAI response schedule presented to the NRC during the June 9, 2010, Public Meeting, and to allow time to interact with the NRC on the responses, the schedule for the remaining two questions has been changed.

The revised schedule for the technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 155 — 03.08.01-24	May 25, 2011

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

From: BRYAN Martin (EXT)
Sent: Wednesday, April 21, 2010 12:56 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining 24 questions. AREVA NP submitted Supplement 5 to the response on July 31, 2009, to address 11 of the remaining 16 questions. AREVA NP submitted Supplement 6 to the response on October 30, 2009, to provide new dates for 5 of the remaining 5 questions. AREVA NP submitted Supplement 7 to the response on January 28, 2010, to answer 1 of the remaining 5 questions and provide a new date for 1 of the remaining 5 questions. The attached file, "RAI 155 Supplement 8 Response US EPR DC.pdf" provides a technically correct and complete response to 2 of the remaining 4 questions, as committed

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 155 Questions 03.08.01-3 and 03.08.01-6.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 8 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-3	2	3
RAI 155 — 03.08.01-6	4	5

The schedule for technically correct and complete responses to the remaining 2 questions is unchanged and provided below:

Question #	Response Date
RAI 155 — 03.08.01-24	August 3, 2010
RAI 155 — 03.08.04-06	August 3, 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

From: DUNCAN Leslie E (AREVA NP INC)
Sent: Thursday, January 28, 2010 7:40 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining 24 questions. AREVA NP submitted Supplement 5 to the response on July 31, 2009, to address 11 of the remaining 16 questions. AREVA NP submitted Supplement 6 to the response on October 30, 2009, to provide new dates for 5 of the remaining 5 questions. The attached file, "RAI 155 Supplement 7 Response US EPR DC.pdf" provides a technically correct and complete response to 1 of the remaining 5 questions, as committed.

The response for 1 of the 2 questions committed for in Supplement 7 has been deferred for submittal in conjunction with Supplement 8 because of its dependency on work that is not yet complete.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 7 Response US EPR DC.pdf" that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 155 — 03.08.01-20	2	11

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

Question #	Response Date
RAI 155 – 03.08.01-3	April 21, 2010
RAI 155 – 03.08.01-6	April 21, 2010
RAI 155 – 03.08.01-24	August 3, 2010
RAI 155 – 03.08.04-6	August 3, 2010

Sincerely,

Les Duncan
Licensing Engineer
AREVA NP Inc.
An AREVA and Siemens Company
Tel: (434) 832-2849
Leslie.Duncan@areva.com

From: WELLS Russell D (AREVA NP INC)
Sent: Friday, October 30, 2009 12:57 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. 155, FSAR Ch 3, Supplement 6

Getachew,

AREVA NP Inc. (AREVA NP) is unable to provide a response for RAI 155 Supplement 6 at this time. As discussed with the NRC staff, new seismic analyses using an embedded Finite Element – SASSI model are being finalized, which yields a new in-structure-seismic-response-spectra that will provide a more accurate assessment of sliding and overturning and improve high frequency response analysis.

The revised schedule for technically correct and complete responses to the remaining 5 questions is provided below:

Question #	Response Date
RAI 155 — 03.08.01-3	January 28, 2010
RAI 155 — 03.08.01-6	April 21, 2010
RAI 155 — 03.08.01-20	January 28, 2010
RAI 155 — 03.08.01-24	August 3, 2010
RAI 155 — 03.08.04-6	August 3, 2010

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: Pederson Ronda M (AREVA NP INC)
Sent: Friday, July 31, 2009 4:15 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining questions. AREVA NP submitted Supplement 4 to the response on June 30, 2009, to address 8 of the remaining questions. The attached file, "RAI 155 Supplement 5 Response US EPR DC.pdf" provides technically correct and complete responses to 11 of the remaining 16 questions, as committed.

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 155 Supplement 5 Questions 03.08.02-2, 03.08.02-7, 03.08.03-4, 03.08.03-17,03.08.05-1, 03.08.05-8, and 03.08.05-12.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 5 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.02-02	2	2
RAI 155 — 03.08.02-07	3	3
RAI 155 — 03.08.02-08	4	4
RAI 155 — 03.08.03-04	5	5
RAI 155 — 03.08.03-16	6	7
RAI 155 — 03.08.03-17	8	9
RAI 155 — 03.08.05-01	10	10
RAI 155 — 03.08.05-08	11	16
RAI 155 — 03.08.05-10	17	18
RAI 155 — 03.08.05-12	19	19
RAI 155 — 03.08.05-18	20	20

The schedule for technically correct and complete responses to the remaining 5 questions is unchanged and provided below:

Question RAI 155 #	Response Date
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.04-06	October 30, 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, June 30, 2009 8:34 PM
To: 'Getachew Tesfaye'; Miernicki, Michael
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. 155, FSAR Ch 3, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining 73 questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining 53 questions. AREVA NP submitted Supplement 3 to the response on May 29, 2009, to address 20 of the remaining 44 questions. The attached file, "RAI 155 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete responses to 8 of the remaining 24 questions, as committed.

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 155 Questions 03.08.05-14 and 03.08.02-1.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-11	2	2
RAI 155 — 03.08.02-1	3	3
RAI 155 — 03.08.02-4	4	4
RAI 155 — 03.08.05-7	5	8
RAI 155 — 03.08.05-13	9	10
RAI 155 — 03.08.05-14	11	13
RAI 155 — 03.08.05-15	14	14
RAI 155 — 03.08.05-16	15	15
RAI 155 — 03.08.05-18	16	16

The schedule for technically correct and complete responses to the remaining 16 questions is unchanged, with the exception of question 03.08.05-18, and is provided below. The schedule for the response to question 03.08.05-18 has been changed to July 31, 2009.

Question RAI 155 #	Response Date
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.02-02	July 31, 2009
RAI 155 — 03.08.02-07	July 31, 2009
RAI 155 — 03.08.02-08	July 31, 2009
RAI 155 — 03.08.03-04	July 31, 2009
RAI 155 — 03.08.03-16	July 31, 2009
RAI 155 — 03.08.03-17	July 31, 2009
RAI 155 — 03.08.04-06	October 30, 2009
RAI 155 — 03.08.05-01	July 31, 2009
RAI 155 — 03.08.05-08	July 31, 2009
RAI 155 — 03.08.05-10	July 31, 2009
RAI 155 — 03.08.05-12	July 31, 2009
RAI 155 — 03.08.05-18	July 31, 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: Pederson Ronda M (AREVA NP INC)
Sent: Friday, May 29, 2009 9:49 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009, to address 20 of the remaining questions. AREVA NP submitted Supplement 2 to the response on April 30, 2009, to address 9 of the remaining questions. The attached file, "RAI 155 Supplement 3 Response US EPR DC.pdf" provides technically correct and complete responses to 20 of the remaining 44 questions, as committed.

