ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, July 01, 2011 2:49 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); HALLINGER Pat (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); LENTZ Tony (EXTERNAL AREVA); SHARPE Robert (AREVA); PATTON Jeff (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Questions 16-311 & 16-313
Attachments: RAI 300 Response US EPR DC - Q 16-311 & 16-313 -DRAFT 6.pdf

Getachew,

Attached is a revised draft response for RAI 300, Questions 16-311 and 16-313 in advance of the July 20, 2011 final date. The changes to the previous response, which are based on NRC feedback, are shown in Track Change format.

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

Thanks,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: RYAN Tom (RS/NB)
Sent: Wednesday, June 15, 2011 9:26 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); LENTZ Tony (External RS/NB); WILLIFORD Dennis (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 13

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5, Supplement 6, and Supplement 7 responses to RAI No. 300 were sent on October 20, 2010, December 11, 2010, and January 26, 2011, respectively, to provide a revised schedule. Supplement 8 response to RAI No. 300 was sent on February 8, 2011, to provide a partial response to three of the remaining questions. Supplement 9 response to RAI No. 300 was sent on March 22, 2011 to provide a revised schedule. Supplement 10 response to RAI No. 300 was sent on April 15, 2011, to provide a partial response to thirteen of the remaining questions. Supplement 11 and Supplement 12 responses to RAI No. 300 were sent on April 21, 2011 and June 7, 2011, respectively, to provide a revised schedule.

The attached file, “RAI 300 Supplement 13 US EPR DC.pdf,” provides a partial response.

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 300.

The following table indicates the respective pages in the response document, “RAI 300 Supplement 13 US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 300 — 16-311, Part 16-150(a)	3	4
RAI 300 — 16-311, Part 16-153	5	5
RAI 300 — 16-311, Part 16-198	6	6
RAI 300 — 16-311, Part 16-204	7	11
RAI 300 — 16-313, Part 16-22	13	14
RAI 300 — 16-313, Part 16-26	15	16

The schedule for a technically correct and complete response to the remaining parts of the four questions remains unchanged and is provided below.

Question #	**Response Date**
RAI 300 — 16-311	July 20, 2011
RAI 300 — 16-312	July 20, 2011
RAI 300 — 16-313	July 20, 2011
RAI 300 — 16-315	July 20, 2011

Sincerely,

Tom Ryan for
Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, June 07, 2011 9:28 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 12

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5, Supplement 6, and Supplement 7 responses to RAI No. 300 were sent on October 20, 2010, December 11, 2010, and January 26, 2011, respectively, to provide a revised schedule. Supplement 8 response to RAI No. 300 was sent on February 8, 2011, to provide a partial response to three of the remaining questions. Supplement 9 response to RAI No. 300 was sent on March 22, 2011 to provide a revised schedule.

Supplement 10 response to RAI No. 300 was sent on April 15, 2011, to provide a partial response to three of the remaining questions. Supplement 11 response to RAI No. 300 was sent on April 21, 2011, to provide a revised schedule for the remaining four questions.

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

Question #	Response Date
RAI 300 — 16-311	July 20, 2011
RAI 300 — 16-312	July 20, 2011
RAI 300 — 16-313	July 20, 2011
RAI 300 — 16-315	July 20, 2011

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, April 21, 2011 12:47 PM
To: Tesfaye, Getachew
Cc: LENTZ Tony (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. 300, FSAR Ch. 16 OPEN ITEM, Supplement 11

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5, Supplement 6, and Supplement 7 responses to RAI No. 300 were sent on October 20, 2010, December 11, 2010, and January 26, 2011, respectively, to provide a revised schedule. Supplement 8 response to RAI No. 300 was sent on February 8, 2011, to provide a partial response to three of the remaining questions. Supplement 9 response to RAI No. 300 was sent on March 22, 2011 to provide a revised schedule. Supplement 10 response to RAI No. 300 was sent on April 15, 2011, to provide a partial response to three of the remaining questions.

Additional time is required to interact with the NRC staff.

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

Question #	Response Date
RAI 300 — 16-311	June 7, 2011
RAI 300 — 16-312	June 7, 2011
RAI 300 — 16-313	June 7, 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: WELLS Russell (RS/NB)
Sent: Friday, April 15, 2011 7:24 AM
To: 'Tesfaye, Getachew'
Cc: LENTZ Tony (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. 300, FSAR Ch. 16 OPEN ITEM, Supplement 10

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5, Supplement 6, and Supplement 7 responses to RAI No. 300 were sent on October 20, 2010, December 11, 2010, and January 26, 2011, respectively, to provide a revised schedule. Supplement 8 response to RAI No. 300 was sent on February 8, 2011, to provide a partial response to three of the remaining questions. Supplement 9 response to RAI No. 300 was sent on March 22, 2011 to provide a revised schedule.

The attached file, “RAI 300 Supplement 10 US EPR DC.pdf,” provides a partial response to 3 of the 4 questions.

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 300 Questions 16-311 and 16-313.

The following table indicates the respective pages in the response document, “RAI 300 Supplement 10 US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 300 — 16-311, Part 16-145(a)	2	3
RAI 300 — 16-311, Part 16-145(c)	4	4
RAI 300 — 16-311, Part 16-145(d)	5	6
RAI 300 — 16-311, Part 16-149(a)	7	9
RAI 300 — 16-311, Part 16-149(b)	10	10
RAI 300 — 16-311, Part 16-166	11	11
RAI 300 — 16-311, Part 16-190(f)	12	12
RAI 300 — 16-311, Part 16-209	13	13

Question #	Start Page	End Page
RAI 300 — 16-312, Part 16-213	14	16
RAI 300 — 16-313, Part 16-11	17	19
RAI 300 — 16-313, Part 16-23(a)	20	21
RAI 300 — 16-313, Part 16-29(b)	22	22
RAI 300 — 16-313, Part 16-53	23	25

The schedule for a technically correct and complete response to the remaining parts of the four questions remains unchanged and is provided below.

Question #	**Response Date**
RAI 300 — 16-311	April 26, 2011
RAI 300 — 16-312	April 26, 2011
RAI 300 — 16-313	April 26, 2011
RAI 300 — 16-315	April 26, 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: WELLS Russell (RS/NB)
Sent: Tuesday, March 22, 2011 1:02 PM
To: Tesfaye, Getachew
Cc: 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. 300, FSAR Ch. 16 OPEN ITEM, Supplement 9

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5 response to RAI No. 300 was sent on October 20, 2010, to provide a revised schedule. Supplement 6 response to RAI No. 300 was sent on December 11, 2010, to provide a revised schedule. Supplement 7 response to RAI No. 300 was sent on January 26, 2011, to provide a revised schedule. Supplement 8 response to RAI No. 300 was sent on February 8, 2011, to provide a partial response to three of the remaining questions.

A revised schedule is provided below to allow additional time to address comments and have additional interaction with the staff on the remaining parts of the four questions.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	Response Date
RAI 300 - 16 — 311	April 26, 2011
RAI 300 - 16 — 312	April 26, 2011
RAI 300 - 16 — 313	April 26, 2011
RAI 300 - 16 — 315	April 26, 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: Tuesday, February 08, 2011 3:22 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB); LENTZ Tony (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 8

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5, Supplement 6, and Supplement 7 responses to RAI No. 300 were sent on October 20, 2010, December 11, 2010, and January 26, 2011, respectively, to provide a revised schedule.

The attached file, "RAI 300 Supplement 8 US EPR DC.pdf," provides a partial response.

The following table indicates the respective pages in the response document, "RAI 300 Supplement 8 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 300 — 16-311, Part 16-129(c)	3	3
RAI 300 — 16-311, Part 16-131(a)	4	4

Question #	Start Page	End Page
RAI 300 — 16-311, Part 16-131(b)	5	5
RAI 300 — 16-311, Part 16-131(c)	6	6
RAI 300 — 16-311, Part 16-141(a)	7	7
RAI 300 — 16-311, Part 16-145(b)	8	8
RAI 300 — 16-311, Part 16-147(a)	9	9
RAI 300 — 16-311, Part 16-149(a)	10	12
RAI 300 — 16-311, Part 16-150(b)	13	13
RAI 300 — 16-311, Part 16-150(c)	14	14
RAI 300 — 16-311, Part 16-151	15	15
RAI 300 — 16-311, Part 16-154	16	17
RAI 300 — 16-311, Part 16-162(a)	18	18
RAI 300 — 16-311, Part 16-162(b)	19	19
RAI 300 — 16-311, Part 16-167	20	20
RAI 300 — 16-311, Part 16-169(b)	21	21
RAI 300 — 16-311, Part 16-174(a)	22	22
RAI 300 — 16-311, Part 16-180(b)	23	23
RAI 300 — 16-311, Part 16-182(a)	24	24
RAI 300 — 16-311, Part 16-182(c)	25	25
RAI 300 — 16-311, Part 16-190(a)	26	26
RAI 300 — 16-311, Part 16-190(b)	27	27
RAI 300 — 16-311, Part 16-190(d)	28	28
RAI 300 — 16-311, Part 16-190(e)	29	29
RAI 300 — 16-311, Part 16-190(f)	30	30
RAI 300 — 16-311, Part 16-190(g)	31	31
RAI 300 — 16-311, Part 16-193(c)	32	32
RAI 300 — 16-311, Part 16-204	33	36
RAI 300 — 16-311, Part 16-205	37	39
RAI 300 — 16-311, Part 16-208	40	40
RAI 300 — 16-311, Part 16-209	41	42
RAI 300 — 16-312, Part 16-212(a)	43	44
RAI 300 — 16-312, Part 16-212(b)	45	45
RAI 300 — 16-312, Part 16-217(b)	46	46
RAI 300 — 16-312, Part 16-217(c)	47	47
RAI 300 — 16-312, Part 16-217(d)	48	48
RAI 300 — 16-312, Part 16-219	49	49
RAI 300 — 16-312, Part 16-226	50	50
RAI 300 — 16-312, Part 16-227	51	52
RAI 300 — 16-312, Part 16-234(b)	53	54
RAI 300 — 16-313, Part 16-23(b)	55	55
RAI 300 — 16-313, Part 16-27	56	56
RAI 300 — 16-313, Part 16-33	57	57
RAI 300 — 16-313, Part 16-36	58	58
RAI 300 — 16-313, Part 16-39	59	59
RAI 300 — 16-313, Part 16-40(a)	60	60
RAI 300 — 16-313, Part 16-40(b)	61	61
RAI 300 — 16-313, Part 16-42	62	62
RAI 300 — 16-313, Part 16-43	63	63
RAI 300 — 16-313, Part 16-49(a)	64	64

The schedule for a technically correct and complete response to the remaining parts of the four questions remains unchanged and will be provided by March 24, 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 (External RS/NB)
Sent: Wednesday, January 26, 2011 3:13 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 7

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5 response to RAI No. 300 was sent on October 20, 2010, to provide a revised schedule. Supplement 6 response to RAI No. 300 was sent on December 11, 2010, to provide a revised schedule.

A revised schedule is provided below to allow additional time to address comments and have additional interaction with the staff on the remaining parts of the four questions.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	**Response Date**
RAI 300 - 16 — 311	March 24, 2011
RAI 300 - 16 — 312	March 24, 2011
RAI 300 - 16 — 313	March 24, 2011
RAI 300 - 16 — 315	March 24, 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 (External RS/NB)
Sent: Saturday, December 11, 2010 9:13 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 6

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions. Supplement 5 response to RAI No. 300 was sent on October 20, 2010, to provide a revised schedule.

A revised schedule is provided below to allow additional time to address comments and have additional interaction with the staff on the remaining parts of the four questions.

Note that question 16-314 was shown as still outstanding in Supplement 4 and Supplement 5, but the responses sent in Supplement 4 completed the response to question 16-314, so it has been removed from the schedule below. Also note that the response to question 16-315 was not complete as reported in the initial response , so question 16-315 has been added back to the schedule below.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	Response Date
RAI 16 — 311	January 27, 2011
RAI 16 — 312	January 27, 2011
RAI 16 — 313	January 27, 2011
RAI 16 — 315	January 27, 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 (External RS/NB)
Sent: Wednesday, October 20, 2010 3:30 PM

To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 5

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule. Supplement 4 response to RAI No. 300 was sent on October 07, 2010, to provide a partial response to 29 parts of the remaining four questions.

A revised schedule is provided below to allow additional time to address comments and have additional interaction with the staff on the remaining parts of the four questions.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	Response Date
RAI 16 — 311	December 16, 2010
RAI 16 — 312	December 16, 2010
RAI 16 — 313	December 16, 2010
RAI 16 — 314	December 16, 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: BRYAN Martin (External RS/NB)
Sent: Thursday, October 07, 2010 10:55 AM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); LENTZ Tony (External RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 4

Getachew,

AREVA NP Inc. provided responses to the four questions of RAI No. 300 on March 26, 2010. Supplement 1, Supplement 2, and Supplement 3 responses to RAI No. 300 were sent on May 3, 2010, June 15, 2010, and August 27, 2010, respectively, to provide a revised schedule.

The attached file, "RAI 300 Supplement 4 US EPR DC.pdf," provides a partial response.

The following table indicates the respective pages in the response document, "RAI 300 Supplement 4 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 300 — 16-311, Part 16-129(b)	3	3
RAI 300 — 16-311, Part 16-130	4	4
RAI 300 — 16-311, Part 16-138(b)	5	5
RAI 300 — 16-311, Part 16-138(c)	6	6
RAI 300 — 16-311, Part 16-141(b)	7	7
RAI 300 — 16-311, Part 16-144	8	8
RAI 300 — 16-311, Part 16-147(b)	9	9
RAI 300 — 16-311, Part 16-147(c)	10	10
RAI 300 — 16-311, Part 16-147(d)	11	11
RAI 300 — 16-311, Part 16-147(e)	12	12
RAI 300 — 16-311, Part 16-150(d)	13	13
RAI 300 — 16-311, Part 16-162(c)	14	14
RAI 300 — 16-311, Part 16-169(a)	15	15
RAI 300 — 16-311, Part 16-174(b)	16	16
RAI 300 — 16-311, Part 16-185	17	17
RAI 300 — 16-311, Part 16-190(h)	18	18
RAI 300 — 16-311, Part 16-191(a)	19	19
RAI 300 — 16-311, Part 16-191(b)	20	20
RAI 300 — 16-311, Part 16-200	21	21
RAI 300 — 16-311, Part 16-207	22	23
RAI 300 — 16-312, Part 16-217(a)	25	25
RAI 300 — 16-312, Part 16-217(e)	26	26
RAI 300 — 16-312, Part 16-223	27	27
RAI 300 — 16-313, Part 16-18	29	29
RAI 300 — 16-313, Part 16-29(a)	30	30
RAI 300 — 16-313, Part 16-46	31	31
RAI 300 — 16-313, Part 16-49(b)	32	32
RAI 300 — 16-314, Part 16-237(a)	34	34
RAI 300 — 16-314, Part 16-237(b)	35	35

The schedule for a technically correct and complete response to the remaining parts of the four questions remains unchanged and will be provided on October 21, 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: BRYAN Martin (External RS/NB)
Sent: Friday, August 27, 2010 12:00 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 3

Getachew,

AREVA NP provided technically correct and complete responses to 2 of the 6 questions on March 26, 2010. In a meeting with the NRC on April 27-28, 2010, it was agreed that further interactions should take place prior to formal submittal of the remaining 4 RAI responses. AREVA provided an updated schedule for the remaining 4 responses on May 3, 2010. AREVA provided an updated schedule for the remaining 4 responses on June 15, 2010 to allow for additional interaction with the NRC.

A revised schedule is provided below to allow additional time to address comments and have additional interaction with the staff on the four remaining questions.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	**Response Date**
RAI 16 — 311	October 21, 2010
RAI 16 — 312	October 21, 2010
RAI 16 — 313	October 21, 2010
RAI 16 — 314	October 21, 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: BRYAN Martin (EXT)
Sent: Tuesday, June 15, 2010 2:32 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); RYAN Tom (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 2

Getachew,

AREVA NP provided technically correct and complete responses to 2 of the 6 questions on March 26, 2010. In a meeting with the NRC on April 27-28, 2010, it was agreed that further interactions should take place prior to formal submittal of the remaining 4 RAI responses. AREVA provided an updated schedule for the remaining 4 responses on May 3, 2010.

