ArevaEPRDCPEm Resource

From: DUNCAN Leslie E (AREVA NP INC) [Leslie.Duncan@areva.com]
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
Attachments: RAI 155 Supplement 7 Response US EPR DC.pdf

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
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AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
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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

ronda.pederson@areva.com

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AREVA NP Inc.
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3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

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,

Ronda Pederson
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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.

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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,

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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: 1111

Mail Envelope Properties (F322AA625A7A7443A9C390B0567503A101882064)

Subject: Response to U.S. EPR Design Certification Application RAI No. 155, FSAR Ch 3, Supplement 7
Sent Date: 1/28/2010 7:39:36 PM
Received Date: 1/28/2010 7:39:41 PM
From: DUNCAN Leslie E (AREVA NP INC)

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Files	**Size**	**Date & Time**
MESSAGE	32363	1/28/2010 7:39:41 PM
RAI 155 Supplement 7 Response US EPR DC.pdf	111658	

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

Response to

Request for Additional Information No. 155, Supplement 7

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 03.08.01-20:

FSAR Section 3E.1 describes the three critical sections relating to the RCB which are the wall to foundation connection, equipment hatch area, and typical cylinder wall and buttress. AREVA is requested to include the dome, ring girder (thickened section of concrete at the top perimeter of the cylindrical containment wall where it transitions into the spherical dome), and the temporary construction opening as critical sections. Unless there is sufficient technical basis for excluding these locations, they should be included as critical sections for analysis and design.

Response to Question 03.08.01-20:

A three-tier critical section selection methodology has been developed and implemented for selection of U.S. EPR Seismic Category I structure critical sections, as discussed with the NRC staff in a series of audits and meetings during 2009.

This critical section selection methodology was used to produce a set of critical sections, which are listed in Table 03.08.01-20-1. Critical sections selected by application of this methodology include the dome and dome ring girder areas but not the temporary construction opening. Critical sections featuring major Reactor Containment Building (RCB) penetrations (i.e., equipment hatch opening, typical airlock, main steam, and feedwater penetrations) are included and provide bounding representation of the behavior of RCB penetrations that are not identified as critical sections, including the temporary construction opening.

A revised U.S. EPR FSAR Tier 2, Appendix 3E with results of critical section design and with descriptions of applicable loadings, analysis, modeling techniques, and design methods will be provided with the Response to RAI 155 Question 03.08.04-6.

Critical Sections for Safety-Related Structures

This section describes critical section selection criteria for U.S. EPR Seismic Category I structures and presents design criteria and analysis results for determining adequate safety of the U.S. EPR design.

This section discusses the Nuclear Island (NI) Common Basemat Structures, Emergency Power Generating Buildings (EPGBs), and Essential Service Water Buildings (ESWBs).

For these safety-related structures, this description provides:

- Critical section selection criteria.
- Critical section listing.
- Critical section description.
- Critical section design criteria.
- Critical section analysis and results.

U.S. EPR critical sections are listed in Table 03.08.01-20-1.

Critical Section Selection Criteria

Critical sections are those portions of individual Seismic Category I structures (i.e., shear walls, floor slabs and roofs, structure-to-structure connections) that are particularly important for prevention or mitigation of consequences of postulated design basis accidents, are expected to experience the largest structural demands during design basis conditions, or are needed for safety evaluation of an essentially complete design.

Some selected critical sections may also be typical of other portions of the structure, where the portions they typify are not identified as critical sections due to their strong similarities with the selected critical sections. Once detailed design of critical sections is complete, the design for that structure is essentially complete for safety evaluation purposes. Critical sections are analytically representative of an essentially complete U.S. EPR design, and their structural design adequacy provides reasonable assurance of overall U.S. EPR structural design adequacy.

U.S. EPR critical section selection is characterized by a three-tier process that includes qualitative, quantitative, and supplementary methodologies to reasonably assure completeness and consistency across each structure. A description of each methodology is discussed in this response.