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 155 Questions 03.08.01-8, 03.08.01-10, 03.08.01-12, 03.08.03-3, 03.08.03-6, 03.08.03-10, 03.08.04-3, and 03.08.05-6.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 3 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-8	2	9
RAI 155 — 03.08.01-9	10	10
RAI 155 — 03.08.01-10	11	17
RAI 155 — 03.08.01-12	18	19
RAI 155 — 03.08.01-16	20	21
RAI 155 — 03.08.01-22	22	24
RAI 155 — 03.08.01-27	25	26
RAI 155 — 03.08.02-5	27	27
RAI 155 — 03.08.02-6	28	31
RAI 155 — 03.08.02-10	32	32
RAI 155 — 03.08.03-3	33	35
RAI 155 — 03.08.03-6	36	37
RAI 155 — 03.08.03-10	38	38
RAI 155 — 03.08.03-11	39	40
RAI 155 — 03.08.03-12	41	41
RAI 155 — 03.08.04-3	42	45
RAI 155 — 03.08.04-4	46	47
RAI 155 — 03.08.04-5	48	48
RAI 155 — 03.08.05-2	49	50
RAI 155 — 03.08.05-6	51	52

The schedule for technically correct and complete responses to the remaining 24 questions is unchanged and provided below:

Question RAI 155 #	Response Date
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-11	June 30, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.02-01	June 30, 2009
RAI 155 — 03.08.02-02	July 31, 2009
RAI 155 — 03.08.02-04	June 30, 2009

RAI 155 — 03.08.02-07	July 31, 2009
RAI 155 — 03.08.02-08	July 31, 2009
RAI 155 — 03.08.03-04	July 31, 2009
RAI 155 — 03.08.03-16	July 31, 2009
RAI 155 — 03.08.03-17	July 31, 2009
RAI 155 — 03.08.04-06	October 30, 2009
RAI 155 — 03.08.05-01	July 31, 2009
RAI 155 — 03.08.05-07	June 30, 2009
RAI 155 — 03.08.05-08	July 31, 2009
RAI 155 — 03.08.05-10	July 31, 2009
RAI 155 — 03.08.05-12	July 31, 2009
RAI 155 — 03.08.05-13	June 30, 2009
RAI 155 — 03.08.05-14	June 30, 2009
RAI 155 — 03.08.05-15	June 30, 2009
RAI 155 — 03.08.05-16	June 30, 2009
RAI 155 — 03.08.05-18	June 30, 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: Thursday, April 30, 2009 9:16 PM
To: Getachew Tesfaye (gxt2@nrc.gov)
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 2 (part 4 of 4)

Getachew,

Response file, "RAI 155 Supplement 2 Response US EPR DC (Part 4 of 4).pdf" is attached.

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: Thursday, April 30, 2009 9:12 PM
To: Getachew Tesfaye (gxt2@nrc.gov)
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 2 (part 3 of 4)

Getachew,

Response file, "RAI 155 Supplement 2 Response US EPR DC (Part 3 of 4).pdf" is attached.

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: Thursday, April 30, 2009 9:11 PM
To: Getachew Tesfaye (gxt2@nrc.gov)
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 2 (part 2 of 4)

Getachew,

Response file, "RAI 155 Supplement 2 Response US EPR DC (Part 2 of 4).pdf" is attached.

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: Thursday, April 30, 2009 9:09 PM
To: Getachew Tesfaye (gxt2@nrc.gov)
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 2 (part 1 of 4)

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. AREVA NP submitted Supplement 1 to the response on March 31, 2009 to address 20 of the remaining questions. The response document, "RAI 155 Supplement 2 Response U.S. EPR DC" provides technically correct and complete responses to 9 of the remaining 53 questions, as committed.

Due to transmittal size limitations, the response file has been separated to e-mail the response in four parts. Attached is "RAI 155 Supplement 2 Response U.S. EPR DC (Part 1 of 4).pdf."

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 155 Questions 03.08.01-07, 03.08.02-03, 03.08.03-05, 03.08.03-14 and 03.08.03-15.

The following table indicates the respective pages in the response document, "RAI 155 Supplement 2 Response U.S. EPR DC," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-07	2	5
RAI 155 — 03.08.01-17	6	6
RAI 155 — 03.08.02-03	7	7
RAI 155 — 03.08.03-05	8	15
RAI 155 — 03.08.03-14	16	16
RAI 155 — 03.08.03-15	17	37
RAI 155 — 03.08.04-02	38	38
RAI 155 — 03.08.05-05	39	42
RAI 155 — 03.08.05-11	43	43
RAI 155 — 03.08.05-12	44	44

AREVA NP's response to RAI 155 Question 03.08.05-12 has been deferred to July 31, 2009 to be provided concurrently with the response to a similar question regarding the Nuclear Island common structure. With this exception, the schedule for technically correct and complete responses to the remaining 44 questions is unchanged and is provided below:

Question RAI 155 #	Response Date
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-08	May 29, 2009

RAI 155 — 03.08.01-09	May 29, 2009
RAI 155 — 03.08.01-10	May 29, 2009
RAI 155 — 03.08.01-11	June 30, 2009
RAI 155 — 03.08.01-12	May 29, 2009
RAI 155 — 03.08.01-16	May 29, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-22	May 29, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.01-27	May 29, 2009
RAI 155 — 03.08.02-01	June 30, 2009
RAI 155 — 03.08.02-02	July 31, 2009
RAI 155 — 03.08.02-04	June 30, 2009
RAI 155 — 03.08.02-05	May 29, 2009
RAI 155 — 03.08.02-06	May 29, 2009
RAI 155 — 03.08.02-07	July 31, 2009
RAI 155 — 03.08.02-08	July 31, 2009
RAI 155 — 03.08.02-10	May 29, 2009
RAI 155 — 03.08.03-03	May 29, 2009
RAI 155 — 03.08.03-04	July 31, 2009
RAI 155 — 03.08.03-06	May 29, 2009
RAI 155 — 03.08.03-10	May 29, 2009
RAI 155 — 03.08.03-11	May 29, 2009
RAI 155 — 03.08.03-12	May 29, 2009
RAI 155 — 03.08.03-16	July 31, 2009
RAI 155 — 03.08.03-17	July 31, 2009
RAI 155 — 03.08.04-03	May 29, 2009
RAI 155 — 03.08.04-04	May 29, 2009
RAI 155 — 03.08.04-05	May 29, 2009
RAI 155 — 03.08.04-06	October 30, 2009
RAI 155 — 03.08.05-01	July 31, 2009
RAI 155 — 03.08.05-02	May 29, 2009
RAI 155 — 03.08.05-06	May 29, 2009
RAI 155 — 03.08.05-07	June 30, 2009
RAI 155 — 03.08.05-08	July 31, 2009
RAI 155 — 03.08.05-10	July 31, 2009
RAI 155 — 03.08.05-12	July 31, 2009
RAI 155 — 03.08.05-13	June 30, 2009
RAI 155 — 03.08.05-14	June 30, 2009
RAI 155 — 03.08.05-15	June 30, 2009
RAI 155 — 03.08.05-16	June 30, 2009
RAI 155 — 03.08.05-18	June 30, 2009

Sincerely,

Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Tuesday, March 31, 2009 8:16 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT); HEDRICK Gary E (AFS)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 5 of the 78 questions of RAI No. 155 on February 13, 2009. The attached file, "RAI 155 Supplement 1 Response U.S. EPR DC" provides technically correct and complete responses to 20 of the remaining 73 questions, as committed.