Based on the stated availability of the NRC staff, as well as preparation time for their input to these interactions, AREVA is providing a revised schedule below.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	**Response Date**
RAI 16 — 311	August 31, 2010
RAI 16 — 312	August 31, 2010
RAI 16 — 313	August 31, 2010
RAI 16 — 314	August 31, 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: BRYAN Martin (EXT)
Sent: Monday, May 03, 2010 5:55 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); PANNELL George L (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Supplement 1

Getachew,

AREVA NP provided technically correct and complete responses to 2 of the 6 questions on March 26, 2010. In a meeting with the NRC on April 27-28, 2010, it was agreed that further interactions should take place prior to formal submittal of the remaining 4 RAI responses. Based on the stated availability of the NRC staff, as well as preparation time for their input to these interactions, AREVA is providing a revised schedule below.

A complete answer is not provided for the remaining 4 questions. The schedule for a technically correct and complete response to these questions is changed and is provided below.

Question #	Response Date
RAI 16 — 311	June 24, 2010
RAI 16 — 312	June 24, 2010
RAI 16 — 313	June 24, 2010
RAI 16 — 314	June 24, 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: BRYAN Martin (EXT)
Sent: Friday, March 26, 2010 5:39 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); PANNELL George L (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information RAI 300. The attached file, "RAI 300 Response US EPR DC.pdf" provides technically correct and complete responses to 2 of the 6 questions.

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 16-310.

The following table indicates the respective pages in the response document, "RAI 300 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 16 — 310	2	3
RAI 16 — 311	4	9
RAI 16 — 312	10	11
RAI 16 — 313	12	16
RAI 16 — 314	17	17
RAI 16 — 315	18	23

A complete answer is not provided for 4 of the 6 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 16 — 311	May 3, 2010
RAI 16 — 312	May 3, 2010
RAI 16 — 313	May 3, 2010
RAI 16 — 314	May 3, 2010

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, November 19, 2009 5:49 PM
To: ZZ-DL-A-USEPR-DL
Cc: Le, Hien; DeMarshall, Joseph; Kowal, Mark; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 300 (3730,3742),FSAR Ch. 16 OPEN ITEM

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 23, 2009, and discussed with your staff on November 18, 2009. Draft RAI Question 16-311 was revised as a result of that discussion to request a revised response to RAI 16-199. The questions in this RAI are OPEN ITEMs in the safety evaluation report for Chapter 16 for Phases 2 and 3 reviews. As such, the schedule we have established for your application assumes technically correct and complete responses prior to the start of Phase 4 review. For any RAI that cannot be answered prior to the start of Phase 4 review, it is expected that a date for receipt of this information will be provided so that the staff can assess how this information will impact the published schedule.

Thanks,

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3189

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D47AF5A7)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 300, FSAR Ch. 16 OPEN ITEM, Questions 16-311 & 16-313
Sent Date: 7/1/2011 2:48:37 PM
Received Date: 7/1/2011 2:48:46 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
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Tracking Status: None

Post Office: auscharmx02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	32602	7/1/2011 2:48:46 PM
RAI 300 Response US EPR DC - Q 16-311 & 16-313 -DRAFT 6.pdf	623536	

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

Response to

Request for Additional Information No. 300 (3730, 3742), DRAFT 6

11/19/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 16 - Technical Specifications
Application Section: FSAR Chapter 16

QUESTIONS for Technical Specification Branch (CTSB)

Question 16-311:

Potential Open Item

Provide the additional information and update the following RAI responses for each of the Instrumentation System Tech Spec items identified, based on the results of Audit Meetings between AREVA NP and NRC Staff on 7/30/09, 7/31/09, 8/13/09 and 8/14/09.

Request for Additional Information No. 103 (1270)

Question 16-311

Followup to Question 16-147:

f) Pressurizer Pressure (NR) instrumentation mode applicability. Apparent inability of Pressurizer Pressure (NR) instrumentation (1615 – 2515 psia) to support Permissive P12 Operability in Mode 4 with P15 inhibited.

Response to Question 16-147(f):

This issue was further clarified on Page 16-24 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 103, Question 16-147, the staff requested that the applicant provide an explanation regarding the mode applicability for Pressurizer Pressure Narrow Range (NR) instrumentation with respect to Reactor Trip Function A.13, "Low Hot Leg Pressure." In a June 30, 2009, response to RAI 301, Question 16-147, the applicant described how the mode requirements for the Pressurizer Pressure NR sensors have been chosen to envelope the required modes of the functions and permissives they support. However, the response does not adequately address the capabilities of the instrumentation to support Permissive P12 (Pressurizer Pressure Lower Than Threshold) or ESFAS Function B.3.b (SIS Actuation on Low Delta P_{sat}), in Mode 4 with Permissive P15 inhibited. Pressurizer Pressure NR sensor mode applicability specified in LCO Table 3.3.1-1 is 1, 2, 3, and $4^{(h)}$, where (h) states, "with Permissive P15 inhibited." The P15 validation pressure setpoint is 3.199 MPa (464 psia). Pressurizer Pressure NR instrument range is 11.135 – 17.340 MPa (1,615 – 2,515 psia). The applicant stated that the instrument range of 11.135 – 17.340 MPa (1,615 – 2,515 psia) is adequate to support the referenced functions on the basis of a design feature that allows the input signals to the permissive to remain at the lowest range of the instrument after the instrument drops off scale. The applicant maintains that this is acceptable for this application, since the actual Pressurizer Pressure is not necessary for the proper functioning of the permissive, and that validation of Permissive P12 is only dependent on Pressurizer Pressure being above or below the setpoint. The staff questions the applicant's position on the basis that (1) sensor operability is questionable beyond the calibrated range of the instrument, and (2) Pressurizer Pressure NR sensors are required to be operable in Mode 4 with Permissive P15 inhibited (validation pressure setpoint of 3.199 MPa (464 psia)) as specified in FSAR Tier 2, Table 3.3.1-1 for Component A.16 and LCO Table 3.3.1-2 for Function B.3.b and Permissive P12. The requirements for Pressurizer Pressure operability in Mode 4 with P15 inhibited extend to Function B.9.b (Containment Isolation (Stage 1) on SIS Actuation) as well, due to its reliance upon the SIS Actuation on Low Delta P_{sat}.

The definition of Operable is:

> "A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s)."

With regards to an instrument, the known and verified accuracy of the instrument is only necessary for operability when the accuracy of the instrument is credited to support it s safety function.

The setpoint for Permissive P12 is 2005 psia. This is within the qualified and calibrated measurement range of the Pressurizer Pressure (Narrow Range) instrumentation (1615 – 2515 psia). This instrumentation is not valved-out or disconnected outside of this range (such as when the Pressurizer Pressure goes below the range of the narrow range sensor). However, the narrow range sensor continues to be operable outside of the credited range, since the accuracy of the value from the sensor is not relied upon to satisfy safety analysis assumptions. Concern (1) that the sensor operability is questionable beyond the calibrated sensor range is not valid. The concern relates to the lowered pressure that the transmitter sees when Pressurizer Pressure drops to a very low level. Even though the output signal of the transmitter drops below the calibrated range,; nevertheless, the transmitter will continue to retain its integrity from a pressure boundary perspective, and will recover the sensed parameter when pressure is restored with the same uncertainty. This was confirmed in consultation with manufacturers of safety-related nuclear qualified pressure transmitters. When the Pressurizer Pressure drops below the narrow range, the electronics output will level out at some signal below the live zero (4 mA) and no longer be indicative of the actual pressure. The signal going belowoutside the calibrated range of the transmitter will be flagged by the TXS system as outside the range, but the P12 permissive will remain in its validated state by using the last good value of the pressure signal or by using a technique in the Gen2 hardware that is designed in. In the Oconee project, as long as the input from the transmitter did not fall below 1 milliamp, the TXS system recognized the input, even though it was below the live zero point, as a valid input. The transmitter vendor confirmed that the hardware would support this design. This is true of all divisions. Since the permissive only changes state (validated or inhibited) at 2005 psia, the accuracy of the operable instrument outside the credited measurement range is not necessary for the operability of the function being performed by the permissive.

For concern (2),that the Pressurizer Pressure level is below the calibrated range which could result in inoperability of the Functions B.3.b and B.9.b, the P12 permissive remains validated below the 2005 psia setpoint and does not change when the pressure goes below the calibrated range of the sensor. Once the P12 permissive is validated, the Pressurizer Pressure setpoint is not used to initiate a Safety Injection signal (SIS) or a Containment Isolation signal. Rather, the SIS is initiated on Delta P_{sat}, which uses the ~~Pressurizer~~ Hot Leg Pressure (Wide Range) sensor as the pressure input.

In conclusion, because the Pressurizer Pressure (Narrow Range) sensor operates (though not accurately) below the calibrated range, and because the P12 permissive continues to be validated even though the signal no longer accurately represents the pressurizer pressure, the Pressurizer Pressure (Narrow Range) sensor can continue to be considered OPERABLE even when the sensed pressure goes below calibrated range.

FSAR Impact:

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

Question 16-311

Followup to Question 16-180:

a) Inconsistent use of footnote (f) in Table 3.3.1-1 for Sensor A.6.

Response to Question 16-180(a):

This issue was further clarified on Page 16-32 of the NRC's March 10, 2010 Safety Evaluation, which states:

> However, the same information is not accurately reflected in the changes incorporated in the FSAR markup provided with the June 30, 2009, response for Sensor A.6 in LCO Table 3.3.1-1. Footnote presentation is inconsistent. Footnote (f) for example, is used to represent a stand-alone condition in conjunction with Modes 1 through 4, and as a superscript in Mode 5.

Footnote (f) was deleted in Revision 2 to U.S. EPR FSAR Tier 2, Chapter 16, LCO Table 3.3.1-1 for the Hot Leg Pressure (Wide Range) sensors (Sensor A.10) since the sensor is already required to be operable in all modes.

The Protection System LCO Table 3.3.1-1 Footnote (f)~~ [Note that Footnote (f) will be renumbered to Footnote (h)]~~, regarding when Pressurizer Safety Relief Valve operability is required by LCO 3.4.11, will ~~generally ~~not be presented in the Technical Specifications as a stand-alone condition. ~~However, t~~The Technical Specifications and Bases ~~are also being~~will be revised to reflect the use of the Hot Leg Pressure (Narrow Range) sensor in ESF Functions 12.a and 12.b, PSRV Actuation – First Valve and Second Valve and the P17 permissive. ~~As a result, Footnote (h), regarding when Pressurizer Safety Relief Valve operability is required by LCO 3.4.11, is not always presented in the Technical Specifications as a stand-alone condition to avoid potential confusion. The Hot Leg Pressure (Narrow Range) is not required to support any other reactor trip or ESF function. Since the minimum number of components required for functional capability is different when the Low Temperature Overpressure Protection (LTOP) function is required in Mode 4 (3 required) versus when the LTOP function is required in Modes 5 and 6 (2 required), the operators could be confused regarding the required number of components if Footnote (h) always appeared in the Technical Specifications without an associated Mode.~~

Numerous other changes in the Technical Specifications and Bases will be incorporated, such as listing Mode 4 requirements on a separate line in LCO Table 3.3.1-1 when a cited Condition only applies in that Mode. U.S. EPR FSAR Tier 2, Tables 15.0-18 and 15.0-25 will be revised for consistency with U.S. EPR FSAR Tier 2, Table 15.0-8 with respect to the setpoint for Main Control Room ~~HVAC ~~Air Conditioning System Isolation and Filtering ~~Reconfiguration to Recirculation Mode ~~on High Intake Activity function.

FSAR Impact:

U.S. EPR FSAR Tier 2, Tables 15.0-18 and 15.0-25 and Chapter 16, Technical Specifications and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-311

Followup to Question 16-182:

b) Table 3.3.1-2 footnote presentation associated with footnotes (b) and (c) for Functions B.11.c, B.11.d, A.1.a, A.1.b, A.1.c, A.1.d, A.1.e, and A.2.

Response to Question 16-182(b):

This issue was further clarified on Page 16-32 of the NRC's March 10, 2010 Safety Evaluation, which states:

> The placement associated with Footnotes (b) and (c) in LCO Table 3.3.1-2 for Functions A.1.a, A.1.b, A.1.c, A.1.d, A.1.e, A.2, B.11.c, and B.11.d is incorrect. The footnotes should appear as superscripts for the referenced functions.

Footnotes (b) and (c) in U.S. EPR FSAR Tier 2, Chapter 16, LCO Table 3.3.1-2 will be deleted. Revised text will be added to U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases and bracketed to clarify the surveillance testing requirements of appropriate sensors.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-311

Followup to Question 16-190:

c) Ambiguities associated with RCP Current sensor Operability requirements in Bases Table 3.3.1-1 for Functions B.4 and Permissive P15.

Response to Question 16-190(c):

This issue was further clarified on Page 16-33 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 103, Question 16-190, the staff requested that the applicant provide an explanation regarding inconsistencies associated with Bases Table B 3.3.1-1, Protection System Functional Dependencies. In a June 30, 2009, response to RAI 103, Question 16-190, the applicant adequately addressed items a, b, e, and f. However, it did not adequately address Items c and d.
>
> Item d identifies ambiguities associated with RCP Current instrumentation requirements. LCO Table 3.3.1-1 specifies a minimum requirement of two RCP current sensors per pump. Bases Table B 3.3.1-1 was revised by the FSAR markup provided with the June 30, 2009, response to define which RCP current sensors are acquired by each division without apparently specifying any minimum requirements for divisional operability. It is unclear how to interpret the revised RCP current sensor information in Bases Table B 3.3.1-1 in terms of evaluating divisional operability with respect to Function B.4 and Permissive P15. The changes made under the FSAR markup provided with the June 30, 2009, response did not adequately address the staff's concerns regarding the RCP current sensor minimum divisional requirement information specified in previous revisions of the GTS. In Revision 1, for example, if two sensors within the same division (different pumps) became inoperable, the division would be declared inoperable, with the minimum requirements for pump operability still satisfied. Bases Table B 3.3.1-1 guidance does not appear to consider the fact that ESFAS Function B.4, "RCP Trip on Low Delta Pressure with SIS Actuation," and Permissive P15 both employ four divisions of two-out-of-three voting logic that receive RCP Current sensor information from the other divisions as well.

A design change is being incorporated to eliminate the use of the Reactor Coolant Pump (RCP) current sensors in the Protection System. The Protection System Technical Specifications and Bases will be revised to reflect this change. In addition, the references to RCP Current sensors will be updated in U.S. EPR FSAR Tier 1 Table 2.2.1-3, and Tier 2 Table 3.11-1 and Section 7.2.1.3.10.

FSAR Impact:

U.S. EPR FSAR Tier 1 Table 2.2.1-3, Tier 2 Table 3.11-1, Section 7.2.1.3.10, and Chapter 16 Technical Specifications and Bases will be revised as described in the response and indicated on the enclosed mark-up.

Question 16-311

Followup to Question 16-193:

a) Removal of all technical references associated with the Standard Technical Specifications (STS) regarding the basis and methodology for obtaining allocated sensor, signal processing/conditioning, and actuation logic response times for Protection System (PS) Instrumentation without providing comparable replacement references in the Bases for SR 3.3.1.10.

Response to Question 16-193(a):

This issue was further clarified on Pages 16-35 and 16-37 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 103, Question 16-193, the staff requested that the applicant provide an explanation regarding the overall approach to surveillance requirement testing for U.S. EPR PS instrumentation, and how that approach ensures that all RT and ESFAS functions specified in LCO 3.3.1 are adequately tested. The following issues were identified based on evaluation of: (1) The March 19, 2009, response to RAI 103, Question 16-193, including review of the accompanying Figure 16-193-1, “Summary of Protection System Testing,” which provides a correlation between specific sections of Siemens Topical Report EMF-2341P, “Generic Strategy for Periodic Surveillance Testing of TELEPERM XS Systems in U.S. Nuclear Generating Stations,” Revision 1, and the surveillance testing specified in TS Section 3.3.1, and (2) the FSAR markup provided with the June 30, 2009, response.
>
> - LCO 3.3.1 SRs are only specified for the components (Sensors, Manual Actuation Switches, Signal Processors, and Actuation Devices) listed in LCO Table 3.3.1-1. There are no SRs associated with any of the functions or permissives in LCO Table 3.3.1-2. This approach deviates from the established convention for function-based surveillance testing in the STS and all TS issued for operating plants. The applicant maintains that (1) there is no fundamental difference between a function-based surveillance testing approach and a component-based approach, and (2) since a function is performed by components, a component-based approach specifies an additional level of detail by defining which specific surveillances apply to which specific components. The digitally-based U.S. EPR Protection System combines signals between all four divisions (Divisional versus Channelized concept where protective action signals are shared and processed by voting logic computers within each division). In many cases the PS design relies upon a single sensing device to provide the input signals to multiple functions and permissives. It is unclear how SR testing specified at the component level ensures that each of the Reactor Trip functions, ESFAS functions, and permissives are properly tested. The applicant does not address how the performance of CALIBRATION surveillances for designated components listed in LCO Table 3.3.1-1, verifies the Limiting Safety System Setting values for each of the functions in LCO Table 3.3.1-2, especially in cases where the PS logic for certain functions depends upon the acquisition of input signals from more than one sensor.
> - SR 3.3.1.10, PS Response Time, Bases discussion on Pages B 3.3.1-97 and B 3.3.1-98 of the FSAR markup provided with the June 30, 2009, response, describes allocations for sensor, signal processing and actuation logic response times. Comparable Bases discussions for SR 3.3.1.16 (RTS Response Time) and SR 3.3.2.10 (ESFAS Response Times) in NUREG-1431 cite two topical reports, one that provides the basis and methodology for using allocated sensor

response times (Westinghouse Commercial Atomic Power (WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996), and one that provides the basis and methodology for using allocated signal conditioning and actuation logic response times (WCAP-14036-P, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," December 1995). The staff questions the applicant's position regarding response time allocations for PS Instrumentation on the basis that (1) all technical references associated with the STS appear to have been removed without providing comparable replacement references, (2) differences in the methods used by the GTS and STS have not been clearly delineated, and (3) the definition for PS Response Time in GTS Definitions Section 1.1 states that, "In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC."