Qualitative Methodology

The qualitative methodology is applied to portions of the U.S. EPR NI Common Basemat Structures that are credited in the risk mitigation of the nuclear power plant under design basis loading conditions to provide protection of public safety through the physical plant boundaries. Due to a safety-critical role, some of the U.S. EPR NI Common Basemat Structures are required to achieve major performance requirements for functions whose failures could degrade system or equipment performance of the U.S. EPR or pose a safety hazard to plant personnel or to the general public. In this regard, they are considered critical structures or critical sections. Recognizing unique engineered features in each of the structures can be further broken into portions (e.g., cylindrical walls, liner plates, dome, and dome ring areas of the RCB) that are defined as critical sections.

Quantitative Methodology

ANSYS, V 10.0 SP1, is used to create a finite element analysis model of the U.S. EPR NI Common Basemat Structures. This model incorporates numerous finite element types to represent the NI geometry.

The quantitative methodology identifies critical sections by analysis of force and moment results extracted from portions of the global static model not already defined as critical sections by the qualitative methodology. Element forces and moments are extracted from the finite element model (FEM) and sorted for each force or moment type using a series of ANSYS macros to identify elements that have maximum and minimum force demand (minimum being the largest negative forces and moments). The quantitative selection methodology identifies critical sections as follows:

- Specific NI Common Basemat Structures to be reviewed are identified.
- Controlling load combinations are identified.

- Element forces and moments per unit length (i.e., T_X, T_Y, T_{XY}, M_X, M_Y, M_{XY}, N_X, and N_Y), along with element centroids in the global Cartesian coordinate system, are obtained from the specified load combinations for all elements in the applicable buildings.
- The elements for walls and slabs are sorted in ascending order by force and moment type.
- For each load combination, elements with the maximum and minimum force demands are identified for walls and slabs. This process is repeated for the selected load combinations and results are combined to produce a subset of potential critical elements.
- The subset of potential critical elements is further refined by eliminating duplicate elements for each element type. The final subset contains only unique controlling critical elements.
- Critical element locations are plotted at their respective elevations for each building. XY scatter plots of controlling critical elements are produced for each elevation containing critical elements and are generated at 10 percent intervals from 100 percent of unique critical elements down to 10 percent. As the percentage of the critical elements with highest forces and moments plotted is decreased, limiting critical elements become apparent. Final identification of critical sections is performed based on the maximum value of load type and frequency.

Supplementary Methodology

In addition to the critical sections identified by the qualitative and quantitative methodologies, there are other portions or sections of the plant that may be safety-related but are not explicitly modeled and considered in the U.S. EPR static finite element model. Seismic Category I structures that perform safety-related functions are reviewed to determine which structural sections are not otherwise selected by either the quantitative or qualitative method. Once these sections are determined, engineering judgment is applied to assess whether they should be identified as critical sections. Critical sections selected using this method are supplementary critical sections.

Supplementary critical sections also include sections that constitute significant portions of the Seismic Category I structures in terms of their physical dimensions (i.e., wall and slab areas). Although these sections are not subject to the limiting structural demands of quantitatively-defined critical sections and can be considered less critical, they are necessary to represent an essentially complete design of each structure and provide reasonable assurance of U.S. EPR design adequacy. This is a significant consideration because quantitatively-determined critical sections represent only those portions of a structure that experience high loads or stress and may not identify intervening structural elements that are not subject to high stress or loading but are needed for evaluating structural functionality.

Because potential supplementary critical sections exist throughout the U.S. EPR design, spatial distribution and significant structural discontinuities are also important factors in supplementary critical sections selection.

NI Structures

Description of NI Structures

Critical sections presented in this section are structures supported on the NI Common Basemat. This includes the RCB containing the Reactor Building Internal Structures (RBIS); Fuel Building (FB); Safeguard Buildings (SBs) 1, 2, 3, and 4; and the Reactor Shield Building (RSB).

The RCB is located inside the reinforced concrete RSB and is separated by an annular space to protect against interaction of the two structures during postulated design basis loading conditions.