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 155 Supplement 1 Questions 03.08.01-04, 03.08.01-05, 03.08.01-21, 03.08.02-09, 03.08.03-02, 03.08.03-09, 03.08.05-03, and 03.08.05-04.

The following table indicates the respective page(s) in the response document, "RAI 155 Supplement 1 Response U.S. EPR DC," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-01	2	2
RAI 155 — 03.08.01-02	3	9
RAI 155 — 03.08.01-04	10	12
RAI 155 — 03.08.01-05	13	16
RAI 155 — 03.08.01-13	17	19
RAI 155 — 03.08.01-21	20	20
RAI 155 — 03.08.01-23	21	21
RAI 155 — 03.08.01-25	22	22
RAI 155 — 03.08.02-09	23	23
RAI 155 — 03.08.03-01	24	31
RAI 155 — 03.08.03-02	32	33
RAI 155 — 03.08.03-07	34	34
RAI 155 — 03.08.03-08	35	36
RAI 155 — 03.08.03-09	37	37
RAI 155 — 03.08.03-13	38	38

RAI 155 — 03.08.04-01	39	40
RAI 155 — 03.08.05-03	41	41
RAI 155 — 03.08.05-04	42	46
RAI 155 — 03.08.05-09	47	48
RAI 155 — 03.08.05-17	49	53

The schedule for technically correct and complete responses to the remaining 53 questions is unchanged and provided below:

Question RAI 155 #	**Response Date**
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-07	April 30, 2009
RAI 155 — 03.08.01-08	May 29, 2009
RAI 155 — 03.08.01-09	May 29, 2009
RAI 155 — 03.08.01-10	May 29, 2009
RAI 155 — 03.08.01-11	June 30, 2009
RAI 155 — 03.08.01-12	May 29, 2009
RAI 155 — 03.08.01-16	May 29, 2009
RAI 155 — 03.08.01-17	April 30, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-22	May 29, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.01-27	May 29, 2009
RAI 155 — 03.08.02-01	June 30, 2009
RAI 155 — 03.08.02-02	July 31, 2009
RAI 155 — 03.08.02-03	April 30, 2009
RAI 155 — 03.08.02-04	June 30, 2009
RAI 155 — 03.08.02-05	May 29, 2009
RAI 155 — 03.08.02-06	May 29, 2009
RAI 155 — 03.08.02-07	July 31, 2009
RAI 155 — 03.08.02-08	July 31, 2009
RAI 155 — 03.08.02-10	May 29, 2009
RAI 155 — 03.08.03-03	May 29, 2009
RAI 155 — 03.08.03-04	July 31, 2009
RAI 155 — 03.08.03-05	April 30, 2009
RAI 155 — 03.08.03-06	May 29, 2009
RAI 155 — 03.08.03-10	May 29, 2009
RAI 155 — 03.08.03-11	May 29, 2009
RAI 155 — 03.08.03-12	May 29, 2009
RAI 155 — 03.08.03-14	April 30, 2009
RAI 155 — 03.08.03-15	April 30, 2009
RAI 155 — 03.08.03-16	July 31, 2009
RAI 155 — 03.08.03-17	July 31, 2009

RAI 155 — 03.08.04-02	April 30, 2009
RAI 155 — 03.08.04-03	May 29, 2009
RAI 155 — 03.08.04-04	May 29, 2009
RAI 155 — 03.08.04-05	May 29, 2009
RAI 155 — 03.08.04-06	October 30, 2009
RAI 155 — 03.08.05-01	July 31, 2009
RAI 155 — 03.08.05-02	May 29, 2009
RAI 155 — 03.08.05-05	April 30, 2009
RAI 155 — 03.08.05-06	May 29, 2009
RAI 155 — 03.08.05-07	June 30, 2009
RAI 155 — 03.08.05-08	July 31, 2009
RAI 155 — 03.08.05-10	July 31, 2009
RAI 155 — 03.08.05-11	April 30, 2009
RAI 155 — 03.08.05-12	April 30, 2009
RAI 155 — 03.08.05-13	June 30, 2009
RAI 155 — 03.08.05-14	June 30, 2009
RAI 155 — 03.08.05-15	June 30, 2009
RAI 155 — 03.08.05-16	June 30, 2009
RAI 155 — 03.08.05-18	June 30, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, February 13, 2009 7:18 PM
To: 'Getachew Tesfaye'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT); HARRIS Carolyn A (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s (AREVA NP) response to the subject request for additional information (RAI). The attached file, "RAI 155 Response US EPR DC.pdf" provides technically correct and complete responses to 5 of the 78 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses to RAI 155 Questions 03.08.01-15, 03.08.01-18, 03.08.01-19, and 03.08.01-26.

The following table indicates the respective pages in the response document, "RAI 155 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 155 — 03.08.01-01	2	2
RAI 155 — 03.08.01-02	3	3
RAI 155 — 03.08.01-03	4	4
RAI 155 — 03.08.01-04	5	5
RAI 155 — 03.08.01-05	6	6
RAI 155 — 03.08.01-06	7	7
RAI 155 — 03.08.01-07	8	8
RAI 155 — 03.08.01-08	9	9
RAI 155 — 03.08.01-09	10	10
RAI 155 — 03.08.01-10	11	11
RAI 155 — 03.08.01-11	12	12
RAI 155 — 03.08.01-12	13	13
RAI 155 — 03.08.01-13	14	14
RAI 155 — 03.08.01-14	15	17
RAI 155 — 03.08.01-15	18	19
RAI 155 — 03.08.01-16	20	20
RAI 155 — 03.08.01-17	21	21
RAI 155 — 03.08.01-18	22	22
RAI 155 — 03.08.01-19	23	24
RAI 155 — 03.08.01-20	25	25
RAI 155 — 03.08.01-21	26	26
RAI 155 — 03.08.01-22	27	27
RAI 155 — 03.08.01-23	28	28
RAI 155 — 03.08.01-24	29	30
RAI 155 — 03.08.01-25	31	31
RAI 155 — 03.08.01-26	32	34
RAI 155 — 03.08.01-27	35	35
RAI 155 — 03.08.02-01	36	36
RAI 155 — 03.08.02-02	37	37
RAI 155 — 03.08.02-03	38	38
RAI 155 — 03.08.02-04	39	39
RAI 155 — 03.08.02-05	40	40
RAI 155 — 03.08.02-06	41	41
RAI 155 — 03.08.02-07	42	42