The sentence in the definition of Protection System Response Time that makes provisions for NRC approval for alternatives to the response time testing will be revised.. The associated discussion contained in the Bases description for SR 3.3.1.10 will also be revised . Appropriate Reviewer's Notes will be added.

The periodic surveillance test strategy for the TELEPERM XS system was defined in a Topical Report which was submitted to the NRC (Framatome ANP Report EMF-2341(P)). For the U.S. EPR design certification, this report will be replaced by AREVA Technical Report ANP-10315P, "U.S. EPR Protection System Surveillance Testing and TELEPERM XS Self-Monitoring." This report describes the self-tests and the periodic surveillances that can be performed on the U.S. EPR protection system. Technical Report ANP-10315P will be provided by separate letter.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16 Technical Specification Definitions and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-311

Followup to Question 16-194:

Inconsistencies regarding use of the terms “channel” and “division” throughout the Protection System Bases B 3.3.1.

Response to Question 16-194:

This issue was further clarified on Page 16-38 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 103, Question 16-194, the staff requested an explanation regarding setpoint relationships, references to Sensor Operational Test, and use of the word “channel” in the Bases. In a March 19, 2009, response to RAI 103, Question 16-194, the applicant adequately addressed each of these issues; however, the staff noted inconsistencies throughout Bases B 3.3.1 regarding use of the terms “channel” and “division.”

As discussed in the Response to RAI 122, Question 16-243, since protective action signals are shared between all four divisions throughout the design of the Protection System, the use of the term "channel" as defined in both IEEE Standards 338-1997 and 603-1998 does not accurately describe the overall configuration of the Protection System. The use of the term "division" more accurately describes how the system architecture is designed and functions. The use of the terms "channel" and "division" in the Protection System Bases were reviewed and determined to be accurate. Note that the term "channel uncertainties" is correct as defined in AREVA Topical Report ANP-10275P-A, "U.S. EPR Instrument Setpoint Methodology Topical Report," since it reflects the latest industry guidance provided by American National Standards Institute (ANSI), and Instrument Society of America (ISA), in ANSI/ISA-67.04.01-2006, “Setpoint for Nuclear Safety-Related Instrumentation,” May 2006.

Editorial corrections will be made to U.S. EPR FSAR Tier 2 Chapter 16 Technical Specification Section 3.3.1 Bases description.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16 Technical Specification Bases will be revised as described in the response and indicated on the enclosed markup.

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

Question 16-311

Followup to Question 16-203:

Inaccuracies associated with the response to Question 16-203 regarding the statement "Boron dilution events are protected by the chemical and volume control system (CVCS) charging line isolation function of the anti-dilution mitigation (ADM) system."

Response to Question 16-203:

This issue was further clarified on Page 16-41 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 103, Question 16-203, the staff requested that the applicant provide a technical justification regarding omission of the Source Range Neutron Flux Reactor Trip function from LCO 3.3.1. In accordance with NUREG-1431, the Source Range Neutron Flux Reactor Trip function ensures protection against an uncontrolled RCCA bank withdrawal accident from a subcritical condition during startup. The applicable modes are Modes 2(d), 3(a), 4(a), and 5(a), where (d) is, “Below the P-6 (Intermediate Range Neutron Flux) interlocks,” and (a) is ”With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.” In the GTS LCO 3.3.1, PS Reactor Trip functions, “High-Neutron Flux (Intermediate Range),” and “Low Doubling Time (Intermediate Range),” both protect against excessive reactivity additions during reactor startup from a subcritical or low power startup condition. Applicable modes associated with both of these functions in the FSAR markup provided with the June 30, 2009, response are Modes 1(i), 2, 3(f), where (i) is “Below 10 percent RTP,” and (f) is “With the Reactor Control, Surveillance and Limitation System capable of withdrawing an RCCA or one or more RCCAs not fully inserted.” Although the Reactor Trip Functions are similar between NUREG-1431 and the GTS, the mode applicability is different. The U.S. EPR Protection System does not provide protection against excessive reactivity additions from RCCA withdrawal events from subcritical conditions in Modes 4 and 5. In a March 19, 2009, response to RAI 103, Question 16-203, the applicant stated that in Modes 4 and 5, RCCA withdrawal events are controlled by (1) plant procedures that will restrict RCCAs from being capable of being withdrawn below a minimum temperature for criticality 298°C (568°F), and (2) RCS boration, by plant procedure, to a value greater than the all rods out (ARO) critical boron concentration, if RCCAs are required to be exercised below 298°C (568°F). The staff questions the applicant’s position on the basis that the applicant appears to be relying solely upon administrative controls to provide protection against uncontrolled RCCA withdrawal events from subcritical conditions in Modes 4 and 5. This issue has been identified as an open item. In addition, the staff identified the following issue based on evaluation of the response:
>
> - The Boron Dilution Events section of the March 19, 2009, response to RAI 103, Question 16-203, on Page 17 of 21, inaccurately states that, “Boron dilution events are protected by the Chemical and Volume Control System charging line isolation function of the Anti-Dilution Mitigation System.” The CVCS Charging Line does not isolate on Anti-Dilution Mitigation

In the response to Question 16-203, the statement that "Boron dilution events are protected by the chemical and volume control system (CVCS) charging line isolation function of the anti-dilution mitigation (ADM) system" should be restated as:

> "U.S. EPR FSAR Tier 2, Chapter 15, Section 15.4.6 addresses Chemical and Volume Control System Malfunction that Results in a Decrease in the Boron Concentration in the Reactor Coolant. As discussed therein, dilution events are terminated by the Anti-Dilution Mitigation functions."

The U.S. EPR design includes Protection System reactor trip functions "High Neutron Flux (Intermediate Range)", "Low Doubling Time (Intermediate Range)", and "High Neutron Flux Rate of Change (Power Range)," which protect against excessive reactivity additions during reactor startup from a sub-critical or low power startup condition. These trip functions are required to be operable in Modes 1, 2 and and in Mode 3 (~~when~~ with the RCSL System capable of withdrawing a Rod Cluster Control Assembly~~ies~~ (RCCA~~s~~) ~~are capable of being withdrawn~~or one or more RCCAs not fully inserted). The "High Neutron Flux (Intermediate Range)" and "Low Doubling Time (Intermediate Range)" are operable in Mode 1 < 10% RTP (P6). Excess reactivity addition can be postulated to occur either by RCCA withdrawal, boron dilution, ~~rod ejection, or~~ overcooling, or RCCA ejection events.

RCCA Withdrawal Events

RCCA withdrawal events are only possible if the reactor trip ~~circuit~~ breakers are closed and the RCCAs are capable of being withdrawn. In Mode 3, the three described reactor trips are required to be operable whenever the Reactor Control, Surveillance and Limitation (RCSL) system is capable of withdrawing an RCCA or one or more RCCAs are not fully inserted. Above 568°F (minimum temperature for criticality - Mode 3), with RCCAs capable of being withdrawn, the "High Neutron Flux (Intermediate Range)", "Low Doubling Time (Intermediate Range)", and "High Neutron Flux Rate of Change (Power Range)" reactor trips are required to be operable. Below 568°F, the RCCA trip breakers will be normally open, and the RCCAs will not be capable of being withdrawn. Rod drop testing is controlled by Technical Specification Surveillance SR 3.1.4.3 to be performed ≥ 568°F (see attached markup to SR 3.1.4.3 and associated bases). Rod drop testing requires that the RCCA trip breakers be closed and the RCCAs capable of being withdrawn. In addition, a sufficient shutdown margin is maintained in Mode 3 above the minimum temperature for criticality until the Power Dependent Insertion Limit (PDIL) is met (transition to Mode 2) so that an inadvertent RCCA withdrawal event will not result in bringing the reactor critical. Therefore, RCCA withdrawal events are protected in Mode 3.

If the RCCA trip breakers are open, the RCCAs are not capable of being withdrawn, even considering an electrical fault or operator error. Thus, RCCA withdrawal events are controlled by the following:

1. In Modes 3, 4, and 5, Technical Specifications through the Core Operating Limits Report (COLR) will impose conditions under which RCCAs are made capable of being withdrawn below the minimum temperature for criticality (568°F). Normally, the RCCAs are not capable of being withdrawn below the minimum temperature for criticality. SR 3.1.4.3 restricts rod drop testing to temperatures ≥ 568°F to simulate a reactor trip under actual conditions. For the purpose of verifying drop time, colder temperatures are conservative.
2. If it is required that the RCCAs be exercised below 568°F in Modes 3, 4, and 5, the Reactor Coolant System (RCS) will be borated to a value greater than the ARO critical boron concentration. Alternatively, because it is not possible for the control banks and shutdown banks to be withdrawn simultaneously, it is sufficient to borate to a value greater than critical concentration with either the shutdown banks out or all control banks out. The required boron concentration is cycle dependent and will be provided in the COLR.

Items 1 and 2 preclude the possibility of an inadvertent criticality by RCCA withdrawal ~~below the minimum temperature for criticality,~~ in Modes 3, 4 and 5 below the minimum temperature for criticality.

Boron Dilution Events

Boron dilution events are protected by the CVCS Isolation function of the Anti-Dilution Mitigation (ADM) System. ADM is required to operable in Modes 1, 2, 3, 4, 5, and 6. A detailed discussion of the ADM and the ADM isolation setpoint derivation is provided in FSAR Section 15.4.6. The critical boron concentrations used in the setpoint derivation are based on ARI less the maximum worth rod fully withdrawn. This supports the performance of rod drop tests under cold conditions, if desired. Rod drop testing and other rod exercises under these conditions can be performed as long as one rod is withdrawn at a time to preserve the assumptions made for deriving the ADM isolation setpoints.

Overcooling Events

Overcooling events, with a negative moderator temperature coefficient, can also result in excessive reactivity addition. If sufficient positive reactivity is added, the reactor could go critical. An inadvertent criticality could result in challenging fuel design limits. The limiting overcooling events from shutdown are main steam system piping failures and excess steam demands. The limiting main steam system piping failures were analyzed from Modes 1, 2, and in Mode 3 from the minimum temperature for criticality, and from the thermal hydraulic conditions associated with the P12 permissive. For the spectrum of main steam system piping failures in Modes 1 and 2, the limiting case is from Mode 2 and predicts a return to power. In Mode 3, the results (from minimum temperature for criticality and the P12 Permissive) show that the reactor returns to a lower power level than the limiting case from Mode 2. Thus, from the standpoint of return to power and potential fuel failure, the main steam system piping failure from Mode 3 is bounded by the analysis results for Modes 1 and 2. For Modes 4 and 5 sufficient shutdown margin exists so that the most limiting overcooling event does not result in a return to power.

RCCA Ejection Events

An RCCA ejection event can be postulated to occur in Modes 1 through 5. In Mode 5, RCS pressure is less than 464 psia, making the likelihood of a rod ejection very small, if not impossible. This event is specifically analyzed in Modes 1 and 2 based on RCCAs being controlled by the Power Dependent Insertion Limit (PDIL). The primary means of protection for this event is the High Neutron Flux Rate of Change (Power Range) reactor trip which is required to be operable in Modes 1, 2, and 3 when the RCCAs are capable of being withdrawn. The RCCAs could be capable of being withdrawn above the minimum temperature for criticality (568°F). Below the minimum temperature for criticality (Modes 3, 4, and 5), sufficient shutdown margin is provided by inserted rods or boron so that a RCCA ejection will not result in bringing the reactor critical and thus a power transient is not possible.

Above the minimum temperature for criticality, the RCCAs could be made capable of being withdrawn and rod configurations could deviate from the PDIL. The PDIL restricts rod position in Modes 1 and 2. Sufficient shutdown margin is maintained in Mode 3 above the minimum temperature for criticality until the PDIL is met (transition to Mode 2) so that an ejected RCCA will not result in bringing the reactor critical or until the ejected rod worths are bounded by assumptions in the RCCA accident analysis in Modes 1 and 2.

This discussion provides a technical discussion demonstrating that the U.S. EPR protection system provides protection for excess reactivity addition events from all operating modes.

Technical Specification Requirements

Technical Specifications for the U.S. EPR require the "High Neutron Flux (Intermediate Range)", "Low Doubling Time (Intermediate Range)", and "High Neutron Flux Rate of Change (Power Range)," to be operable in Modes 1, 2 and in Mode 3 with the RCSL System capable of withdrawing a RCCA or one or more RCCAs not fully insertedwhen the control rods are capable of being withdrawn. Shutdown margin requirements, specified in the Core Operating Limits Report (COLR), impose boron concentration requirements depending on whether the RCCAs are capable of being withdrawn and whether the RCS is above or below the minimum temperature for criticality. In Modes 4 and 5 (and part of Mode 3), below the minimum temperature for criticality (568°F), the RCCAs are not normally capable of being withdrawn. If the RCCAs are required to be exercised below 568°F, the RCS is borated to prohibit an inadvertent criticality. This requires the RCS to be borated to the ARO critical boron concentration that corresponds to control groups banks ARO or shutdown groups banks ARO whichever is greater. In addition, sufficient shutdown margin is maintained in Mode 3, above the minimum temperature for criticality until the PDIL is met (transition to Mode 2) so that an inadvertent RCCA withdrawal event or rod ejection will not result in bringing the reactor critical.

These added restraints are specified in the COLR under shutdown margin requirements.

Shutdown Margin (Specification 3.1.1)

Shutdown margin requirements to meet Technical Specification 3.1.1 are specified in the COLR as follows:

- Mode 2 > 3000 pcm
- Mode 3 > 568°F with RCCAs capable of being withdrawn > 3000 pcm
- Mode 3 < 568°F with RCCAs not capable of being withdrawn[1] or RCS borated to ARO critical (control or shutdown groups) with RCCAs capable of being withdrawn
- Modes 4 and 5 with RCCAs not capable of being withdrawn[1] or RCS borated to ARO critical (control or shutdown groups) with RCCAs capable of being withdrawn

If the RCCAs are made capable of being withdrawn below the minimum temperature for criticality only one RCCA can be withdrawn at a time to preserve the assumptions made in deriving the setpoint for the ADM system isolation function.

In addition, sufficient shutdown margin is maintained in Mode 3 above the minimum temperature for criticality until the PDIL is met (transition to Mode 2) so that an inadvertent RCCA withdrawal event or rod ejection will not result in bringing the reactor critical.

U.S. EPR FSAR Tier 2, Chapter Section 15.4.1 and Chapter 16 Technical Specifications and Bases will be revised to reflect this discussion.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter Section 15.4.1 and Chapter 16 Technical Specifications and Bases will be revised as described in the response and indicated on the enclosed markup.

Question 16-313

Potential Open Item

Provide the additional information and update the following RAI responses for each of the Electrical Power System Tech Spec items identified, based on the results of Audit Meeting between AREVA NP and NRC Staff on 6/24/09.

Request for Additional Information No. 74 (953)

Question 16-313

Followup to Question 16-51:

The applicant is requested to enhance the Distribution Systems - Operating Bases (B 3.8.9) LCO discussion regarding the ability of redundant equipment with divisional pairs to maintain safety-related functional capabilities when alternate power feed cross tie breakers are closed. The Bases does not adequately describe the capabilities of the inter-divisional alternate feed protection and coordination scheme to provide protection so that a fault on one division does not degrade the other division below an acceptable level with a tie breaker closed.