The RBIS consists of concrete walls and floors, steel framing members, and other concrete and steel structural elements that are located inside of the RCB.

The RSB completely encloses the RCB and is connected to the external walls of SB 2 and SB 3 and the FB.

There are four SBs located around and immediately adjacent to the RSB. SB 2 and SB 3 are located inside a single shield building that protects them against beyond design basis accidents.

The FB is located on the side of the RSB opposite SB 2 and SB 3. The FB is protected against external events such as aircraft hazard by thickened exterior walls and roof.

U.S. EPR FSAR Tier 2, Section 3.8.5.1.1 describes the NI Common Basemat. The NI basemat is a cruciform-shaped, heavily-reinforced concrete slab that supports the NI Common Basemat Structures.

Description of NI Critical Sections

Critical sections within the NI Common Basemat Structures are chosen using the three-tier methodology.

Critical sections identified by the qualitative methodology are:

- RCB – typical liner plate.
- RCB – typical cylinder wall and buttress.
- RCB – typical dome and dome ring areas.
- RCB – typical connection of containment wall to NI basemat.
- RCB – equipment hatch area.
- RBIS – typical primary shield wall/reactor vessel support area.
- NI basemat and RBISs baseslab.
- FB internal structures – typical spent fuel pool walls and floor slab.
- RCB – typical airlock and MS/FW penetrations.
- FB Internal Structures – fuel transfer tube.

Critical sections identified by the quantitative methodology are:

- RBIS – typical operating floor slab area.
- RBIS – typical elevation +4 feet, 11 1/16 inches heavy slab and support walls.
- RBIS – typical steam generator (SG) cubicle area walls.
- SB 2/3 hardened shell – typical walls from top of NI basemat to grade.
- SB 2/3 internal structures – typical exterior walls from top of NI basemat to grade.
- SB 2/3 internal structures – typical floor slab at elevation 0 feet, 0 inches.
- SBs 1 and 4 – typical main steam and feedwater valve room walls and slabs.
- SBs 1 and 4 – typical exterior walls from top of NI basemat to grade.
- FB hardened shell – typical walls from top of NI basemat to grade.
- FB internal structures – typical major walls from top of NI basemat to elevation +3 feet, 3 3/8 inches.
- FB internal structures – typical spent fuel pool walls and floor slab.
- RSB – typical wall areas and connection between RSB wall and SB/FB roof slabs.
- RSB – typical dome-to-wall transition areas.

Note that spent fuel pool walls and slab were identified as critical sections by both the qualitative and quantitative methodologies.

Critical sections identified by the supplementary methodology are:

- SB 2/3 internal structures – typical floor slab at elevation -16 feet, 4 13/16 inches.
- FB internal structures – typical floor slab at elevation -20 feet, 4 1/16 inches.
- SB 2/3 internal structures – typical 0 feet, 11 13/16 inches thick shear wall next to RSB.
- NI – typical columns and beams.

Design Criteria for NI Critical Sections

U.S. EPR FSAR Tier 2, Sections 3.8.1.2, 3.8.2.2, 3.8.3.2, 3.8.4.2, and 3.8.5.2 describe codes, standards, and specifications for use in the design of the RCB (concrete), RCB (steel), RBIS, Seismic Category I structures other than the RCB, RBIS, and NI basemat, respectively.

Analysis for NI Critical Sections

To determine forces and moments throughout these structures, a global ANSYS FEM (U.S. EPR FSAR Tier 2, Sections 3.8.1.4.1, 3.8.3.4.1, 3.8.4.4.2, and 3.8.5.4.2) was developed and solved using independent loads and load combinations as prescribed by applicable codes and standards. U.S. EPR FSAR Tier 2, Sections 3.8.1.3, 3.8.2.3, 3.8.3.3, 3.8.4.3, and 3.8.5.3 describe independent loads and load combinations for use in the design of the NI Common Basemat Structures.