RAI 155 — 03.08.02-08	43	43
RAI 155 — 03.08.02-09	44	44
RAI 155 — 03.08.02-10	45	45
RAI 155 — 03.08.03-01	46	46
RAI 155 — 03.08.03-02	47	47
RAI 155 — 03.08.03-03	48	48
RAI 155 — 03.08.03-04	49	49
RAI 155 — 03.08.03-05	50	50
RAI 155 — 03.08.03-06	51	51
RAI 155 — 03.08.03-07	52	52
RAI 155 — 03.08.03-08	53	53
RAI 155 — 03.08.03-09	54	54
RAI 155 — 03.08.03-10	55	55
RAI 155 — 03.08.03-11	56	56
RAI 155 — 03.08.03-12	57	57
RAI 155 — 03.08.03-13	58	58
RAI 155 — 03.08.03-14	59	59
RAI 155 — 03.08.03-15	60	60
RAI 155 — 03.08.03-16	61	61
RAI 155 — 03.08.03-17	62	63
RAI 155 — 03.08.04-01	64	64
RAI 155 — 03.08.04-02	65	65
RAI 155 — 03.08.04-03	66	67
RAI 155 — 03.08.04-04	68	68
RAI 155 — 03.08.04-05	69	69
RAI 155 — 03.08.04-06	70	70
RAI 155 — 03.08.05-01	71	71
RAI 155 — 03.08.05-02	72	72
RAI 155 — 03.08.05-03	73	73
RAI 155 — 03.08.05-04	74	75
RAI 155 — 03.08.05-05	76	76
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RAI 155 — 03.08.05-07	78	78
RAI 155 — 03.08.05-08	79	80
RAI 155 — 03.08.05-09	81	81
RAI 155 — 03.08.05-10	82	82
RAI 155 — 03.08.05-11	83	83
RAI 155 — 03.08.05-12	84	84
RAI 155 — 03.08.05-13	85	85
RAI 155 — 03.08.05-14	86	86
RAI 155 — 03.08.05-15	87	87
RAI 155 — 03.08.05-16	88	88
RAI 155 — 03.08.05-17	89	89
RAI 155 — 03.08.05-18	90	90

A complete answer is not provided for 73 of the 78 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 155 — 03.08.01-01	March 31, 2009
RAI 155 — 03.08.01-02	March 31, 2009
RAI 155 — 03.08.01-03	October 30, 2009
RAI 155 — 03.08.01-04	March 31, 2009
RAI 155 — 03.08.01-05	March 31, 2009
RAI 155 — 03.08.01-06	October 30, 2009
RAI 155 — 03.08.01-07	April 30, 2009
RAI 155 — 03.08.01-08	May 29, 2009
RAI 155 — 03.08.01-09	May 29, 2009
RAI 155 — 03.08.01-10	May 29, 2009
RAI 155 — 03.08.01-11	June 30, 2009
RAI 155 — 03.08.01-12	May 29, 2009
RAI 155 — 03.08.01-13	March 31, 2009
RAI 155 — 03.08.01-16	May 29, 2009
RAI 155 — 03.08.01-17	April 30, 2009
RAI 155 — 03.08.01-20	October 30, 2009
RAI 155 — 03.08.01-21	March 31, 2009
RAI 155 — 03.08.01-22	May 29, 2009
RAI 155 — 03.08.01-23	March 31, 2009
RAI 155 — 03.08.01-24	October 30, 2009
RAI 155 — 03.08.01-25	March 31, 2009
RAI 155 — 03.08.01-27	May 29, 2009
RAI 155 — 03.08.02-01	June 30, 2009
RAI 155 — 03.08.02-02	July 31, 2009
RAI 155 — 03.08.02-03	April 30, 2009
RAI 155 — 03.08.02-04	June 30, 2009
RAI 155 — 03.08.02-05	May 29, 2009
RAI 155 — 03.08.02-06	May 29, 2009
RAI 155 — 03.08.02-07	July 31, 2009
RAI 155 — 03.08.02-08	July 31, 2009
RAI 155 — 03.08.02-09	March 31, 2009
RAI 155 — 03.08.02-10	May 29, 2009
RAI 155 — 03.08.03-01	March 31, 2009
RAI 155 — 03.08.03-02	March 31, 2009
RAI 155 — 03.08.03-03	May 29, 2009
RAI 155 — 03.08.03-04	July 31, 2009
RAI 155 — 03.08.03-05	April 30, 2009
RAI 155 — 03.08.03-06	May 29, 2009
RAI 155 — 03.08.03-07	March 31, 2009
RAI 155 — 03.08.03-08	March 31, 2009

RAI 155 — 03.08.03-09	March 31, 2009
RAI 155 — 03.08.03-10	May 29, 2009
RAI 155 — 03.08.03-11	May 29, 2009
RAI 155 — 03.08.03-12	May 29, 2009
RAI 155 — 03.08.03-13	March 31, 2009
RAI 155 — 03.08.03-14	April 30, 2009
RAI 155 — 03.08.03-15	April 30, 2009
RAI 155 — 03.08.03-16	July 31, 2009
RAI 155 — 03.08.03-17	July 31, 2009
RAI 155 — 03.08.04-01	March 31, 2009
RAI 155 — 03.08.04-02	April 30, 2009
RAI 155 — 03.08.04-03	May 29, 2009
RAI 155 — 03.08.04-04	May 29, 2009
RAI 155 — 03.08.04-05	May 29, 2009
RAI 155 — 03.08.04-06	October 30, 2009
RAI 155 — 03.08.05-01	July 31, 2009
RAI 155 — 03.08.05-02	May 29, 2009
RAI 155 — 03.08.05-03	March 31, 2009
RAI 155 — 03.08.05-04	March 31, 2009
RAI 155 — 03.08.05-05	April 30, 2009
RAI 155 — 03.08.05-06	May 29, 2009
RAI 155 — 03.08.05-07	June 30, 2009
RAI 155 — 03.08.05-08	July 31, 2009
RAI 155 — 03.08.05-09	March 31, 2009
RAI 155 — 03.08.05-10	July 31, 2009
RAI 155 — 03.08.05-11	April 30, 2009
RAI 155 — 03.08.05-12	April 30, 2009
RAI 155 — 03.08.05-13	June 30, 2009
RAI 155 — 03.08.05-14	June 30, 2009
RAI 155 — 03.08.05-15	June 30, 2009
RAI 155 — 03.08.05-16	June 30, 2009
RAI 155 — 03.08.05-17	March 31, 2009
RAI 155 — 03.08.05-18	June 30, 2009