Response to Question 16-51:

This issue was further clarified on Page 16-82 of the NRC's March 10, 2010 Safety Evaluation, which states:

> In RAI 74, Question 16-51, the staff requested that the applicant enhance the Bases discussion associated with LCO 3.8.9, "Distribution Systems − Operating," to describe how redundant electrical power distribution subsystem equipment within a divisional pair is considered operable and capable of performing its safety-related functions when alternate feed cross tie breakers are closed. In an October 30, 2008, response to RAI 74, Question 16-51, the applicant adequately described the capabilities of the inter-divisional alternate feed protection and coordination scheme to provide protection so that a fault on one division does not degrade the other division below an acceptable level with a tie breaker closed. The FSAR markup, however, did not include this information in the associated Bases discussion.

The following information was added to U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications LCO 3.8.9 Bases in U.S. EPR FSAR, Revision 2:

> "Each division can be aligned to power a subset of loads ("alternate fed loads") in the other division in its divisional pair by means of an "alternate feed". An alternate feed provides a standby source of power to required safety systems, safety support systems, or components that do not have the required redundant trains to support extended EDG maintenance. An OPERABLE EDG supporting the alternate feed loads and the remaining OPERABLE EDG(S) can power the minimum required ESF functions and achieve completion of required safety function following an AOO or postulated accident, regardless of which two EDGs are inoperable."

The following information is already contained in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications LCO 3.8.9 Bases:

> "With a tie breaker closed to implement alternate feed, a fault within the alternate fed divisional pair may affect two redundant subsystems within the divisional pair. During alternate feed, this is acceptable since the other divisional pair power distribution subsystems are available to support redundant subsystems."

During a Loss of Offsite Power, with one EDG inoperable and the other EDG in the divisional pair running with its alternate feed aligned, a subsequent single failure could cause the loss of power to the divisional pair. The remaining divisional pair would have sufficient capability to mitigate the consequences of a postulated design basis event or abnormal operational occurrence. Additional information regarding the inter-divisional alternate feeds protections and coordination will be added to the LCO description in the Bases for Section 3.8.9.

FSAR Impact:

U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Bases will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 2.2.1-3—Instrumentation Power Supplies, Classification, and Displays (7 Sheets)

16-311, Part 16-190(c)

Equipment Description	Equipment Tag Number[1]	Equipment Location	IEEE Class 1E	EQ – Harsh Environment	MCR/RSS Displays
SG NR Level	30JEA10CL801	Reactor Building	1	Yes	Level/Level
	30JEA10CL802		2		
	30JEA10CL803		3		
	30JEA10CL804		4		
	30JEA20CL801		1		
	30JEA20CL802		2		
	30JEA20CL803		3		
	30JEA20CL804		4		
	30JEA30CL801		1		
	30JEA30CL802		2		
	30JEA30CL803		3		
	30JEA30CL804		4		
	30JEA40CL801		1		
	30JEA40CL802		2		
	30JEA40CL803		3		
	30JEA40CL804		4		
~~RCP Current Sensors~~	~~30JEB10CE889~~	~~Reactor Building~~	~~1~~	~~No~~	~~Current/Current~~
	~~30JEB10CE890~~		~~1~~		
	~~30JEB10CE891~~		~~1~~		
	~~30JEB20CE889~~		~~2~~		
	~~30JEB20CE890~~		~~2~~		
	~~30JEB20CE891~~		~~2~~		
	~~30JEB30CE889~~		~~3~~		
	~~30JEB30CE890~~		~~3~~		
	~~30JEB30CE891~~		~~3~~		
	~~30JEB40CE889~~		~~4~~		
	~~30JEB40CE890~~		~~4~~		
	~~30JEB40CE891~~		~~4~~		

Table 2.2.1-3—Instrumentation Power Supplies, Classification, and Displays (7 Sheets)

Equipment Description	Equipment Tag Number[1]	Equipment Location	IEEE Class 1E	EQ – Harsh Environment	MCR/RSS Displays
RCP Speed Sensor	30JEB10CS896	Reactor Building	1	Yes	Speed/Speed
~~RCP Speed Sensor - Standby~~	30JEB20CS896	~~Reactor Building~~	2	~~Yes~~	~~Speed/Speed~~
	30JEB30CS896		3		
	30JEB40CS896		4		
	30JEB10CS897		1		
	30JEB20CS897		2		
	30JEB30CS897		3		
	30JEB40CS897		4		

1) Equipment tag numbers are provided for information only and are not part of the certified design.

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 17 of 130)

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
RCP Seal #3 Inject Vlv Act Loop 1	30JEB10AA013	30UJA34014	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #3 Leakoff Vlv Act Loop 1	30JEB10AA017	30UJA15013	H	H	SII	NS-AQ EMC	Y (1) Y (5)
SSSS Actuation Vlv Act Loop 1	30JEB10AA018	30UJA15002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
SSSS Atmos Vent Vlv Act Loop 1	30JEB10AA020	30UJA15002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Oil Lift Pump Motor Loop 1	30JEB10AP011	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Anti-Cond Heater Element Loop 1	30JEB10AH501	30UJA23002	H	H	SII	NS-AQ	Y (1) Y (5)
RCP TB Press Sensor Loop 1	30JEB10CP002	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP TB Temp Sensor Loop 1	30JEB10CT007	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Diff Press Sensor #1 Loop 1	30JEB10CP065	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Diff Press Sensor #2 Loop 1	30JEB10CP567	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Temp Sensor #1 Loop 1	30JEB10CT002	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Temp Sensor #2 Loop 1	30JEB10CT003	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Tk Level Sensor #1 Loop 1	30JEB10CL065	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Tk Level Sensor #2 Loop 1	30JEB10CL066	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Leakoff Flowrate Sensor #1 Loop 1	30JEB10CF063	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Leakoff Flowrate Sensor #2 Loop 1	30JEB10CF064	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #3 Tk Level Sensor #1 Loop 1	30JEB10CL057	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #3 Tk Level Sensor #2 Loop 1	30JEB10CL061	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP SSSS Position Sensor #1 Loop 1	30JEB10CG050A	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP SSSS Position Sensor #2 Loop 1	30JEB10CG050B	30UJA11002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #1 Loop 1	30JEB10CE089	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #2 Loop 1	30JEB10CE090	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #3 Loop 1	30JEB10CE091	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
~~RCP-M Current Sensor #1 Loop 1~~	~~30JEB10CE889~~	~~31UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
~~RCP-M Current Sensor #2 Loop 1~~	~~30JEB10CE890~~	~~31UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
~~RCP-M Current Sensor #3 Loop 1~~	~~30JEB10CE891~~	~~31UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
RCP-M Speed Sensor Loop 1	30JEB10CS896	30UJA18002	H	H	RT SI	S 1E EMC	Y (1) Y (5)
RCP-M Speed Sensor - ~~Standby~~ Loop 1	30JEB10CS897	30UJA18002	H	H	RT SI	S 1E EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #1 Loop 1	30JEB10CT069	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #2 Loop 1	30JEB10CT070	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #3 Loop 1	30JEB10CT071	30UJA18002	H	H	SII	NS-AQ EMC	Y (1) Y (5)

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 19 of 130)

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
RCP Seal #1 Diff Press Sensor #2 Loop 2	30JEB20CP567	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Temp Sensor #1 Loop 2	30JEB20CT002	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #1 Temp Sensor #2 Loop 2	30JEB20CT003	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Tk Level Sensor #1 Loop 2	30JEB20CL065	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Tk Level Sensor #2 Loop 2	30JEB20CL066	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Leakoff Flowrate Sensor #1 Loop 2	30JEB20CF063	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #2 Leakoff Flowrate Sensor #2 Loop 2	30JEB20CF064	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #3 Tk Level Sensor #1 Loop 2	30JEB20CL057	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP Seal #3 Tk Level Sensor #2 Loop 2	30JEB20CL061	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP SSSS Position Sensor #1 Loop 2	30JEB20CG050A	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP SSSS Position Sensor #2 Loop 2	30JEB20CG050B	30UJA11005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #1 Loop 2	30JEB20CE089	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #2 Loop 2	30JEB20CE090	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Diff Current Sensor #3 Loop 2	30JEB20CE091	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
~~RCP-M Current Sensor #1 Loop 2~~	~~30JEB20CE889~~	~~32UJK18020~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
~~RCP-M Current Sensor #2 Loop 2~~	~~30JEB20CE890~~	~~32UJK18020~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
~~RCP-M Current Sensor #3 Loop 2~~	~~30JEB20CE891~~	~~32UJK18020~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
RCP-M Speed Sensor Loop 2	30JEB20CS896	30UJA18005	H	H	RT SI	S 1E EMC	Y (1) Y (5)
RCP-M Speed Sensor - ~~Standby~~ Loop 2	30JEB20CS897	30UJA18005	H	H	RT SI	S 1E EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #1 Loop 2	30JEB20CT069	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #2 Loop 2	30JEB20CT070	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Winding Temp Sensor #3 Loop 2	30JEB20CT071	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Oil Tank Temp Sensor Loop 2	30JEB20CT585	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Brg Oil Level Sensor #1 Loop 2	30JEB20CL051	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Brg Oil Level Sensor #2 Loop 2	30JEB20CL501	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Rad Brg Temp Sensor #1 Loop 2	30JEB20CT075	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Rad Brg Temp Sensor #2 Loop 2	30JEB20CT084	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Thr Brg Temp Sensor #1 Loop 2	30JEB20CT080	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Lwr Thr Brg Temp Sensor #2 Loop 2	30JEB20CT081	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Upr Oil Tk Temp Sensor Loop 2	30JEB20CT504	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)
RCP-M Upr Brg Oil Level Sensor #1 Loop 2	30JEB20CL055	30UJA18005	H	H	SII	NS-AQ EMC	Y (1) Y (5)

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 21 of 130)

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)		Safety Class (Note 4)			EQ Program Designation (Note 5)	
RCP Seal #3 Tk Level Sensor #1 Loop 3	30JEB30CL057	30UJA11006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #3 Tk Level Sensor #2 Loop 3	30JEB30CL061	30UJA11006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP SSSS Position Sensor #1 Loop 3	30JEB30CG050A	30UJA11006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP SSSS Position Sensor #2 Loop 3	30JEB30CG050B	30UJA11006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Diff Current Sensor #1 Loop 3	30JEB30CE089	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Diff Current Sensor #2 Loop 3	30JEB30CE090	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Diff Current Sensor #3 Loop 3	30JEB30CE091	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
~~RCP-M Current Sensor #1 Loop 3~~	~~30JEB30CE889~~	~~33UJK18020~~	~~M~~	~~M~~		~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5)~~ ~~Y (6)~~
~~RCP-M Current Sensor #2 Loop 3~~	~~30JEB30CE890~~	~~33UJK18020~~	~~M~~	~~M~~		~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5)~~ ~~Y (6)~~
~~RCP-M Current Sensor #3 Loop 3~~	~~30JEB30CE891~~	~~33UJK18020~~	~~M~~	~~M~~		~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5)~~ ~~Y (6)~~
RCP-M Speed Sensor Loop 3	30JEB30CS896	30UJA18006	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCP-M Speed Sensor - ~~Standby~~ Loop 3	30JEB30CS897	30UJA18006	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #1 Loop 3	30JEB30CT069	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #2 Loop 3	30JEB30CT070	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #3 Loop 3	30JEB30CT071	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Oil Tank Temp Sensor Loop 3	30JEB30CT585	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Brg Oil Level Sensor #1 Loop 3	30JEB30CL051	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Brg Oil Level Sensor #2 Loop 3	30JEB30CL501	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Rad Brg Temp Sensor #1 Loop 3	30JEB30CT075	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Rad Brg Temp Sensor #2 Loop 3	30JEB30CT084	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Thr Brg Temp Sensor #1 Loop 3	30JEB30CT080	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Thr Brg Temp Sensor #2 Loop 3	30JEB30CT081	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Oil Tk Temp Sensor Loop 3	30JEB30CT504	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Brg Oil Level Sensor #1 Loop 3	30JEB30CL055	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Brg Oil Level Sensor #2 Loop 3	30JEB30CL503	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Rad Brg Temp Sensor #1 Loop 3	30JEB30CT076	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Rad Brg Temp Sensor #2 Loop 3	30JEB30CT077	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Thr Brg Temp Sensor #1 Loop 3	30JEB30CT078	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Thr Brg Temp Sensor #2 Loop 3	30JEB30CT079	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Press Sensor #1 Loop 3	30JEB30CP099	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Press Sensor #2 Loop 3	30JEB30CP505	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Coll Tk Level Sensor Loop 3	30JEB30CL056	30UJA18006	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 22 of 130)

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)			EQ Program Designation (Note 5)	
RCP, Loop 4										
RCP Motor Loop 4	30JEB40AP001	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
TB Inlet Water Vlv Actuator Loop 4	30JEB40AA021	30UJA15009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
TB Outlet Water Vlv Actuator Loop 4	30JEB40AA003	30UJA15009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #1 Leakoff Vlv Act Loop 4	30JEB40AA009	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #2 Tk Water Vlv Act Loop 4	30JEB40AA022	30UJA18008	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #2 Leakoff Vlv Act Loop 4	30JEB40AA010	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #3 Inject Vlv Act Loop 4	30JEB40AA013	30UJA29016	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #3 Leakoff Vlv Act Loop 4	30JEB40AA017	30UJA15016	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
SSSS Actuation Vlv Act Loop 4	30JEB40AA018	30UJA15009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
SSSS Atmos Vent Vlv Act Loop 4	30JEB40AA020	30UJA15009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Lift Pump Motor Loop 4	30JEB40AP011	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Anti-Cond Heater Element Loop 4	30JEB40AH501	30UJA23009	H	H	SII	NS-AQ			Y (1)	Y (5)
RCP-M Diff Current Sensor #1 Loop 4	30JEB40CE089	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Diff Current Sensor #2 Loop 4	30JEB40CE090	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Diff Current Sensor #3 Loop 4	30JEB40CE091	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
~~RCP-M Current Sensor #1 Loop 4~~	~~30JEB40CE889~~	~~34UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5) Y (6)~~
~~RCP-M Current Sensor #2 Loop 4~~	~~30JEB40CE890~~	~~34UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5) Y (6)~~
~~RCP-M Current Sensor #3 Loop 4~~	~~30JEB40CE891~~	~~34UJK18027~~	~~M~~	~~M~~	~~SI~~	~~S~~	~~1E~~	~~EMC~~		~~Y (5) Y (6)~~
RCP Seal #2 Leakoff Flowrate Sensor #1 Loop 4	30JEB40CF063	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #2 Leakoff Flowrate Sensor #2 Loop 4	30JEB40CF064	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP SSSS Position Sensor #1 Loop 4	30JEB40CG050A	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP SSSS Position Sensor #2 Loop 4	30JEB40CG050B	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Brg Oil Level Sensor #1 Loop 4	30JEB40CL051	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Brg Oil Level Sensor #1 Loop 4	30JEB40CL055	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Coll Tk Level Sensor Loop 4	30JEB40CL056	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #3 Tk Level Sensor #1 Loop 4	30JEB40CL057	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #3 Tk Level Sensor #2 Loop 4	30JEB40CL061	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #2 Tk Level Sensor #1 Loop 4	30JEB40CL065	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #2 Tk Level Sensor #2 Loop 4	30JEB40CL066	30UJA11009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Brg Oil Level Sensor #2 Loop 4	30JEB40CL501	30UJA18009	H	H	SII	NS-AQ		EMC	Y (1)	Y (5)

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 23 of 130)

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Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)		Safety Class (Note 4)			EQ Program Designation (Note 5)	
RCP-M Upr Brg Oil Level Sensor #2 Loop 4	30JEB40CL503	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP TB Press Sensor Loop 4	30JEB40CP002	30UJA11009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #1 Diff Press Sensor #1 Loop 4	30JEB40CP065	30UJA11009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Press Sensor #1 Loop 4	30JEB40CP099	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Oil Press Sensor #2 Loop 4	30JEB40CP505	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #1 Diff Press Sensor #2 Loop 4	30JEB40CP567	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Speed Sensor Loop 4	30JEB40CS896	30UJA18009	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCP-M Speed Sensor ~~Standby~~ Loop 4	30JEB40CS897	30UJA18009	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCP Seal #1 Temp Sensor #1 Loop 4	30JEB40CT002	30UJA11009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP Seal #1 Temp Sensor #2 Loop 4	30JEB40CT003	30UJA11009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP TB Temp Sensor Loop 4	30JEB40CT007	30UJA11009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #1 Loop 4	30JEB40CT069	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #2 Loop 4	30JEB40CT070	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Winding Temp Sensor #3 Loop 4	30JEB40CT071	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Rad Brg Temp Sensor #1 Loop 4	30JEB40CT075	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Rad Brg Temp Sensor #1 Loop 4	30JEB40CT076	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Rad Brg Temp Sensor #2 Loop 4	30JEB40CT077	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Thr Brg Temp Sensor #1 Loop 4	30JEB40CT078	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Thr Brg Temp Sensor #2 Loop 4	30JEB40CT079	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Thr Brg Temp Sensor #1 Loop 4	30JEB40CT080	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Thr Brg Temp Sensor #2 Loop 4	30JEB40CT081	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Rad Brg Temp Sensor #2 Loop 4	30JEB40CT084	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Upr Oil Tk Temp Sensor Loop 4	30JEB40CT504	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
RCP-M Lwr Oil Tank Temp Sensor Loop 4	30JEB40CT585	30UJA18009	H	H		SII	NS-AQ		EMC	Y (1)	Y (5)
Reactor Coolant Loop 1											
RCS Flowrate Sensor #1 Loop 1	30JEC10CF815	30UJA15003	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCS Flowrate Sensor #2 Loop 1	30JEC10CF817	30UJA15003	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCS Flowrate Sensor #3 Loop 1	30JEC10CF819	30UJA15003	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCS Flowrate Sensor #4 Loop 1	30JEC10CF821	30UJA15003	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)
RCS Loop Level Sensor Loop 1	30JEC10CL823	30UJA15003	H	H		SI	S	1E	EMC	Y (1)	Y (5)
RCP Delta P Sensor #1 Loop 1	30JEC10CP801	30UJA15003	H	H	ES	SI	S	1E	EMC	Y (1)	Y (5)
RCP Delta P Sensor #2 Loop 1	30JEC10CP802	30UJA15003	H	H	ES	SI	S	1E	EMC	Y (1)	Y (5)
H/L NR Temp Sensor #1 Loop 1	30JEC10CT801	30UJA15003	H	H	RT	SI	S	1E	EMC	Y (1)	Y (5)

Hot leg temperature (WR) and hot leg pressure (WR) measurements are each compared to a setpoint (350°F, 464 psia). When two-out-of-four of the hot leg temperature (WR) measurements are less than the temperature setpoint, and two-out-of-four of the hot leg pressure measurements (WR) are less than the pressure setpoint, the operator is prompted to manually validate the permissive.