Independent loads considered in the ANSYS FEM are shown in U.S. EPR FSAR Tier 2, Table 3E.1-1. These loads are applied to the global ANSYS FEM to analyze and evaluate the overall structural response of the NI Common Basemat Structures. These analyses are described in U.S. EPR FSAR Tier 2, Sections 3.8.1.4, 3.8.2.4, 3.8.3.4, 3.8.4.4, and 3.8.5.4. Additional independent loads that are not considered in the global ANSYS FEM are shown in U.S. EPR FSAR Tier 2, Table 3E.1-2 and described in U.S. EPR FSAR Tier 2, Sections 3.8.1.3, 3.8.2.3, 3.8.3.3, 3.8.4.3, and 3.8.5.3. These loads will be independently considered and added during the design process.

Global ANSYS analysis results provide element forces and moments in accordance with U.S. EPR FSAR Tier 2, Figure 3E.1-1—ANSYS Analysis Results for Nuclear Island Elements. Forces and moments shown in U.S. EPR FSAR Tier 2, Figure 3E.1-1 are:

T_x = axial or membrane load in x-direction (kips/foot).

T_y = axial or membrane load in y-direction (kips/foot).

T_{xy} = in-plane shear load (kips/foot).

N_x = out-of-plane shear load along y-axis of element (kips/foot).

N_y = out-of-plane shear load along x-axis of element (kips/foot).

M_x = bending moment about y-axis through element (kip-feet/foot).

M_y = bending moment about x-axis through element (kip-feet/foot).

M_{xy}= twisting moment (kip-feet/foot).

EPGB

Description of EPGB

The U.S. EPR design provides two EPGB adjacent to the NI Common Basemat Structures and the ESWB.

U.S. EPR FSAR Tier 2, Section 3.8.4.1.4 provides EPGB general descriptions, including descriptions of functional equipment at each floor level.

EPGB lateral load resisting elements are primarily exterior and interior reinforced concrete shear walls and a reinforced concrete mat foundation situated at grade. The basemat, elevated concrete slabs, and steel framed platforms consist of the structural elements described in U.S. EPR FSAR Tier 2, Sections 3.8.4.1.4 and 3.8.5.1.2.

Description of EPGB Critical Sections

EPGB critical sections are selected using the supplementary selection methodology. This methodology requires that the structural components of the major lateral load path and the gravity load path for the EPGB are sufficiently represented by selected critical sections to verify that they act together to represent an essentially complete design. EPGB critical sections are

those portions of the structures selected by engineering judgment that are typical of the remaining portions of the EPGB and serve as lateral and gravity loading resisting elements. This approach is acceptable because the EPGB has a predominantly symmetrical, minimally complex geometry with evenly distributed loading as compared to the NI Common Basemat Structures.

EPGB critical sections are:

- EPGB – basemat foundation at elevation 0 ft.–0 in.
- EPGB – shear wall on column line 11.
- EPGB – reinforced concrete slab and composite beams at elevation 51 ft.–6 in.
- EPGB – shear wall on column line C.
- EPGB – shear wall on column line E.

Design Criteria for EPGB Critical Sections

U.S. EPR FSAR Tier 2, Sections 3.8.4.2 and 3.8.5.2 describe applicable codes, standards, and specifications for use in the design of EPGB reinforced concrete and structural steel components (including composite beams).

Analysis for EPGB Critical Sections

For the EPGB and other buildings outside the NI Common Basemat, GT STRUDL is used to develop individual FEM that include structure-to-structure effects from the NI.

Soil-structure interaction (SSI) analysis by the Bechtel Code SASSI 2000 (v. 3.1) is used to determine enveloping structural response accelerations for development of equivalent static SSE loads for the GT STRUDL FEM.

U.S. EPR FSAR Tier 2, Sections 3.8.4.4.3 and 3.8.5.4.3 describe the use of GT STRUDL in EPGB critical section design. Design forces and moments are extracted from GT STRUDL analyses for use in the design of EPGB basemat and superstructure components.