Sincerely,

Ronda Pederson
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AREVA NP Inc.
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3315 Old Forest Road
Lynchburg, VA 24506-0935
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 14, 2009 9:33 AM
To: ZZ-DL-A-USEPR-DL
Cc: Jim Xu; Samir Chakrabarti; Sujit Samaddar; Michael Miernicki; Joseph Colaccino; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 155 (1671, 1831,1672, 1834, 1833, 1836), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 12, 2008, and discussed with your staff on January 13, 2009. No changes were made to the Draft RAI Questions 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: 2977

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41045A4E81)

Subject: Draft Revised Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Question 03.08.01-06
Sent Date: 5/12/2011 5:59:14 PM
Received Date: 5/12/2011 5:59:20 PM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

Recipients:
"CORNELL Veronica (EXTERNAL AREVA)" <Veronica.Cornell.ext@areva.com>
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"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
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Tracking Status: None
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Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**	
MESSAGE	42786	5/12/2011 5:59:20 PM	
RAI 155 Question 03.08.01-6 Response US EPR DC - DRAFT.pdf			379457

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 155, Question 03.08.01-06, Revision 1

01/14/2009

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.08.01 - Concrete Containment
SRP Section: 03.08.02 - Steel Containment
SRP Section: 03.08.03 - Concrete and Steel Internal Structures of Steel or Concrete Containments
SRP Section: 03.08.04 - Other Seismic Category I Structures
SRP Section: 03.08.05 - Foundations
Application Section: FSAR Section 3.8

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

Question 03.08.01-6:

FSAR Section 3.8.1.3.1 and Section 3.8.2.3.1 – Design Loads, under the heading Other Loads, discuss the combustible gas pressurization loads that result from a fuel-clad metal-water reaction (WMR) and an uncontrolled hydrogen burn. Reference is made to Regulatory Guide 1.136, Regulatory Position C.5 for the loads and load combinations. FSAR Sections 3.8.1.3.1 and 3.8.2.3.1 state that "RG 1.136, Regulatory Position C.5 and RG 1.7 specify a pressure of 45 psig combined with dead load (D) as a minimum design condition. Therefore, the strains and stresses for the RCB calculated using the U.S. EPR design pressure in the load combinations in Table CC-3230-1 of the ASME BPV Code bounds the results of the pressure specified in RG 1.136 and RG 1.7." The staff position is that RG 1.136, RG 1.7, SRP 3.8.1, and 3.8.2 specify the load combinations which are to be used for the pressurization arising from the hydrogen generation and hydrogen burn. An additional criterion is that the pressure utilized should be as a minimum 45 psig. Thus, the higher pressure arising from the actual hydrogen generation/burn due to assumed 100% WMR and 45 psig should be used. AREVA is requested to identify what is the maximum pressure load (and associated containment temperature transient) from the hydrogen generation/burn event due to assumed 100% WMR; evaluate the containment integrity for the higher pressure from this event and 45 psig; and include the proper loads, load combinations, acceptance criteria, and analysis description in the FSAR. In addition, explain why satisfying both stresses and strains are being discussed for evaluation of the combustible gas pressurization loads, since the acceptance criteria for the concrete sections of containment only require meeting strain limits as described in RG 1.7 and ASME Code, Section III, Division 2, Subarticle CC – 3720.

Response to Question 03.08.01-6:

In the Response to RAI 234, Supplement 1, Question 19-305, AREVA NP calculated containment internal temperature and pressure load time histories due to hydrogen burn by assuming 100 percent fuel clad-coolant reaction. During hydrogen burn, maximum calculated pressure is 75 psi and the corresponding temperature is 549.1°F. Containment integrity evaluation is performed based on this maximum pressure and material degradation consequent to the resultant temperature.

In the Response to RAI 234, Supplement 1, Question 19-305, Reactor Containment Building (RCB) nonlinear structural analysis was conducted using the ANSYS computer code. This analysis considered dead loads, pre-stressing loads, and internal pressure load from the hydrogen burn event. Based on the results of the ANSYS thermal time history analysis of the RCB, a tensile strength reduction factor of 0.8 and a modulus of elasticity reduction factor of 0.7 were determined and applied to concrete properties for the structural analysis. To determine effects of further reducing the modulus of elasticity and tensile strength of concrete, a second analysis was performed that employed a reduction factor of 0.5 for both parameters. From these analyses, maximum liner strain is calculated to be 0.00044 inch/inch in tension and 0.00096 inch/inch in compression. ASME Boiler and Pressure Vessel Code Section III, Division 2, Subarticle CC-3720 states that the maximum allowable membrane strain in the liner is 0.003 inch/inch in tension and 0.005 inch/inch in compression. According to ASME Boiler and Pressure Vessel Code Section III, Division 2, Subarticle CC-3720, liner strains are bounded by the limiting maximum strains.

The internal pressure load time history in Figure 19-305-2 (Response to RAI 234, Supplement 1, Question 19-305), was evaluated for dynamic effects due to pressure spikes. Dynamic

effects were found to be negligible. Based on the pressure time history, four critical spikes were identified as potentially having the largest maximum dynamic load factor (DLF):

1. Spike 1 - peak pressure is 23.27 psig and occurs at 1.2 hours (4352.18 seconds).
2. Spike 2 - peak pressure is 27.14 psig and occurs at 6.6 hours (23925.3 seconds).
3. Spike 3 - peak pressure is 28.72 psig and occurs at 8.6 hours (31040.3 seconds).
4. Spike 4 - peak pressure is 75.04 psig and occurs at 13.3 hours (47758.7 seconds).

All four spikes are seen to be of a shape that is bounded by an evaluation of both the 'isosceles triangle load pulse' and the 'constant force with finite rise time' dynamic loading functions that are analyzed in Sections 2.3c and 2.3d of Reference [1]. The rise slope of spike 2 changes significantly at t = 19564 s. The steeper slope at the beginning of the rise is conservatively assumed throughout and envelopes the two loading functions. For both loading functions, the maximum dynamic load factor (DLF_{max}) approach unity for $t_{r,d} >> T$, where t_r is the finite rise time of the constant force function, t_d is the duration of the isosceles triangle load pulse and T is the natural period of the system as defined in Reference [1]. For the four potential spikes, t_r and t_d are calculated as follows:

1. Spike 1: $t_r = ½\ t_d$ = 4352.18 – 3027.53 = 1325 seconds → t_r = 1325 s, t_d = 2650 s
2. Spike 2: $t_r = ½\ t_d$ = (19564 – 19217.7)*[(27.14 – 10.25)/(17.83 – 10.25)] = 772 seconds → t_r = 772 s, t_d = 1543 s
3. Spike 3: $t_r = ½\ t_d$ = 31040.3 – 29830.8 = 1210 seconds → t_r = 1210 s, t_d = 2420 s
4. Spike 4: $t_r = ½\ t_d$ = 47758.7 – 46933.6 = 825 seconds → t_r = 825 s, t_d = 1650 s

Based on theoretical equations, the bounding maximum DLFs were calculated for each spike. The worst case DLF was conservatively calculated as:

$$DLF_{max} \leq 1 + [2/(\omega t_r)] = 1 + [2/(2\pi * t_r/T)] \leq 1 + [2/(2\pi * 3784)] = 1.0001,$$

where t_r = 772 seconds is the finite rise time of the controlling spike and T = 0.204 seconds is the maximum natural period of the RCB (which occurs in both the X- and Y-directions). Dynamic effects are thus negligible.