This permissive is P-MANU with respect to validation and inhibition.

Figure 7.2-33—P14 Permissive Logic illustrates the logic for the P14 permissive.

7.2.1.3.10 P15 Permissive

The P15 permissive defines when SI actuation due to ΔP_{sat} is disabled and SI actuation due to low loop level is enabled.

RCP current measurements and theThe same pressure and temperature measurement used in the P14 permissive are used for this permissive. RCP speed and breaker positions are monitored to determine if an RCP is off. If two-out-of-four of the following conditions are true, then an "RCP OFF" signal is generated for that pump:

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- RCP breaker open position.
- RCP bus breaker open position.
- First RCP speed measurement less than or equal to a setpoint (90% percent).
- Second RCP speed measurement less than or equal to a setpoint (90% percent).

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When "RCP OFF" signals are generated for all four pumps, a delay time is started. After the delay time has expired, and the P14 permissive pressure and temperature conditions are satisfied, the operator is prompted to manually validate the permissive P15 permissive.

This permissive is P-MANU with respect to validation and P-AUTO with respect to inhibition.

Figure 7.2-34—P15 and P7 Permissive Logic illustrates the logic for the P15 permissive.

7.2.1.3.11 P16 Permissive

The P16 permissive defines when the SIS may be aligned from cold leg injection to hot leg injection.

Hot leg pressure (WR) measurements are compared to a setpoint (289.7 psia). When two-out-of-four of the hot leg pressure (WR) measurements are less than the setpoint, the operator is prompted to manually validate the permissive.

Table 15.0-18—Summary of MCR/TSC Characteristics

Description	Value	References and Remarks
Exposure interval	30 days	RG 1.183, Section 4.2.6
Outside air intakes	Worst-case MCR air intake on Safeguard Building Division 3 (for main MCR intake)	
	SAC HVAC air intake for Safeguard Building Division 3 (for unfiltered inleakage)	
Atmospheric dispersion factors (χ/Q)	Accident specific, as presented individually for each DBA	
Occupancy factor: 0–24 hrs	100%	RG 1.183, Section 4.2.6
Occupancy factor: 24–96 hrs	60%	
Occupancy factor: 96–720 hrs	40%	
Breathing rate	3.5E-04 m^3/sec	RG 1.183, Section 4.2.6
Free air volume of MCR envelope	200,000 ft^3	Total volume consists of 133,000 ft^3 for MCR proper on elevation 53 feet, plus 67,000 ft^3 HVAC room on elevation 69 feet)
Charcoal filtration system actuation time (delay time for system re-alignment)	1 min	Automatic actuation based on either a containment isolation signal or high radiation level at the intake duct radiation monitor
Filtration efficiency (halogens and particulates), intake, and recirculation-flow filters	99%	4-inch charcoal beds
Number of charcoal filtration systems in service	1 train	
Pre-isolation unfiltered intake flow	750 cfm/train 1500 cfm total	Two trains assumed to be operating before the DBA
Post-isolation filtered intake flow	1000 cfm (single train)	
Pre- and post-isolation unfiltered inleakage from areas surrounding the MCR pressure envelope, including ingress and egress	50 cfm total	Includes 10 cfm for egress and ingress
Post isolation filtered recirculation flow	3000 cfm/train	
Floor thickness concrete shielding MCR proper from filters	50 cm	
Air intake duct radiation monitor range	1.0E-05–10 rad/hr	Nominal set point at ~~10~~3× background

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Table 15.0-25—SGTR Design Input (Sheet 2 of 2)

Description		Value	References and Remarks
Chemical composition of halogens released to atmosphere	Elemental	97%	RG 1.183, Appendix F, Section 4
	Organic	3%	
Atmospheric release pathway and duration	Via condenser, while at full power	0–30 min	For the MCR doses, all atmospheric releases were conservatively assumed to be via the MSRT, which is closest to the MCR intake.
	Via MSRTs/silencers	After 30 min	
Other Variables			
Iodine appearance rates		See Table 15.0-17	
Offsite receptor variables		See Table 15.0-19	
MCR variables		See Table 15.0-18	MCR isolation actuated by high radiation signal in intake duct set at a nominal ~~10~~3 × background
MCR composite χ/Q and intake filter bypass fractions		See Table 15.0-28	

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standby conditions. This event is an anticipated operational occurrence (AOO) of moderate frequency as described in Section 15.0.0.1.

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For tThe U.S. EPR core design contains, the 89 RCCAs. are divided into four banks spanning the reactor core. Banks 1, 2 and 3 contain 22 RCCAs each, while bank 4 contains 23 RCCAs and includes the center fuel assembly. Within each bank, tThe RCCAs are grouped further into a control banks and a shutdown banks, as described in Sections 4.3.2.4.12 and 4.3.2.5. There are four control banks are referred to as banks A, B, C, and D. There are three shutdown banks referred to as SA, SB, and SC. Of the four banks, only banks C and D can trip the reactor to approximately 50 percent of rated thermal power (RTP) without a full insertion of the RCCAs in these banks. The rod position measurement instrumentation is divided into four redundant divisions with each symmetric RCCA position of a four rod sub-bank distributed to an individual division. Sections 4.2 and 4.3 describe the RCCAs in detail.

RCCA bank withdrawal events are analyzed only for plant mModes 1 (power operation) and 2 (startup). Events occurring in mMode 1 are addressed in Section 15.4.2. Events occurring in mMode 2 are initiated with the control rods at the hot zero power (HZP) rod sequence and overlap limits. because plant technical specifications (TS) and operating procedures require that sufficient boron concentration is maintained to prevent a core criticality when the control rods are more deeply inserted. The rod sequence and overlap limits are specified in the Core Opening Limits Report (COLR) and placeTS that put restrictions on the allowed RCCSA bank positions as a function of core power. These restrictions are known as the Power Dependent Insertion Limits (PDIL). Therefore, sufficient shutdown margin must be maintained to preclude an inadvertent criticality by RCCA withdrawal until the RCCAs are in compliance with the PDIL. In mode 3 (hot standby), the plant TS and operating procedures require that sufficient boron concentration is maintained to prevent the core from going critical, even if the control rods are fully withdrawn. Therefore, an RCCA bank withdrawal from mode 3 will not result in a core criticality.

For an RCCA bank withdrawal transient to occur, the control rod breakers must be energized (RCCAs are capable of being withdrawn). In Mode 3 below the minimum temperature for criticality (568°F), the RCCAs are normally not capable of being withdrawn (control rod breakers are not energized). If, for any reason, it becomes possible for the RCCAs to be withdrawn below the minimum temperature for criticality (cold rod exercise testing), sufficient boron is added to the system to preclude an inadvertent criticality in the event of an inadvertent RCCA withdrawal.

In mModes 4 (hot shutdown), 5 (cold shutdown), and 6 (refueling), the control rod breakers are not energized and an RCCA bank withdrawal event cannot occur. The same exception for cold rod exercise testing, as discussed above for Mode 3, applies in Modes 4 and 5. Therefore, RCCA withdrawals from the shutdown modes are protected by de-energizing the control rod breakers or providing sufficient boron concentration to preclude an inadvertent criticality by RCCA withdrawal.

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The uncontrolled addition of reactivity to the reactor core by an uncontrolled RCCA bank withdrawal is postulated to result from a malfunction of the reactor control or RCCA control systems, which leads to a power excursion. The neutron flux response to the continuous reactivity insertion is characterized by a fast rise limited by the reactivity feedback effect of the negative fuel temperature coefficient. This self-limitation of the power excursion is important because it limits the power during the delay for the safety system to respond. The excore neutron flux level is measured during the transient. If the detected flux or rate of change of flux exceeds a threshold values, a reactor trip (RT) is initiated.

The transient is terminated by the following RT signals that are part of the PS:

- High positive neutron flux rate of change (power range). This signal limits the consequences of an excessive reactivity increase from an intermediate power level as well as from hot full power (HFP) power. The signal is a representation of the nuclear flux derivative based on the excore instrumentation.

- Low doubling time of (intermediate range) neutron flux. This signal is the doubling time of the nuclear flux derived from the intermediate range detectors.

- Intermediate range hHigh neutron flux (intermediate range). This signal is the nuclear flux derived from the intermediate range detectors.

These three trip setpoints are reached nearly simultaneously during uncontrolled RCCA bank withdrawals from HZP because of the fastrapid power increase.

The applicable acceptance criteria for the uncontrolled RCCA bank withdrawal from a subcritical or low-power condition event are as follows:

- The departure from nucleate boiling ratio (DNBR) thermal margin limit is met.

- Fuel centerline temperatures do not exceed the melting point.

- Uniform cladding strain does not exceed one percent.

The pressure acceptance criterion requires that the pressures in the reactor coolant and the main steam systems are maintained below 110 percent of their respective system design pressures. RCS and secondary pressure do not rise significantly until turbine trip (TT) occurs on RT with delay. Because TT occurs after RT, the capacity of the main steam relief trains (MSRT) is adequate to prevent opening of the main steam safety valves (MSSV). RCS pressure does not increase to the pressurizer safety relief valve (PSRV) setpoint. Therefore, peak RCS and secondary pressures for this event are bounded by the TT and main steam isolation valve closure (MSIVC) events, respectively.

This event primarily challenges the specified acceptable fuel design limits (SAFDL). The minimum calculated departure from nucleate boiling ratio (DNBR) is greater than the 95/95 safety limit of the applicable DNBR correlation, which demonstrates that a departure from nucleate boiling (DNB) is avoided. The peak central temperature of the fuel is maintained lower than the melting pointing during the event.

15.4.1.2 Method of Analysis and Assumptions

The methodology for this event uses the S-RELAP5 computer code to simulate the responses to the event of the primary and secondary coolant systems, reactor, protective equipment and systems, and automatic controllers. The transient analysis is performed using the methodology described in the Codes and Methods Applicability Report for the U.S. EPR (Reference 1). Section 15.0.2 provides a description of the S-RELAP5 analysis methodology.

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The focus for this event is the SAFDLs. A single S-RELAP5 system response case is analyzed for this event to evaluate the minimum departure from nucleate boiling ratio (MDNBR) and the peak fuel centerline temperature. This limiting case uses the maximum RCCA bank withdrawal rate and a maximum differential bank reactivity worth for the fastest possible power increase. This limiting case also uses the most positive beginning of cycle (BOC) value for moderator temperature coefficient (MTC) with +2 pcm/°F uncertainty added resulting in the fastest reactivity increase. The most positive Doppler temperature coefficient is used and is also biased by 10 percent to minimize the effect of Doppler reactivity feedback during the event. Doppler reactivity feedback will slow the reactivity increase because fuel temperature increases during this event. The analysis assumes the initial power level is below the power level expected for any shutdown condition (10^{-9} fraction of rated power). The combination of highest reactivity insertion rate and low initial power produces the highest peak heat flux. The limiting case assumes a LOOP. The limiting case uses the minimum Technical Specification (TS) value for scram reactivity worth to slow the rate of decrease in reactivity due to scram. The limiting case also uses a maximum BOC value for delayed neutron fraction for reactivity conversion to produce lower kinetics feedback and the initial RCS loop flowrate is biased low to minimize MDNBR.

The core thermal-hydraulic computer code LYNXT is used to calculate the core flow, enthalpy distributions, DNBR, and peak fuel centerline temperatures using the RCS response from S-RELAP5 as a boundary condition as described in Incore Trip Setpoint and Transient Methodology for the U.S. EPR (Reference 2).

Table 15.4-1—Uncontrolled Control Bank Withdrawal from a Subcritical or Low-Power Startup Condition - Key Input Parameters lists the key input parameters for the limiting case. Table 15.4-2—Uncontrolled Control Bank Withdrawal from a Subcritical or Low-Power Startup Condition - Equipment Status lists the plant systems and equipment that are available to mitigate the effects of this event. The effect of

16-311, Part 16-203

non-safety-related equipment is considered in this analysis when it results in a more limiting transient. The analysis assumes that the scram worth includes the most reactive RCCA is stuck in a fully withdrawn position. There is no single failure that can lead to more severe consequences. The PS is single failure proof due to its redundancy. The uncontrolled RCCA bank withdrawals from HZP are simulated by withdrawing ~~either~~ the control banks ~~or the shutdown banks~~ with the maximum RCCA velocity and a maximum differential worth from the bank overlap positions.

15.4.1.3 Results

Table 15.4-3—Uncontrolled Control Bank Withdrawal from a Subcritical or Low-Power Startup Condition - Sequence of Events presents the sequence of events for the limiting case. Figure 15.4-1—Uncontrolled Control Bank Withdrawal from a Subcritical or Low Power Startup Condition - Reactor Power through Figure 15.4-5—Uncontrolled Control Bank Withdrawal from a Subcritical or Low Power Startup Condition - Cold Leg Mass Flow, Figure 15.4-44—Uncontrolled Control Bank Withdrawal from a Subcritical or Low Power Startup Condition - Primary Hot Leg Temperature, and Figure 15.4-45—Uncontrolled Control Bank Withdrawal from a Subcritical or Low Power Startup Condition - Primary Cold Leg Temperature present the response of the most important system parameters.

The minimum DNBR remains above the design limit value (refer to Section 4.4). The peak fuel centerline temperature remains below the fuel melting point. The fuel temperatures do not increase high enough to cause enough fuel expansion to exceed one percent uniform clad strain. Figure 15.4-46—Uncontrolled Control Bank Withdrawal from a Subcritical or Low Power Startup Condition - Normalized Minimum DNBR and FCM to SAFDL presents the DNB and fuel centerline melt (FCM) normalized to their respective SAFDLs.

15.4.1.4 Radiological Conclusions

Radiological consequences are not calculated for this event because no fuel or cladding damage occurs and no radioactive materials are released to the environment.

15.4.1.5 Conclusions

The analyses presented evaluate an uncontrolled control rod assembly withdrawal from a subcritical or low-power startup condition. During this event, the plant instrumentation, protection functions, and equipment provide an RT sufficiently early to preclude fuel or cladding damage. The core remains adequately cooled throughout this event.

1.1 Definitions

PHYSICS TESTS	PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation. These tests are: a. Described in FSAR Chapter 14, "Verification Programs"; b. Authorized under the provisions of 10 CFR 50.59; or c. Otherwise approved by the Nuclear Regulatory Commission.
PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)	The PTLR is the unit specific document that provides the reactor vessel pressure and temperature limits, including heatup and cooldown rates and the low temperature overpressure protection setpoints, for the current reactor vessel fluence period. These pressure and temperature limits shall be determined for each fluence period in accordance with Specification 5.6.4, "Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)."