U.S. EPR FSAR Tier 2, Figure 3E.2-1—Finite Element Planar Reference Frame Systems provides the planar reference system for the GT STRUDL finite element analysis output. U.S. EPR FSAR Tier 2, Figure 3E.2-1, “Plant Bending” shows the positive direction of the finite element bending moments M_{xx}, M_{yy} and M_{xy} and out-of-plane shear forces V_{xx} and V_{yy}. U.S. EPR FSAR Tier 2, Figure 3E.2-1, “Plane Stress/Strain” shows that the positive direction of the finite element in-plane forces N_{xx}, N_{yy} and N_{xy} are the same as the positive orientation of the plane stresses S_{xx}, S_{yy} and S_{xy}.

U.S. EPR FSAR Tier 2, Sections 3.8.4.3.1 and 3.8.5.3 describe applicable independent loads for use in the EPGB critical section design. U.S. EPR FSAR Tier 2, Sections 3.8.4.3.2 and 3.8.5.3 describe applicable load combinations for use in the EPGB critical section design, and U.S. EPR FSAR Tier 2, Table 3.7.1-6 lists applicable soil cases.

ESWB

Description of ESWB

The U.S. EPR design includes four ESWB adjacent to the NI Common Basemat Structures and the EPGB.

U.S. EPR FSAR Tier 2, Section 3.8.4.1.5 provides ESWB general descriptions, including descriptions of functional equipment at each floor level.

ESWB lateral load resisting elements are interior and exterior reinforced concrete shear walls and a concrete basemat foundation situated at 22 ft – 0 in below grade. The structural elements pertaining to the ESWB are described in U.S. EPR FSAR Tier 2, Sections 3.8.4.1.5 and 3.8.5.1.3.

Description of ESWB Critical Sections

ESWB critical sections are selected using the supplementary selection methodology. This methodology requires that the structural components of the major lateral load path and the gravity load path for the ESWB are sufficiently represented by the selected critical sections to verify that they act together to represent an essentially complete design. Accordingly, ESWB critical sections are those portions of the structures selected by engineering judgment that are typical of the remaining portions of the ESWB and deemed to serve as major lateral and gravity loading resisting elements. This approach is acceptable because the ESWB has a predominantly symmetrical, minimally complex geometry with evenly distributed loading as compared to the NI Common Basemat Structures.

ESWB critical sections are:

- ESWB – basemat foundation at elevation -16 ft – 0 in.
- ESWB – shear wall at column line 4.
- ESWB – fan deck slab at elevation 63 ft – 0 in.
- ESWB – shear wall on column line D.

Design Criteria for ESWB Critical Sections

U.S. EPR FSAR Tier 2, Sections 3.8.4.2 and 3.8.5.2 describe applicable codes, standards, and specifications for use in the ESWB critical section design.

Analysis for ESWB Critical Sections

For the ESWB and other buildings outside the NI Common Basemat, GT STRUDL is used to develop individual FEM that include structure-to-structure effects from the NI.

SSI analysis by the Bechtel Code SASSI 2000 (v. 3.1) is used to determine enveloping structural response accelerations for development of equivalent static SSE loads for the GT STRUDL FEM.

U.S. EPR FSAR Tier 2, Sections 3.8.4.4.4 and 3.8.5.4.4 describe the use of GT STRUDL in ESWB critical section design. Design forces and moments are extracted from GT STRUDL analyses for use in the design of basemat foundation and superstructure components.

U.S. EPR FSAR Tier 2, Figure 3E.3-1 provides the planar reference system for the GT STRUDL finite element analysis output. U.S. EPR FSAR Tier 2, Figure 3E.2-1, “Plant Bending” shows the positive direction of the finite element bending moments M_{xx}, M_{yy} and M_{xy} and out-of-plane shear forces V_{xx} and V_{yy}. U.S. EPR FSAR Tier 2, Figure 3E.2-1, “Plane Stress/Strain” shows that the positive direction of the finite element in-plane forces N_{xx}, N_{yy} and N_{xy} are the same as the positive orientation of the plane stresses S_{xx}, S_{yy} and S_{xy}.