The combustible gas load descriptions in U.S. EPR FSAR Tier 2, Sections 3.8.1.3.1, 3.8.2.3.1, 3.8.1.4, and 3.8.2.4 were revised in the Response to RAI 354, Question 3.8.2-11 and are attached to this response for completeness.

Reference [1]: Biggs, John, *Introduction to Structural Dynamics*, McGraw-Hill 1964

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

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- RG 1.136, Revision 3 (exception described in 3.8.1.3).
- RG 1.199, November 2003 (exception described in 3.8.1.4).
- RG 1.216, August 2010.

3.8.1.3 Loads and Load Combinations

The U.S. EPR standard plant design loads envelope includes the expected loads over a broad range of site conditions. Loads and load combinations for the RCB are in accordance with the requirements of Article CC-3000 of the ASME Code, Section III, Division 2, Code for Concrete Containments and ACI Standard 359, and RG 1.136 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). RG 1.136 endorses the 2001 Edition of the ASME Code with the 2003 addenda (including exceptions taken in RG 1.136). The U.S. EPR standard plant design is based on the 2004 Edition of the Code, inclusive of the exceptions taken in RG 1.136. Design loads and loading combinations for the concrete RCB are described in Sections 3.8.1.3.1 and 3.8.1.3.2.

A COL applicant that references the U.S. EPR design certification will confirm that site-specific loads lie within the standard plant design envelope for the RCB, or perform additional analyses to verify structural adequacy.

3.8.1.3.1 Design Loads

The concrete RCB is designed for the following loads:

Service Loads

- Normal Loads – Normal loads are those loads encountered during normal plant operation and shutdown (GDC 4). This load category includes:
  - Dead Loads (D) – Dead loads include the weight of the structure and any permanent equipment or material weights. Dead load effects also refer to internal moments and forces due to dead loads.
  - Live Loads (L) – Live loads include any normal loads that vary with intensity or point of application, including moveable equipment. Live load effects also refer to internal moments and forces due to live loads. Live loads are applied, removed, varied from zero to full value, or shifted in location to obtain the worst-case loading conditions. Impact forces due to moving loads are applied as appropriate for the loading condition.
  - Soil Loads or Lateral Earth Pressure (H) – There are no soil or lateral earth pressure loads on the RCB because it is surrounded by other Seismic Category I structures that shield it from these loads.
  - Hydrostatic Loads (F) – Hydrostatic loads due to water stored in pools and tanks are considered in the design of RB internal structures that exert reaction loads on the RCB and NI Common Basemat Structure foundation basemat.

evaluation of this loading condition is considered as part of the plant safeguard and security measures. Explosion pressure wave loads are not applicable on the RCB because it is surrounded by other Seismic Category I structures that provide a shield.

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- Combustible Gas (C) – Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment ~~inerted by carbon dioxide~~ (Refer to Section 6.2.5). ~~RG 1.136, Regulatory Position C.5 provides the loads and load combinations acceptable for analysis and design of containment when exposed to the loading conditions associated with combustible gas. The principal combustible gas for the U.S. EPR is hydrogen. The U.S. EPR design does not include an inerting gas system. Containment maximum pressure is 75 psig based on pressure load time histories due to the hydrogen released by assuming 100 percent fuel-clad reaction with reactor coolant followed by hydrogen burning. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a minimum pressure of 45 psig combined with dead load (D) as a minimum design condition. U.S. EPR calculated maximum pressure is greater than the regulatory required minimum pressure. ANSYS computer code was used to perform a structural analysis of the Reactor Containment Building (RCB) to calculate maximum liner strain. The elastic model of containment described in Section 3.8.1.4.1 is employed. The elements associated with the liner plate, containment wall, ring girder, dome, foundation, and RBIS foundation are isolated from the overall static model. Additionally, a nonlinear model created from a 6° slice of the RCB liner, wall, ring girder, and dome, which implements axisymmetric boundary conditions, is also analyzed. This nonlinear model allows for concrete cracking and the tensile capability of the reinforcing bars. A separate analysis is performed to determine the effects of the pressure load on containment penetrations. These analyses consider dead loads, pre-stressing loads, and the internal pressure load from the hydrogen burn event, and considered degradation of material properties due to the higher temperature resulting from hydrogen burn. RCB liner strains calculated for the pressure time histories during this hydrogen burn are within strain limits described by RG 1.7 and ASME Code Section III, Division 2, Subarticle CC-3720.~~

Missile Loads other Than Wind- or Tornado-Generated Missiles

There are no missile loads on the RCB resulting from activities of nearby military installations, turbine failures, or other causes. The RCB is surrounded by other Seismic Category I structures that shield it from missiles.

3.8.1.3.2 Design Load Combinations

Loading combinations used for the design of the RCB, including its steel liner plate, are in accordance with guidance provided in NUREG-0800, Standard Review Plan, Section 3.8.1 (Reference 3) (GDC1, GDC 2, GDC 4, GDC 16, and GDC 50).

The NI Common Basemat Structure is a monolithic concrete structure. However, various portions of the structure have different classifications (i.e., RCB, RB internal structures, and other Seismic Category I structures) and correspondingly different

- Factored load combinations (abnormal or extreme environmental loads).

$$U_F = D + L + H + F + F_b + J + G + E' + P_a + T_a + R_a + R_r$$

$$U_F = D + J + P_g1 + P_g2$$

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3.8.1.4 Design and Analysis Procedures

The analysis and design of the post-tensioned RCB comply with the requirements of Article CC-3300 of the ASME Code, Section III, Division 2 and RG 1.136 (GDC 1 and GDC 16).

Computer programs perform many of the computations required for the RCB analysis and design. In many cases, classical methods and manual techniques are also used for the analysis of localized areas of the containment structure and its subassemblies. Manual calculations are generally used for:

- Initial proportioning of the dome, wall, and base slab and determining tendon layout.
- Evaluation of the effects of locally applied loads, such as crane loads and pipe reaction loads.
- Preparation of input for the computer analyses.
- Design of the liner plate and its anchorage to the concrete containment shell.

The analysis and design methods incorporate several phases. Overall analysis and design are performed for structures using computer models of the NI Common Basemat Structure, Seismic Category I structures. Then, localized design evaluations account for local loadings and discontinuities in structures (e.g., openings and local changes in member cross-sections). Results from the local analyses are combined with the overall global analysis results to produce the final design.