16-311, Part 16-193(a)

PROTECTION SYSTEM (PS) RESPONSE TIME	-------------------------REVIEWER'S NOTE------------------------- The last sentence in the PS RESPONSE TIME definition applies to plants that have obtained NRC approval to utilize allocations for selected components based on NRC-approved U.S. EPR-applicable Topical Report. -- The PS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its PS actuation setpoint at the division sensor until the PS equipment is capable of performing its safety function (i.e., loss of stationary gripper coil voltage, the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. [In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.]

16-311, Part 16-193(a)

~~REVIEWER'S NOTE~~
~~Applicable portions of NRC approved Topical Reports may be utilized to modify the requirements for response time surveillance testing. These applicable portions of NRC approved Topical Reports should be referenced and discussed in the Bases description for the PS RESPONSE TIME surveillance requirement.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two or more RCCAs not within alignment limits.	D.1.1 Verify SDM to be within the limits specified in the COLR.	1 hour
	OR	
	D.1.2 Initiate boration to restore SDM to within limit.	1 hour
	AND	
	D.2 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Verify individual RCCA positions within alignment limit.	12 hours
SR 3.1.4.2	Verify RCCA freedom of movement (tripability) by moving each RCCA not fully inserted in the core 16 to 20 steps in either direction.	92 days
SR 3.1.4.3	Verify drop time of each RCCA, from the fully withdrawn position, is $\leq$ 3.5 seconds from opening of the reactor trip breaker to the centerline of lowest RCCA position indication coil, with: a. $T_{avg} \geq$ ~~500~~568°F; and [16-311, Part 16-203] b. All reactor coolant pumps operating.	Prior to criticality after each removal of the reactor head

3.3 INSTRUMENTATION

3.3.1 Protection System (PS)

LCO 3.3.1 The PS sensors, manual actuation switches, signal processors, and actuation devices specified in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1.

ACTIONS

--- NOTE ---
Separate Condition entry is allowed for each sensor, manual actuation switch, signal processor, and actuation device.

16-311, Part 16-180(a)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more sensors inoperable.	A.1 -------------NOTE-------------- Only applicable for Table 3.3.1-1, Component A.~~24~~27. -------------------------------------- Place inoperable sensor in trip.	1 hour
	AND	
	A.2 -------------NOTE-------------- Not applicable for Table 3.3.1-1, Component A.~~24~~27. -------------------------------------- Place inoperable sensor in lockout.	4 hours

Table 3.3.1-1 (page 2 of 97)
Protection System Sensors, Manual Actuation Switches,
Signal Processors, and Actuation Devices

16-311, Part 16-180(a)

COMPONENT	REQUIRED NUMBER OF SENSORS, SWITCHES, SIGNAL PROCESSORS, OR ACTUATION DEVICES	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY	CONDITION	SURVEILLANCE REQUIREMENTS
6. Cold Leg Temperature (Wide Range)	4	1,2(e),3(c)	3	N,S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	4(c)(f)	3	O,S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5(c)(f)	2	Q,	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	6(f)	2	S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
7. Containment Equipment Compartment Pressure	4	1,2,3,4	3	N	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
8. Containment Service Compartment Pressure (Narrow Range)	4	1,2,3,4	3	N	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
9. Containment Service Compartment Pressure (Wide Range)	4	1,2,3,4	3	N	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
10. Containment Equipment Compartment/ Containment Service Compartment Delta Pressure	2 per division, 4 divisions	1,2,3,4	1 per division, 3 divisions	N	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10

(c) With P7 permissive P7 inhibited (one or more RCPs in operation).

(e) With P5 permissive P5 validated.

(f) When Pressurizer Safety Relief Valve (PSRV) OPERABILITY is required by LCO 3.4.11.

Table 3.3.1-1 (page 3 of 97)
Protection System Sensors, Manual Actuation Switches,
Signal Processors, and Actuation Devices

16-311, 16-180(a)

COMPONENT	REQUIRED NUMBER OF SENSORS, SWITCHES, SIGNAL PROCESSORS, OR ACTUATION DEVICES	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY	CONDITION	SURVEILLANCE REQUIREMENTS
1011. Hot Leg Pressure (Narrow Range)	4	4(f)	3	S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5(f),6(f)	2	S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
1012. Hot Leg Pressure (Wide Range)	4	1,2,3,4	3	L,N,S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5,6	2	R,S	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
1113. Hot Leg Temperature (Narrow Range)	4 per division, 4 divisions	1,2(e)	3 per division, 3 divisions	J	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10

(e) With P5 permissive P5 validated.

(f) When Pressurizer Safety Relief Valve (PSRV) OPERABILITY is required by LCO 3.4.11.

Table 3.3.1-1 (page 5 of 97)
Protection System Sensors, Manual Actuation Switches,
Signal Processors, and Actuation Devices

COMPONENT	REQUIRED NUMBER OF SENSORS, SWITCHES, SIGNAL PROCESSORS, OR ACTUATION DEVICES	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY	CONDITION	SURVEILLANCE REQUIREMENTS
1820. Radiation Monitor - Control Room HVAC Intake Activity	4	1,2,3,4	3	T	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5,6 (ia)	2	T	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
1921. RCP CurrentBreaker Position Indication	3 per RCP4	1,2,3,4	2 per RCP3	NO	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5,6	2	Q,R	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
2122. RCP Bus Breaker Position Indication	4	3,4	3	O	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	4	5,6	2	Q,R	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
2023. RCP Delta Pressure	2 per RCP, 4 RCPs	1,2,3,4	1 per RCP, 3 RCPs	N	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
2124. RCP Speed	42 per RCP, 4 RCPs	1(d),3,4	32 per RCP, 3 RCPs	HN	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10
	2 per RCP, 4 RCPs	5,6	2 per RCP, 2 RCPs	Q,R	SR 3.3.1.5 SR 3.3.1.6 SR 3.3.1.10

16-311, Part 16-180(a)

16-311, Part 16-190(c)

16-311, Part 16-190(c)

(a) During movement of irradiated fuel assemblies.

16-311, Part 16-180(a)

(d) With P2 permissive P2 validated.

(i) During movement of irradiated fuel assemblies.

16-311, Part 16-182(b)

Table 3.3.1-2 (page 1 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

--REVIEWER'S NOTE--
~~[Reviewers Note:~~ The values specified in brackets in the ~~Limiting~~ Nominal Trip Setpoint column are included for reviewer information only. A plant-specific setpoint study will be conducted. The values in ~~Limiting~~ the Nominal Trip Setpoint column will then be replaced after the completion of this study. ~~]~~

16-311, Part 16-182(b)

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION		APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY(a)	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
A.	REACTOR TRIP				
1.a.	Low Departure from Nucleate Boiling Ratio (DNBR)	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
1.b.	Low DNBR and (Imbalance or Rod Drop (1/4))	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
1.c.	Low DNBR and Rod Drop (2/4)	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
1.d.	Low DNBR - High Quality	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
1.e.	Low DNBR - High Quality and (Imbalance or Rod Drop (1/4))	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
2.	High Linear Power Density	1(~~d~~b)	3 divisions	[(~~e~~c)~~(b)(c)~~]	H
3.	High Neutron Flux Rate of Change (Power Range)	1,2,3(~~f~~d)	3 divisions	[11% RTP~~(b)(c)~~]	K
4.	High Core Power Level	1,2(~~g~~e)	3 divisions	[105% RTP~~(b)(c)~~]	J
5.	Low Saturation Margin	1,2(~~g~~e)	3 divisions	[30 Btu/lb~~(b)(c)~~]	J
6.a.	Low-Low Reactor Coolant System (RCS) Loop Flow Rate in One Loop	1(~~h~~f)	3 divisions	[54% nominal flow~~(b)(c)~~]	G

(a) A division~~al~~ Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~d~~b) With P2 permissive ~~P2~~ validated.

(~~e~~c) As specified in the COLR.

(~~f~~d) With the RCSL System capable of withdrawing a RCCA or one or more RCCAs not fully inserted.

(~~g~~e) With P5 permissive ~~P5~~ validated.

(~~h~~f) With P3 permissive ~~P3~~ validated.

Table 3.3.1-2 (page 2 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION		APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[(a)]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
6.b.	Low RCS Loop Flow Rate in Two Loops	1[(~~d~~b)]	3 divisions	[90% nominal flow[~~(b)(c)~~]]	H
7.	Low Reactor Coolant Pump (RCP) Speed	1[(~~d~~b)]	3 divisions	[93% nominal speed[~~(b)(c)~~]]	H
8.	High Neutron Flux (Intermediate Range)	1[(~~i~~g)],2,3[(~~f~~d)]	3 divisions	[25% RTP[~~(b)(c)~~]]	K
9.	Low Doubling Time (Intermediate Range)	1[(~~i~~g)],2,3[(~~f~~d)]	3 divisions	[20 sec.[~~(b)(c)~~]]	K
10.	Low Pressurizer Pressure	1[(~~d~~b)]	3 divisions	[2005 psia[~~(b)(c)~~]]	H
11.	High Pressurizer Pressure	1,2	3 divisions	[2415 psia[~~(b)(c)~~]]	J
12.	High Pressurizer Level	1,2,3[(h)]	3 divisions	[75% measuring range[~~(b)(c)~~]]	J
13.	Low Hot Leg Pressure	1,2,3[(~~f~~d)(~~j~~h)]	3 divisions	[2005 psia[~~(b)(c)~~]]	L
14.	Steam Generator (SG) Pressure Drop	1,2,3[(~~f~~d)]	3 divisions	[29 psi/min; 102 psi < steady state; and Max 1088 psia[~~(b)(c)~~]]	K
15.	Low SG Pressure	1,2,3[(~~f~~d)(~~j~~h)]	3 divisions	[725 psia[~~(b)(c)~~]]	L
16.	High SG Pressure	1	3 divisions	[1385 psia[~~(b)(c)~~]]	I
17.	Low SG Level	1,2	3 divisions	[20% Narrow Range[~~(b)(c)~~]]	J
18.	High SG Level	1,2	3 divisions	[69% Narrow Range[~~(b)(c)~~]]	J
19.	High Containment Pressure	1,2,3,4	3 divisions	[18.7 psia[~~(b)(c)~~]]	~~K~~N

16-311, Part 16-182(b)

(a) A divisional Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~d~~b) With P2 permissive ~~P2~~ validated.

(~~f~~d) With the RCSL System capable of withdrawing a RCCA or one or more RCCAs not fully inserted.

(~~i~~g) With P6 permissive inhibited.~~Less than or equal to 10% RTP.~~

(~~j~~h) With P12 permissive ~~P12~~ inhibited.

Table 3.3.1-2 (page 3 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[(a)]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
B. ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (ESFAS) SIGNALS				
1. Turbine Trip on Reactor Trip (RT)	1	3 divisions	[~~Reactor Trip for~~ 1 sec. time delay]	I
2.a. Main Feedwater Full Load Isolation on Reactor Trip (All SGs)	1,2(~~k~~i),3(~~k~~i)	3 divisions	[NA]	M
2.b. Main Feedwater Full Load Isolation on High SG Level (Affected SG~~s~~)	1,2(~~k~~i),3(~~k~~i)	3 divisions	[69% Narrow Range~~(b)(c)~~]	M
2.c. Startup and Shutdown System (SSS)~~Feedwater~~ Isolation on SG Pressure Drop (Affected SG~~s~~)	1,2(~~l~~j),3(~~l~~j)	3 divisions	[29 psi/min; 247 psi < steady state; and Max 943 psia~~(b)(c)~~]	M
2.d. ~~Startup and Shutdown System~~SSS ~~Feedwater~~ Isolation on Low SG Pressure (Affected SG~~s~~)	1,2(~~l~~j),3(~~j~~h)(~~l~~j)	3 divisions	[580 psia~~(b)(c)~~]	L
2.e. ~~Startup and Shutdown System~~SSS ~~Feedwater~~ Isolation on High SG Level for Period of Time (Affected SG~~s~~)	1,2(~~l~~j),3(~~l~~j)	3 divisions	[65% Narrow Range; ~~for~~ and 10 sec. time delay~~(b)(c)~~]	M
2.f. SSS Isolation on High Containment Pressure (All SGs)	1,2,3,4	3 divisions	[18.7 psia]	N
3.a. SIS Actuation on Low Pressurizer Pressure	1,2,3(~~j~~h)	3 divisions	[1668 psia~~(b)(c)~~]	L
3.b. SIS Actuation on Low Delta P_{sat}	3(~~m~~k),4(~~n~~l)	3 divisions	[220 psi~~(b)(c)~~]	O

16-311, Part 16-182(b)

16-311, Part 16-182(b)

(a) A divisional Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~j~~h) With P12 permissive ~~P12~~ inhibited.

(~~k~~i) Except when all MFW full load lines are isolated.

(~~l~~j) Except when all MFW full load and low load lines are isolated.

(~~m~~k) With P12 permissive ~~P12~~ validated.

(~~n~~l) With P15 permissive ~~P15~~ inhibited.

Table 3.3.1-2 (page 4 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[(a)]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
3.c. SIS Actuation on Low RCS Loop Level	4[(~~o~~m)]	3 divisions	[18.9 in.[~~(b)(c)~~]]	O
	5[(m)],6[(m)]	2 divisions		
4.a. RCP Trip on Low Delta Pressure across RCP with SIS Actuation	1,2,3,4	3 divisions	[80% nominal pressure[~~(b)(c)~~]]	N
4.b. RCP Trip on Containment Isolation (Stage 2)	1,2,3,4	3 divisions	[36.3 psia]	N
5. Partial Cooldown Actuation on SIS Actuation	1,2,3,4[(n)]	3 divisions	[NA]	~~M~~N
6.a. Emergency Feedwater System (EFWS) Actuation on Low-Low SG Level (Affected SG~~s~~)	1,2,3,4[(n)]	3 divisions	[40% Wide Range[~~(b)(c)~~]]	~~M~~N
6.b. EFWS Actuation on Loss of Offsite Power (LOOP) and SIS Actuation (All SGs)	1,2	3 divisions	[NA]	
7.a. Main Steam Relief Train (MSRT) Actuation on High SG Pressure (Affected SG)	1,2,3,4[(~~p~~n)]	3 divisions	[1385 psia[~~(b)(c)~~]]	N
7.b. MSRT Isolation on Low SG Pressure (Affected SG)	1,2,3[(~~j~~h)]	3 divisions	[580 psia[~~(b)(c)~~]]	L
8.a. Main Steam Isolation Valve (MSIV) Isolation on SG Pressure Drop (All SGs)	1,2,3[(~~q~~o)]	3 divisions	[29 psi/min; 102 psi < steady state; and Max 1088 psia[~~(b)(c)~~]]	M
8.b. MSIV Isolation on Low SG Pressure (All SGs)	1,2,3[(~~j~~h)(~~q~~o)]	3 divisions	[725 psia[~~(b)(c)~~]]	L
8.c. MSIV Isolation on High Containment Pressure (All SGs)	1,2,3,4	3 divisions	[18.7 psia]	N

16-311, Part 16-182(b)

16-311, Part 16-182(b)

16-311, Part 16-182(b)

(a) A divisional Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~j~~h) With P12 permissive ~~P12~~ inhibited.

(~~o~~m) With P15 permissive ~~P15~~ validated.

(~~p~~n) When the SGs are relied upon for heat removal.

(~~q~~o) Except when all MSIVs are closed.

Table 3.3.1-2 (page 5 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
9.a. Containment Isolation (Stage 1) on High Containment Pressure	1,2,3,4	3 divisions	[18.7 psia~~(b)(c)~~]	N
9.b. Containment Isolation (Stage 1) on SIS Actuation	1,2,3,4	3 divisions	[NA]	N
9.c. Containment Isolation (Stage 2) on High-High Containment Pressure	1,2,3,4	3 divisions	[~~≤~~ 36.3 psia~~(b)(c)~~]	N
9.d. Containment Isolation (Stage 1) on High Containment Radiation	1,2,3,4	3 divisions	[≤ 100 x background~~(b)(c)~~]	N
10.a. Emergency Diesel Generator (EDG) Start on Degraded Grid Voltage	1,2,3,4	4 divisions	[≥ 6210 V and ≤ 6350 V; ≥ 7 sec. and ≤ 11 sec. w/SIS, ≥ 270 sec. and ≤ 300 sec. wo/SIS~~(b)(c)~~]	P
	5,6,(~~r~~p)	2 divisions		P
10.b. EDG Start on LOOP	1,2,3,4	4 divisions	[≥ 4830 V and ≤ 4970 V; ≥ 0.4 sec. and ≤ 0.6 sec.~~(b)(c)~~]	P
	5,6,(~~r~~p)	2 divisions		P
11.a. Chemical and Volume Control System (CVCS) Charging Line Isolation on High-High Pressurizer Level	1,2,3,4(~~s~~q)	3 divisions	[80% measuring range~~(b)(c)~~]	N
11.b. CVCS Isolation on Anti-Dilution Mitigation (ADM) - Shutdown Conditions (RCPs not operating)	3(~~t~~r),4(~~t~~r)	3 divisions	[927 ppm~~(b)(c)~~]	O
	5(~~t~~r),6(r)	2 divisions		Q

16-311, Part 16-180(a)

16-311, Part 16-182(b)

(a) A division~~al~~al Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~r~~p) During movement of irradiated fuel assemblies.