U.S. EPR FSAR Tier 2, Sections 3.8.4.3.1 and 3.8.5.3 describe applicable independent loads for use in the ESWB critical section design. U.S. EPR FSAR Tier 2, Sections 3.8.4.3.2 and 3.8.5.3 describe applicable load combinations for use in the ESWB design, and U.S. EPR FSAR Tier 2, Table 3.7.1-6 lists applicable soil cases.

Table 03.08.01-20-1—U.S. EPR Critical Sections

Section	Description of Critical Section
NI 1	Reactor Containment Building – Typical Liner Plate
NI 2	Reactor Containment Building – Typical Cylinder Wall and Buttress
NI 3	Reactor Containment Building – Typical Dome and Dome Ring Areas
NI 4	Reactor Containment Building – Typical Connection of Containment Wall to Nuclear Island Basemat
NI 5	Reactor Containment Building – Equipment Hatch Area
NI 6	Reactor Building Internal Structures – Typical Primary Shield Wall / Reactor Vessel Support Area
NI 7	Nuclear Island Basemat & Reactor Building Internal Structures Baseslab
NI 8	Reactor Building Internal Structures – Typical Operating Floor Slab Area
NI 9	Reactor Building Internal Structures – Typical Elevation +1.5m Heavy Slab & Support Walls
NI 10	Reactor Building Internal Structures – Typical SG Cubicle Area Walls
NI 11	Safeguard Building 2/3 Hardened Shell – Typical Walls from Top of Nuclear Island Basemat to Grade
NI 12	Safeguard Building 2/3 Internal Structures – Typical Exterior Walls from Top of Nuclear Island Basemat to Grade
NI 13	Safeguard Building 2/3 Internal Structures – Typical Floor Slab at Elevation 0.00m
NI 14	Safeguard Buildings 1 & 4 – Typical Main Steam and Feedwater Valve Room Walls and Slabs
NI 15	Safeguard Buildings 1 & 4 – Typical Exterior Walls from Top of Nuclear Island Basemat to Grade
NI 16	Fuel Building Hardened Shell – Typical Walls from Top of Nuclear Island Basemat to Grade
NI 17	Fuel Building Internal Structures – Typical Major Walls from Top of Nuclear Island Basemat to +1.0m
NI 18	Fuel Building Internal Structures – Typical Spent Fuel Pool Walls and Floor Slab
NI 19	Reactor Shield Building Typical Wall Areas & Connection Between Reactor Shield Building Wall and Safeguard / Fuel Building Roof Slabs
NI 20	Reactor Shield Building – Typical Dome to Wall Transition Areas
NI 21	Safeguard Building 2/3 Internal Structures – Typical Floor Slab at Elevation -5.00m
NI 22	Fuel Building Internal Structures – Typical Floor Slab at Elevation -6.20m
NI 23	Safeguard Building 2/3 Internal Structures – Typical 0.30m Thick Shear Wall Next to RSB
NI 24	Nuclear Island Typical Columns and Beams
NI 25	Reactor Containment Building – Typical Airlock and MS/FW Penetrations
NI 26	Fuel Building Internal Structures – Fuel Transfer Tube
EPGB 1	Emergency Power Generating Building – Basemat Foundation at Elevation 0’–0”
EPGB 2	Emergency Power Generating Building – Shear Wall on Column Line 11
EPGB 3	Emergency Power Generating Building – Reinforced Concrete Slab and Composite Beams at Elevation 51’–6”
EPGB 4	Emergency Power Generating Building – Shear Wall on Column Line C
EPGB 5	Emergency Power Generating Building – Shear Wall on Column Line E
ESWB 1	Essential Service Water Building – Basemat Foundation at Elevation -16’–0”
ESWB 2	Essential Service Water Building – Shear Wall on Column Line 4
ESWB 3	Essential Service Water Building – Fan Deck Slab at Elevation 63’–0”
ESWB 4	Essential Service Water Building – Shear Wall on Column Line D

FSAR Impact:

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