An ultimate capacity analysis is performed, as described in Section 3.8.1.4.11, to determine the ultimate internal pressure load capability of the containment for use in probabilistic risk assessment and severe accident analyses. The ultimate capacity analysis evaluates the concrete containment structure (including the liner plate), as well as large containment penetrations, such as the equipment hatch and airlocks.

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Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (Section 6.2.5). Combustible gas loads are evaluated per the requirements of RG 1.216 and RG 1.136. RG 1.136, Regulatory Position C.5 provides the loads and load combinations acceptable for analysis and design of containment when exposed to the loading conditions associated with combustible gas. The

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principal combustible gas for the U.S. EPR is hydrogen. The U.S. EPR design does not include an inerting gas system. Containment maximum pressure is 75 psig based on pressure load time histories due to the hydrogen released by assuming 100 percent fuel-clad reaction with reactor coolant followed by hydrogen burning. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a minimum pressure of 45 psig combined with dead load (D) as a minimum design condition. U.S. EPR calculated maximum pressure is greater than the regulatory required minimum pressure. ANSYS computer code was used to perform a structural analysis of the RCB to calculate maximum liner strain. The elastic model of containment described in Section 3.8.1.4.1 is employed. The elements associated with the liner plate, containment wall, ring girder, dome, foundation, and RBIS foundation are isolated from the overall static model. Additionally, a nonlinear model created from a six- degree slice of the RCB liner, wall, ring girder, and dome, which implements axisymmetric boundary conditions, is also analyzed. This nonlinear model allows for concrete cracking and the tensile capability of the reinforcing bars. A separate analysis is performed to determine the effects of the pressure load on containment penetrations. These analyses consider dead loads, pre-stressing loads, and the internal pressure load from the hydrogen burn event, and considered degradation of material properties due to the higher temperature resulting from hydrogen burn. RCB liner strains calculated for the pressure time histories during this hydrogen burn are within strain limits described by RG 1.7 and ASME Code Section III, Division 2, Subarticle CC-3720.

Gaps are provided between the RCB and adjoining interior and exterior structures to accommodate deformation during pressurization and as a result of seismic movements.

Appendix 3E provides details of the design and reinforcement for the containment wall to foundation connection.

Appendix 3E provides details of the design and reinforcement for the containment cylinder wall and buttresses.

The following sections provide details of design and analysis of the RCB.

3.8.1.4.1 Computer Programs

The containment structure is included in an overall model developed for analysis of the NI Common Basemat Structure, which includes the RCB with the RB internal structures, the RSB, the SBs, the FB, and the NI Common Basemat Structure foundation basemat. The RCB is modeled and analyzed using the ANSYS computer program. ANSYS is a validated and verified, quality-controlled computer program that has been used for a number of years in the nuclear power industry. Refer to Chapter 17 for a description of the quality assurance program for the U.S. EPR design certification.

- RG 1.136, Revision 3 (exception described in 3.8.1.3).
- RG 1.193, Revision 1.
- RG 1.216, August 2010.

3.8.2.3 Loads and Load Combinations

The U.S. EPR standard plant design loads envelope includes the expected loads over a broad range of site conditions. Design loads and loading combinations for steel portions of the RCB that are not backed by concrete are described in the following sections (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). Section 3.8.1.3 addresses loads and loading combinations for design of the steel liner plate.

3.8.2.3.1 Design Loads

Steel portions of the RCB that are not backed by concrete are designed for the following loads:

The effects of missiles and external events such as hurricanes, tornados, aircraft hazards, and explosion pressure waves are not considered because the containment is protected from these effects by the RSB. RCB and RSB penetrations are protected by other Seismic Category I structures (i.e., Safeguards or FB).

Service Loads

- Normal loads – Normal loads are those loads encountered during normal plant operation and shutdown (GDC 4). This load category includes:
  - Dead loads (D) – Dead loads include the weight of the structure and any permanent equipment or material weights. Dead load effects also refer to internal moments and forces due to dead loads.
  - Live loads (L) – Live loads include any normal loads that vary with intensity or point of application, including moveable equipment. Live load effects also refer to internal moments and forces due to live loads. Live loads are applied, removed, varied from zero to full value, or shifted in location to obtain the worst-case loading conditions. Impact forces due to moving loads are applied as appropriate for the loading condition.
  - Thermal loads (T_o) – Thermal loads consist of thermally induced forces and moments resulting from normal plant operation and environmental conditions. These are described in Section 3.8.1.3.1.
  - Pipe reactions (R_o) – Pipe reactions are those loads applied by piping system supports during normal operating or shutdown conditions based on the critical transient or steady state conditions. The dead weight of the piping and its contents are included. Appropriate dynamic load factors are used when applying transient loads, such as water hammers.

- Pipe break missile impact loads (R_{rm}) – R_{rm} is defined as the missile impact equivalent static load on the structure generated by or during the postulated break, such as pipe whipping.

Other Loads

Other loads refer to postulated events or conditions that are not included in design basis (GDC 4). The loading conditions and effects are evaluated without regard to the bounding conditions under which SSC are required to perform design basis functions. This load category includes:

- Aircraft hazard (A) – Aircraft hazard refers to the loads on a structure resulting from the impact of an aircraft. The evaluation of this loading condition is considered as part of the plant safeguards and security measures. Aircraft hazard loads are not applicable to steel portions of the RCB because it is surrounded by other Seismic Category I structures that provide a shield.

- Explosion pressure wave (B) – Explosion pressure wave refers to the loads on a structure resulting from an explosion in the vicinity of the structure. The evaluation of this loading condition is considered as part of the plant safeguards and security measures. Explosion pressure wave loads are not applicable to steel portions of the RCB because it is surrounded by other Seismic Category I structures that provide a shield.

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- Combustible gas loads (P_g1 and P_g2) – Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (refer to Section 6.2.5). ~~inerted by carbon dioxide. RG 1.136, Regulatory Position C.5 provides acceptable loads and load combinations for use in reactor containment analysis and design of containments exposed to combustible gas loading conditions. U.S. EPR design does not include an inerting gas system. Hydrogen is the principal combustible gas considered in U.S. EPR design. The maximum containment pressure calculated for the U.S. EPR RCB is 75 psig. This pressure is taken from pressure load time histories of calculations that assume 100 percent fuel clad coolant reaction followed by burning the hydrogen released by this reaction. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a pressure of 45 psig combined with dead load (D) as a minimum design condition.~~

- Missile loads other than wind or tornado-generated missiles – Missile loads are not applicable to steel portions of the RCB resulting from activities of nearby military installations, turbine failures, or other causes. RCB and RSB penetrations are protected by other Seismic Category I structures (i.e., Safeguards or FBs).

3.8.2.3.2 Design Load Combinations

Loading combinations for steel items of the RCB that are not backed by concrete and are in accordance with Subsection NE of the ASME Code, Section III, Division 1, as augmented by the applicable provisions of RG 1.57 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50).