(~~s~~q) With P17 permissive ~~P17~~ inhibited.

(~~t~~r) With P7 permissive ~~P7~~ validated (no RCPs in operation).

Table 3.3.1-2 (page 6 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[(a)]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
11.c. CVCS Isolation on ADM - Standard Shutdown Conditions	3[(~~u~~s)],4[(~~u~~s)]	3 divisions	[(~~e~~c)[~~(b)(c)~~]]	O
	5[(~~u~~s)]	2 divisions		Q
11.d. CVCS Isolation on ADM at Power	1,2	3 divisions	[(~~e~~c)[~~(b)(c)~~]]	J
12.a. Pressurizer Safety Relief Valve (PSRV) Actuation - First Valve	4[(~~v~~t)(v)]	3 divisions	[(~~w~~u)]	S
	5[(~~v~~t)(v)],6[(~~v~~t)(v)]	2 divisions		S
12.b. PSRV Actuation - Second Valve	4[(~~v~~t)]	3 divisions	[(~~w~~u)]	S
16-311, Part 16-180(a)	5[(~~v~~t)],6[(~~v~~t)]	2 divisions		S
13. Control Room Heating, Ventilation, and Air Conditioning Reconfiguration to Recirculation Mode on High Intake Activity	1,2,3,4	3 divisions	[≤ 3 x background[~~(b)(c)~~]]	T
	5,6,(~~r~~p)	2 divisions		T

16-311, Part 16-182(b)

(a) A division~~al~~ Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

(~~e~~c) As specified in the COLR.

(~~r~~p) During movement of irradiated fuel assemblies.

(~~u~~s) With P7 permissive ~~P7~~ inhibited (one or more RCPs in operation).

(~~v~~t) When PSRV OPERABILITY is required by LCO 3.4.11.

(~~w~~u) As specified in the Pressure Temperature Limits Report.

(v) With P17 permissive validated.

16-311, Part 16-182(b)

Table 3.3.1-2 (page ~~6~~7 of ~~7~~8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[a]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
14.a. Hydrogen Mixing Dampers Opening on High Containment Pressure	1,2,3,4	3 divisions	[17.4 psia]	N
14.b. Hydrogen Mixing Dampers Opening on High Containment Compartments Delta Pressure	1,2,3,4	3 divisions	[0.5 psi]	N
C. PERMISSIVES				
P2 - Flux (Power Range) Measurement Higher than First Threshold	1 (~~≥~~≥ 10% RTP)	3 divisions	[10% RTP]	H
P3 - Flux (Power Range) Measurement Higher than Second Threshold	1 (~~≥~~≥ 70% RTP)	3 divisions	[70% RTP]	G
P5 - Flux (Intermediate Range) Measurement Higher than Threshold	1,2 (~~≥~~≥ 10^{-5}% RTP)	3 divisions	[10^{-5}% RTP]	J

(a) A divisional Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

16-311, Part 16-182(b)

Table 3.3.1-2 (page 8 of 8)
Acquisition and Processing Unit Requirements Referenced from Table 3.3.1-1

TRIP / ~~ACTUATION FUNCTION~~ESF / PERMISSIVE FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	MINIMUM REQUIRED FOR FUNCTIONAL CAPABILITY[(a)]	[NOMINAL ~~LIMITING~~ TRIP SETPOINT ~~/ DESIGN LIMIT~~]	CONDITION
P7 - RCPs Not in Operation	3(~~t~~),4(~~t~~)	3 divisions	[~~50% no load current~~90% nominal speed; and 600 sec. time delay]	O
	5(~~t~~),6(~~t~~)	2 divisions		Q
16-311, Part 16-190(c)				
P8 - Shutdown Rod Cluster Control Assembly Position Lower than Threshold	3(~~u~~s),4(~~u~~s)	3 divisions	[~~All rods in~~NA]	O
	5(~~u~~s)	2 divisions		Q
P12 - Pressurizer Pressure Lower than Threshold	3 (RCS < 2005 psia),4(~~n~~l)	3 divisions	[2005 psia]	O
16-311, Part 16-182(b)				
P14 - Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds	1,2,3,4(~~p~~n)	3 divisions	[350ºF; and 464 psia]	N
P15 - Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown	4	3 divisions	[350ºF~~,~~, 464 psia;~~,~~ ~~and~~ 90% nominal speed; and 600 sec. time delay ~~50% no load current~~]	O
	5, 6	2 divisions		R
	16-311, Part 16-190(c)			
P16 - Hot Leg Pressure ~~and Delta P_{sat}~~ Lower than Thresholds~~, RCP Not in Operation, and Time Elapsed since Safety Injection start~~	1, 2, 3, 4	3 divisions	[290 psia~~, P$_{sat}$ 73 psi, 90% nominal speed for 600 sec.50% no load current, and 1.5 hrs post-SI~~]	N
16-311, Part 16-182(b)				
P17 - Cold Leg Temperature Lower than Threshold	4(~~v~~t)	3 divisions	[248ºF]	OS
	5(~~v~~t),6(~~v~~t)	2 divisions		S
		16-311, Part 16-180(a)		

(a) A divisional Function is OPERABLE provided: a) the minimum sensors required for functional capability for all sensors providing input to the Trip/~~Actuation Function~~ESF/Permissive Function are OPERABLE; and b) the associated signal processors are OPERABLE.

~~(b) If the as-found setpoint is outside its predefined as-found tolerance, then the Trip/Actuation Function shall be evaluated to verify that it is functioning as required before returning the Trip/Actuation Function to service.~~

~~(c) The setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the division shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm Trip/Actuation Function performance. The methodologies used to determine the as-found and the as-left tolerances are specified in a document controlled under 10 CFR 50.59.~~

(~~n~~l) With P15 permissive ~~P15~~ inhibited.

16-311, Part 16-182(b)

(~~p~~n) When the SGs are relied upon for heat removal.

~~(t) With P7 permissive P7 validated (no RCPs in operation).~~

16-311, Part 16-190(c)

(~~u~~s) With P7 permissive ~~P7~~ inhibited (one or more RCPs in operation).

(~~v~~t) When PSRV OPERABILITY is required by LCO 3.4.11.

16-311, Part 16-182(b)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.4.3

16-311, Part 16-203

Verification of RCCA drop times allows the operator to determine that the maximum RCCA drop time permitted is consistent with the assumed RCCA drop time used in the safety analysis. Measuring RCCA drop times prior to reactor criticality, after each reactor vessel head removal, ensures that the reactor internals and rod drive mechanism will not interfere with RCCA motion or RCCA drop time, and that no degradation in these systems has occurred that would adversely affect ~~control~~ RCCA motion or drop time. This testing is performed with all RCPs operating and the average moderator temperature ~~≥ 500~~is greater than the minimum temperature for criticality (568°F) to simulate a reactor trip under actual conditions. Performing rod drop testing at less than the temperature specified for hot zero power (578°F) is conservative due to increased reactor coolant density at lower temperature and the associated increase in rod drop resistance. If RCCAs are made capable of being withdrawn below the minimum temperature for criticality, the boron concentration must be greater than that specified in the COLR for this condition.

This Surveillance is performed prior to criticality after each removal of the reactor head, due to the plant conditions needed to perform the SR and the potential for an unplanned plant transient if the Surveillance were performed with the reactor at power.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 10 and GDC 26.

2. 10 CFR 50.46.

3. FSAR Chapter 15.

BASES

BACKGROUND (continued)

16-311, Part 16-182(b)

------------------------------------REVIEWER'S NOTE------------------------------------
The term "Limiting Trip Setpoint (LTSP)" is generic terminology for the setpoint value calculated by means of the plant-specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term LTSP indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting. Where margin is added between the Analytical Limit and trip setpoint, the term Nominal Trip Setpoint (NTSP) is preferred. The trip setpoint (field setting) may be more conservative than the Limiting or Nominal Trip Setpoint.

Where the LTSP is not included in Table 3.3.1-2 for the purpose of compliance with 10 CFR 50.36, the plant-specific term for the Limiting or Nominal Trip Setpoint must be cited in Note c of Table 3.3.1-2. The as-found and as-left tolerances will apply to the actual setpoint implemented in the Surveillance procedures to confirm division performance.

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the LTSP NTSP and the methodology for calculating the as-left and as-found tolerances, for the phrase "a document controlled under 10 CFR 50.59" in the specifications footnote (c) of Table 3.3.1-1.

The Nominal Trip Setpoint (NTSP) LTSP is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the NTSP LTSP accounts for uncertainties in setting the device (e.g., CALIBRATION), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the device over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments (Ref. 6)). In this manner, the NTSP LTSP ensures that SLs are not exceeded. As such, the NTSP LTSP meets the definition of an SL-LSSS (Ref. 1). The NTSPs LTSPs are determined as part of the safety analysis (Ref. 5).

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." However, the use of the LTSP sensor calibration settings to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an the OPERABILITY limits for the "as-found" values of a protectivesensing device calibration settings during a performance of Surveillances. This

BASES

BACKGROUND (continued)

16-311, Part 16-182(b)

would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, ~~an automatic protective~~a sensing device with ~~a setting~~an as-found sensor calibration setting value that has been found to be different from the ~~LTSP~~ specified sensor calibration setting due to some drift of the ~~setting~~ sensor may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the ~~LTSP~~ NTSP and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as-found" ~~setting~~ value of the ~~protective~~ sensing device. Therefore, the sensing device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to ~~reset the device to the trip setpoint~~calibrate the sensor to account for further drift during the next surveillance interval.

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. The Allowable Value is the least conservative value of the as-found sensor calibration setting ~~setpoint~~ that a ~~division~~ sensor can have when tested such that ~~a division~~the sensor is OPERABLE if the as-found sensor calibration setting value~~setpoint~~ is conservative with respect to the Allowable Value during a CALIBRATION. As such, the Allowable Value differs from the ~~Nominal Trip Setpoint~~ sensor calibration setting by an amount greater than or equal to the expected instrument ~~channel~~ loop uncertainties, such as drift, during the surveillance interval. In this manner, the ~~actual setting~~CALIBRATION of the device will ensure that an SL is not exceeded at any given point ~~of~~ in time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the ~~division~~ sensor is OPERABLE under these circumstances, the ~~setpoint~~ as-left sensor calibration setting values must be ~~left adjusted to a value within~~ set or confirmed to be within the as-left tolerance around the specified calibration settings at the completion of the surveillance, and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found). If the actual sensor calibration setting value ~~setting of the device~~ is found to be non-conservative with respect to the Allowable Value, the ~~device~~ sensor would be considered inoperable from a Technical Specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

BASES

BACKGROUND (continued)

16-311, Part 16-182(b)

Note that the Allowable Value is the least conservative value of the as-found sensor calibration setting setpoint that a Trip/Actuation Function sensor can have during a periodic CALIBRATION or SOT, such that a Trip/Actuation Function the sensor is OPERABLE if the as-found sensor calibration setting value setpoint is conservative with respect to the Allowable Value.

Functional testing of the entire PS, from sensor input through the opening of individual sets of Reactor Trip Circuit Breakers (RTCBs) or Reactor Trip Contactors, is performed each refueling cycle. Process transmitter CALIBRATION is also normally performed on a refueling basis.

Trip setpoints that directly protect against violating the reactor core or RCS pressure boundary Safety Limits during AOOs are SL-LSSS. Permissive setpoints allow bypass of trips when they are not required by the Safety Analysis. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventative or mitigating actions occur. Because these The permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e., the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO). Therefore permissives and interlocks are not considered to be SL-LSSS.

Manual Actuation Switches

Manual actuation switches are provided to initiate the reactor trip function from the main control room (MCR) and the remote shutdown station (RSS). The ability to manually initiate ESF systems is provided in the MCR. Manual actuation of ESF systems initiates all actions performed by the corresponding automatic actuation including starting auxiliary or supporting systems and performing required sequencing functions.

Signal Processors

The PS is a distributed, redundant computer system. It consists of four independent redundant data-processing automatic paths (divisions), each with layers of operation and running asynchronous with respect to each other. In addition to the computers associated with the automatic paths, there are two message and service interface computers to interface with each division.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Each of the analyzed transients and accidents can be detected by one or more PS functions. Each of the PS reactor trips and ESF functions included in the Technical Specifications are credited as part of the primary success path in the accident analysis. Non-credited functions are not included in the Technical Specifications. Refer to FSAR Sections 7.2 and 7.3 for a description of the reactor trip and ESF functions, respectively. Credited functions are included in FSAR Tables 15.0-7, 15.0-8, and 15.0-9.

The LCO requires the PS sensors, manual actuation switches, signal processors, and ~~specified~~ actuation devices to be OPERABLE. The LCO ensures that each of the following requirements is met:

– A reactor trip or ESF function will be initiated when necessary; and
– Sufficient redundancy is maintained to permit a component to be out of service for testing or maintenance.

Failure of any sensors, signal processors, or actuation device reduces redundancy or renders the affected division(s) inoperable.

Trip setpoints that directly protect against violating the reactor core or RCS pressure boundary SLs during AOOs are SL-LSSS. Permissives ~~and interlock setpoints~~ allow bypass of trips when they are not required by the Safety Analysis. These permissives ~~and interlocks~~ ensure that the starting conditions are consistent with the safety analysis, before preventative or mitigating actions occur. ~~Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy, (i.e., the value indicated is sufficiently close to the necessary value to ensure proper operation of the safety systems to turn the AOO).~~ Therefore permissives ~~and interlocks~~ are not considered to be SL-LSSS. Each ~~LTSP~~ specified NTSP is more conservative than the Analytical Limit assumed in the safety analysis in order to account for instrument uncertainties appropriate to the trip function. The methodologies for considering uncertainties are defined in References 1 and 4.

16-311, Part 16-182(b)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

In MODES 5 and 6, automatic actuation of the ESF functions is not normally required because adequate time is available to evaluate plant conditions and respond by manually operating the ESF components if required. Exceptions to this are:

- ESF 3.c: SIS Actuation on Low RCS Loop Level,
- ESF 10.a: Emergency Diesel Generator (EDG) Start on Degraded Grid Voltage,
- ESF 10.b: EDG Start on Loss of Offsite Power (LOOP),
- ESF 11.b: Chemical and Volume Control System (CVCS) Isolation on Anti-Dilution Mitigation (ADM) - Shutdown Conditions (RCPs Not Operating), 16-311, Part 16-190(c)
- ESF 11.c: CVCS Isolation on ADM - Standard Shutdown Conditions,
- ESF 12.a and 12.b: PSRV Actuation - First and Second Valve, and
- ESF 13: Control Room Heating, Ventilation and Air Conditioning (HVAC) Reconfiguration to Recirculation Mode on High Intake Activity.

These ESF functions are required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies to ensure that:

- Systems to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;
- Systems needed to mitigate a fuel handling accident are available; and
- Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available.

The specific safety analysis and OPERABILITY requirements applicable to each PS protective function ~~is~~ are identified below. Permissives that enable a credited function when the permissives are validated ~~will be~~are included in the Technical Specifications. Permissives that disable a reactor trip or ESF function when validated are not part of a primary success path of a safety sequence analysis. While their failure may lead to a spurious reactor trip or ESF actuation, their functioning is not credited to mitigate an accident of anticipated operational occurrence, nor to keep the plant in an analyzed condition.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This function mitigates the following postulated accidents or AOOs:

- Inadvertent opening of a PSRV, and
- Small break LOCA.

The RCP Trip on Low Delta Pressure across RCP with SIS Actuation function requires four divisions of the following sensors and processors to be OPERABLE in MODES 1, 2, 3, and 4:

- RCP Delta Pressure sensors,
- ~~RCP Current sensors,~~
- APUs, and
- ALUs.

16-311, Part 16-190(c)

The sensors required to generate the SIS actuation signal are identified under each separate ESF function: SIS on Low Pressurizer Pressure (Function B.3.a), SIS Actuation on Low Delta P_{sat} (Function B.3.b), and SIS Actuation on Low RCS Loop Level (Function B.3.c).