Level D Service Limits

These service limit load combinations include other applicable service limits and dynamic loads for which containment function is required (GDC 2, GDC 4, and GDC 50).

$$P^* = D + L + T_a + R_a + P_a + R_{rr} + R_{rj} + R_{rm} + E'$$

$$P^* = D + L + F_a + E.$$

3.8.2.4 Design and Analysis Procedures

The steel items described in Section 3.8.2.1 are designed and analyzed in accordance with Article NE-3000 of Subsection NE of the ASME Code, Section III, Division 1, and as augmented by the applicable provisions of RG 1.57 (GDC 1 and GDC 16).

Containment penetrations, or portions thereof, within the jurisdictional boundaries defined by ASME Code, Section III, Division 1, Subsection NE do not exceed the stress intensity limits defined by Articles NE-3221.1, NE-3221.2, NE-3221.3, and NE- 3221.4 of the ASME BPV Code. The stresses induced by the concrete displacements on ASME Subsection NE, Class MC components are displacement limited and hence secondary in nature. Therefore, the qualification of the design for primary stress criteria does not consider the effects of concrete displacement. The concrete displacements are non-cyclical. Therefore, ratcheting and fatigue failure of the penetrations due to concrete displacements are not evaluated. The concrete displacements are considered for the qualification of the ASME Subsection CC sleeve components. ~~Code class shell components are evaluated for buckling under earthquake, thermal, and pressure loads. The method of analysis involves performing a linear buckling analysis using the Eigen value method to predict the theoretical buckling load, a non-linear buckling analysis considering large deflections and plasticity of the material to obtain a buckling pressure, and hand calculations per ASME Section III, Subsection NE-3133 to obtain a maximum allowable pressure. The calculated pressure is compared to 1/3 of the buckling pressure, and the smaller value is conservatively used as the allowable buckling pressure.~~

~~Simple geometries, e.g., piping penetrations, are qualified in accordance with NE-3133 or ASME Code Case N-284-1. The calculated stresses are compared to the allowable buckling limits for the particular design condition, e.g., design, testing, and Service Level A, B, C, D. More complex geometries (e.g., air locks) are analyzed using rigorous finite element buckling analyses.~~

Buckling analyses are performed for the equipment hatch, airlocks, construction opening, and high energy piping penetrations (main steam and feedwater). The equipment hatch was qualified in accordance with NE-3222 and Code Case N-284-1. The airlocks were qualified in accordance with NE-3222. The construction opening is

geometric imperfections in the airlock hatch assembly were conservatively simulated in the model based on the tolerances of the assembly.

In the analysis, the steel liner and ring plate were fixed while constant increments of pressure were applied on the external surface. The full magnitude of the other loads, such as seismic, dead weight, and live, was applied at the first load step. This is conservative since the application of a full magnitude of non-symmetric loads results in a lower critical buckling stress value. The applied pressure was increased until the solution began to diverge. At this point, the analysis was stopped and the critical buckling stress was considered to have been reached.

The maximum allowable buckling stress for design and Levels A and B service limits was determined as one-third the value of the critical buckling stress per NE-3222.1(a). In accordance with NE-3222.2, the allowable limits for Level C and D service limits are 120 percent and 150 percent of the value given in NE-3222.1, respectively. The applied pressure in each load condition was compared to the allowable limit to verify that the criterion was met.

Construction Opening

Due to the simple geometry, the buckling analysis for the construction opening was performed in accordance with NE-3133, and an evaluation according to code Case N-284-1 is not required.

Main Steam Line and Feedwater Line Penetration

Buckling is not a failure mechanism for the main steam and feedwater line penetrations. These penetrations were analyzed using classical analysis where the slenderness ratio (KL/r) must be large enough for buckling to occur. For short columns (or piers) with a KL/r less than 89 (structural steel), the columns will reach yield before buckling occurs. The main steam line (MSL) and feedwater line penetrations are defined as short columns (or piers). The calculated slenderness ratio is below 89, and therefore buckling will not occur.

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Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (refer to Section 6.2.5). Combustible gas loads are evaluated according to the requirements of RG 1.216 and RG 1.136. RG 1.136, Regulatory Position C.5 provides acceptable loads and load combinations for use in reactor containment analysis and design of containments exposed to combustible gas loading conditions. U.S. EPR design does not include an inerting gas system. Hydrogen is the principal combustible gas considered in U.S. EPR design. The maximum containment pressure calculated for the U.S. EPR RCB is 75 psig. This pressure is taken from pressure load time histories of calculations that assume 100 percent fuel clad-coolant reaction followed by burning the hydrogen released by this reaction. RG 1.136,

Regulatory Position C.5 and RG 1.7 specify a pressure of 45 psig combined with dead load (D) as a minimum design condition.

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Evaluation of the containment penetrations use 3–D finite element modeling techniques (ANSYS) using loads and load combinations discussed in Sections 3.8.2.3.1 and 3.8.2.3.2, respectively.

Code class MC components are screened for cyclic service analysis according to the criteria in Article NE-3221.5 of the ASME Code.

Refer to Section 3.5.3 for a description of requirements for missile barrier design and ductility requirements applicable to the design of steel portions of the RCB.

The following sections provide individual descriptions of the design and analysis procedures performed to verify the structural integrity of the steel items. Section 3.8.1 addresses the design and analysis procedures used to qualify the RCB concrete structure for openings provided through the containment pressure boundary for these items. Containment ultimate capacity analysis results are described in Section 3.8.1.4.11, which includes evaluation of major containment steel penetrations.

3.8.2.4.1 Equipment Hatch, Dedicated Spare Penetration, Airlocks, and Construction Opening

The equipment hatch described in Section 3.8.2.1.1 is supported entirely by the concrete shell of the RCB. The sleeve of the equipment hatch is embedded in the concrete containment shell and welded at the periphery to the liner plate. Expansion joints, located in the annulus, allow for differential movement and minimize load transfer between the RCB and RSB walls. The expansion joints maintain the pressure boundary for the annulus ventilation system. The liner plate is thickened in the vicinity of the equipment hatch penetration. The equipment hatch cover is dished and stiffened by a reinforcing ring where it interfaces with the sleeve of the equipment hatch.

The 36-inch diameter dedicated containment spare penetration for containment filtered pressure release is shown in Figure 3.8-119. The portions of the penetration that fall under the jurisdiction of ASME BPV, Subsection NE are bounded by the construction opening closure. The spare penetration has the same cap thickness, but smaller opening size compared to the construction opening closure. Therefore, the stresses in the NE portions of the spare penetration are bounded by the stresses calculated for the construction closure opening. The portions of the penetration that fall under the jurisdiction of ASME BPV, Subsection CC are bounded by the main steam line penetration. The spare penetration is located at a similar elevation, has the same thickness, but smaller opening size compared to the main steam line penetration. Therefore, the strains induced in the CC portions of the spare penetration are bounded by the strains calculated for the main steam line.