The ~~LTSP~~ NTSP ~~for the RCP Trip on Low Delta Pressure across RCP with SIS Actuation function~~ is ~~set~~ low enough to avoid spurious operation but high enough to ensure core cooling is maintained.

There are no ~~automatic~~ permissives associated with this function.

b. Containment Isolation (Stage 2)

In case of LOCA, the RCPs are tripped to prevent their operation in scenarios where the cooling water and seal water are isolated to the RCP.

This function mitigates the following postulated accidents or AOOs:

- Inadvertent opening of a pressurizer pilot operated safety valve, and
- LOCA.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

16-311, Part 16-190(c)

b. Isolation on ADM - Shutdown Conditions (RCPs Not Operating)

The ADM function in the Shutdown Conditions mitigates a dilution event where no RCPs are in operation. This function ensures that:

– The dilution is stopped when the protection is actuated, and
– The core remains sub-critical.

16-311, Part 16-190(c)

The automatic CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating) function is required to be OPERABLE in MODES 3, 4, ~~and~~ 5, and 6 with no RCPs in operation~~, and in MODE 6~~.

16-311, Part 16-190(c)

The automatic CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating) function requires the following sensors and processors:

– Boron Concentration - CVCS Charging Line sensors (4 divisions),
– Boron Temperature - CVCS Charging Line sensors (4 divisions),
– APUs (4 divisions), and
– ALUs (Divisions 1 and 4).

The ~~LTSP~~ NTSP is low enough to provide an operating envelope that prevents unnecessary isolations but high enough to mitigate a dilution event in the shutdown condition where the RCPs are not in operation.

16-311, Part 16-190(c)

~~Validating~~ Validation of the P7 permissive automatically enables the CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating) function when all RCPs are not in operation. When any RCP is operating, the function is automatically disabled by ~~inhibiting~~ inhibition of the P7 permissive ~~P7~~.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

d. Isolation on ADM at Power

This function mitigates a homogeneous dilution event at power conditions. This function ensures that the dilution is stopped when the protection is actuated.

The automatic CVCS Isolation on ADM at Power function requires the following sensors and processors in MODES 1 and 2:

- Boron Concentration - CVCS Charging Line sensors (4 divisions),
- Boron Temperature - CVCS Charging Line sensors (4 divisions),
- CVCS Charging Line Flow sensors (4 divisions),
- APUs (4 divisions), and
- ALUs (Divisions 1 and 4).

The ~~LTSP~~ NTSP is low enough to provide an operating envelope that prevents unnecessary isolations but high enough to mitigate a dilution event at power.

~~Inhibiting~~ Inhibition of the P8 permissive automatically enables the CVCS Isolation on ADM at Power function when any of the RCCA Shutdown Bank Bottom Position Indicators show an RCCA is not inserted.

12.a and 12.b. PSRV Actuation - First and Second Valve

The integrity of the reactor pressure vessel must be ensured under all plant conditions. At low coolant temperature, the cylindrical part of the vessel could fail by brittle fracture before the design pressure of the RCS is reached. Therefore the low-temperature overpressure protection (LTOP) is ensured by opening of the PSRVs.

This function mitigates a low temperature overpressure event.

The automatic PSRV~~s~~ Actuation function requires four divisions of the following sensors and processors to be OPERABLE in MODES 3, 4 and 5 when the PSRVs are required to be OPERABLE by LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP)":

- Hot Leg Pressure (~~Wide~~ Narrow Range) sensors,
- APUs, and
- ALUs.

16-311. Part 16-180(a)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

RCS Loop Flow, Hot Leg Pressure (Narrow Range) measurements, Hot Leg Temperature (Narrow Range) measurements, and Cold Leg Temperature (Narrow Range) measurements are used to calculate core THERMAL POWER. These calculated core THERMAL POWER levels are compared to the setpoint. When three out of four of the calculated core THERMAL POWER levels are greater than the setpoint, the operator is prompted to manually validate the permissive.

The value of the permissive was selected at the boundary between the operating range of the iIntermediate rRange dDetectors and the pPower rRange dDetectors.

Permissives that disable a reactor trip or ESF function when the permissives are validated are not part of a primary success path of a safety sequence analysis. While their failure may lead to a spurious reactor trip or ESF actuation, their functioning is not credited to mitigate an accident or anticipated operational occurrence, nor to keep the plant in an analyzed condition. Since the P6 permissive P6 only disables functions when the permissive is validated, it is not within the scope of 10 CFR 50.36, Criterion 3.

16-311, Part 16-190(c)

5. P7 - RCPs Not in Operation

The P7 permissive facilitates plant heat-up and cooldown by disabling certain ESF functions.

The P7 permissive is utilized in the following ~~reactor trips or~~ ESF functions:

16-311, Part 16-190(c)

- ESF 11.b: CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating), and
- ESF 11.c: CVCS Isolation on ADM - Standard Shutdown Conditions.

16-311, Part 16-190(c)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The P7 permissive requires four divisions of the following sensors and processors to be OPERABLE in MODES 3, 4, 5, and 6 with no RCPs in operation:

16-311, Part 16-190(c)

- RCP Breaker Position Indication,
- RCP Bus Breaker Position Indication,
- RCP Speed,
- RCP Current sensors,
- APUs, and
- ALUs.

If two out of four of the following conditions are true, then a signal is generated for that pump:

- RCP Breaker open position,
- RCP Bus Breaker open position,
- First RCP Speed measurement less than or equal to a setpoint (approximately 90%), and
- Second RCP Speed measurement less than or equal to a setpoint (approximately 90%).

When signals are generated for all four pumps, a delay time (approximately 600 seconds) is started. After the delay time has expired, the permissive is automatically validated.
The RCP current measurements (three per RCP) from different pumps are compared to a setpoint (less than approximately 50% no load current). When two out of three of the measurements taken from all four divisions are less than the setpoint, the permissive is validated (i.e., indicates that the RCPs are not in operation).

The value of the permissive setpoint was selected to establish the requirements for anti-dilution mitigation in a timely manner.

6. P8 - Shutdown RCCA Position Lower than Threshold

The P8 permissive defines the shutdown state with all rods in (ARI).

The P8 permissive is utilized in the following ESF functions:

- ESF 11.c - CVCS Isolation on ADM - Standard Shutdown Conditions, and
- ESF 11.d - CVCS Isolation on ADM at Power.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Hot Leg Temperature (Wide Range) and Hot Leg Pressure (Wide Range) measurements are each compared to a setpoint (350°F, 464 psia). When two out of four of the hot leg temperature measurements are less than the temperature setpoint, and two out of four of the hot leg pressure measurements are less than the pressure setpoint, the operator is prompted to manually validate the permissive. ~~This permissive is manually controlled.~~

10. P15 - Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown

The P15 permissive defines when SIS actuation due to Low Delta P_{sat} is disabled and SIS actuation due to Low RCS Loop Level is enabled.

16-311, Part 16-190(c)

The P15 permissive is utilized in the following ~~reactor trips or~~ ESF functions:

- ESF 3.b: SIS Actuation on Low Delta P_{sat}, and
- ESF 3.c: SIS Actuation on Low RCS Loop Level.

The P15 permissive requires four divisions of the following sensors and processors to be OPERABLE in MODES 4, 5, and 6:

- Hot Leg Temperature (Wide Range) sensors,
- Hot Leg Pressure (Wide Range) sensors,
- RCP Breaker Position Indication,
- RCP Bus Breaker Position Indication,
- RCP Speed,
- ~~RCP Current sensors,~~
- APUs, and
- ALUs.

~~The value for Permissive P15 (RCS temperature less than or equal to approximately 350ºF, RCS pressure less than or equal to approximately 464 psia, and less than or equal to approximately 50% no load current on all RCPs) represents the threshold for switching from the SIS Actuation on Low Delta P_{sat} protection to protection via the SIS Actuation on Low RCS Loop Level.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

If two out of four of the following conditions are true, then a signal is generated for that pump:

- RCP Breaker open position,
- RCP Bus Breaker open position,
- First RCP Speed measurement less than or equal to a setpoint (approximately 90%), and
- Second RCP Speed measurement less than or equal to a setpoint (approximately 90%).

When signals are generated for all four pumps, a delay time (approximately 600 seconds) is started. After the delay time has expired, and the pressure and temperature conditions (RCS pressure less than approximately 464 psia and RCS temperature less than approximately 350°F) are satisfied, the operator is prompted to manually validate the permissive.

16-311, Part 16-190(c)

11. P16 - Hot Leg Pressure and Delta P_{sat} Lower than Thresholds, RCPs Not in Operation, and Time Elapsed since Safety Injection Start

The P16 permissive defines when Safety Injection may be aligned from the cold leg to the hot leg to mitigate the consequences of a LOCA.

The P16 permissive requires four divisions of the following sensors and processors to be OPERABLE in MODES 1, 2, 3, and 4:

- Hot Leg Temperature (Wide Range) sensors,
- Hot Leg Pressure (Wide Range) sensors,
- RCP Breaker Position Indication,
- RCP Bus Breaker Position indication,
- RCP Speed,
- RCP current sensors,
- APUs, and
- ALUs.

The value for Permissive P16 (Hot leg pressure below approximately 290 psia, Delta P_{sat} below approximately 73 psi, less than approximately 50% no load current on all RCPs, and approximately 1.5 hours since Safety Injection initiated) represents the threshold for switching from cold leg injection to hot leg injection.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

D. SENSORS, MANUAL ACTUATION SWITCHES, SIGNAL PROCESSORS, AND ACTUATION DEVICES

The relationship between sensors, manual actuation switches, signal processors, and actuation devices is provided below:

SENSORS

1. 6.9 kV Bus Voltage

Three 6.9 kV Bus Voltage sensors per EDG are required to be OPERABLE in MODES 1, 2, 3, 4, 5, 6, and during movement of irradiated fuel assemblies. These sensors support the following ESF functions:

- ESF 10.a: EDG Start on Degraded Grid Voltage, and
- ESF 10.b: EDG Start on LOOP.

2. Boron Concentration - CVCS Charging Line

Four Boron Concentration - CVCS Charging Line sensors are required to be OPERABLE in MODES 1, 2, 3, 4, 5, and in MODE 6 with no RCPs in operation. These sensors support the following ESF functions:

16-311, Part 16-190(c)

- ESF 11.b: CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating),
- ESF 11.c: CVCS Isolation on ADM - Standard Shutdown Conditions, and
- ESF 11.d: CVCS Isolation on ADM at Power.

3. Boron Temperature - CVCS Charging Line

Four Boron Temperature - CVCS Charging Line sensors are required to be OPERABLE in MODES 1, 2, 3, 4, 5, and in MODE 6 with no RCPs in operation. These sensors support the following ESF functions:

16-311, Part 16-190(c)

- ESF 11.b: CVCS Isolation on ADM - Shutdown Conditions (RCPs Not Operating),
- ESF 11.c: CVCS Isolation on ADM - Standard Shutdown Conditions, and
- ESF 11.d: CVCS Isolation on ADM at Power.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

4. CVCS Charging Line Flow

Four CVCS Charging Line Flow sensors are required to be OPERABLE in MODES 1 and 2, and in MODES 3, 4, and 5 with one or more RCPs in operation. These sensors support the following ESF functions:

- ESF 11.c: CVCS Isolation on ADM - Standard Shutdown Conditions, and
- ESF 11.d: CVCS Isolation on ADM at Power.

5. Cold Leg Temperature (Narrow Range)

Four Cold Leg Temperature (Narrow Range) sensors are required to be OPERABLE in MODE 1 when RTP is greater than or equal to approximately 10%. These sensors support the following functions reactor trips and permissives:

- Reactor Trip 1.a: Low DNBR,
- Reactor Trip 1.b: Low DNBR and (Imbalance or Rod Drop (1/4)),
- Reactor Trip 1.c: Low DNBR and Rod Drop (2/4),
- Reactor Trip 1.d: Low DNBR - High Quality,
- Reactor Trip 1.e: Low DNBR - High Quality and (Imbalance or Rod Drop (1/4)), and
- P6 permissive P6: Thermal Core Power Higher than Threshold.

6. Cold Leg Temperature (Wide Range)

Four Cold Leg Temperature (Wide Range) sensors are required to be OPERABLE in:

- MODE 1,
- MODE 2, when power is greater than or equal to approximately 10^{-5}% as indicated shown on the Intermediate Range Detectors,
- MODE 3, with one or more RCPs in operation,
- MODES 4 and 5, with one or more RCPs in operation or when LTOPPSRV OPERABILITY is required by LCO 3.4.11, and
- MODE 6, when LTOPPSRV OPERABILITY is required by LCO 3.4.11.
- MODES 3, 4, and 5 with one or more RCPs in operation, and
- When PSRV OPERABILITY is required by LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP)".

16-311, Part 16-180(a)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

9. Containment Service Compartment Pressure (Wide Range)

Four Containment Service Compartment Pressure (Wide Range) sensors are required to be OPERABLE in MODES 1, 2, 3, and 4. These sensors support the following ESF functions:

- ESF 4.b: RCP Trip on Containment Isolation (Stage 2)
- ESF 9.a: Containment Isolation (Stage 1) on High Containment Pressure, and
- ESF 9.c: Containment Isolation (Stage 2) on High-High Containment Pressure.

10. Containment Equipment Compartment / Containment Service Compartment Delta Pressure

Two Containment Equipment Compartment / Containment Service Compartment Delta Pressure sensors per division (8 total) are required to be OPERABLE in MODES 1, 2, 3 and 4. These sensors support ESF 14.b: Hydrogen Mixing Dampers Opening on High Containment Compartments Delta Pressure function.

11. Hot Leg Pressure (Narrow Range)

Four Hot Leg Pressure (Narrow Range) sensors are required to be OPERABLE in MODES 4, 5, and 6 when PSRV OPERABILITY is required by LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP)". These sensors support the following ESF functions:

- ESF 12.a: PSRV Actuation - First Valve, and
- ESF 12.b: PSRV Actuation - Second Valve.

16-311, Part 16-180(a)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1210. Hot Leg Pressure (Wide Range)

Four Hot Leg Pressure (Wide Range) sensors are required to be OPERABLE in MODES 1, 2, 3, 4, 5, and 6., and when the PSRVs are required to be OPERABLE per LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP)." These sensors support the following reactor trips, ESF functions and permissives:

16-311, Part 16-180(a)

- Reactor Trip 4: High Core Power Level,
- Reactor Trip 5: Low Saturation Margin,
- Reactor Trip 13: Low Hot Leg Pressure,
- ESF 3.b: SIS Actuation on Low Delta P_{sat},
- ESF 7.a: MSRT Actuation on High SG Pressure (Affected SG) (for setpoint control),
- ESF 12.a: PSRV Actuation - First Valve,
- ESF 12.b: PSRV Actuation - Second Valve,
- P6 permissive P6: Thermal Core Power Higher than Threshold,
- P14 permissive P14: Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds,
- P15 permissive P15: Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown, and
- P16 permissive P16: Hot Leg Pressure and Delta P_{sat} Lower than Thresholds, RCPs Not in Operation, and Time Elapsed since Safety Injection Start.

1311. Hot Leg Temperature (Narrow Range)

Four Hot Leg Temperature (Narrow Range) sensors in each of fourper divisions (16 total) are required to be OPERABLE in MODE 1 and MODE 2 when the reactor power level is greater than or equal to approximately 10^{-5}% RTP as indicated shown on the iIntermediate rRange dDetectors. These sensors support the following functions reactor trips and permissives:

- Reactor Trip 4: High Core Power Level,
- Reactor Trip 5: Low Saturation Margin, and
- P6 permissive P6: Thermal Core Power Higher than Threshold.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

21~~19~~. RCP ~~Current~~Breaker Position Indication

~~Three RCP Current sensors per RCP (12 total) are required to be OPERABLE in MODES 1, 2, 3, 4, 5, and 6.~~ Four RCP Breaker Position Indication sensors are required to be OPERABLE in MODES 3, 4, 5, and 6. These sensors support the following ~~functions and~~ permissives:

- ~~ESF 4: RCP Trip on Low Delta Pressure across RCP with SIS Actuation,~~
- P7 permissive ~~P7~~: RCPs Not in Operation, and
- P15 permissive ~~P15~~: Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown.

22. RCP Bus Breaker Position Indication

Four RCP Bus Breaker Position Indication sensors are required to be OPERABLE in MODES 3, 4, 5, and 6. These sensors support the following permissives:

- P7 permissive: RCPs Not in Operation, and
- P15 permissive: Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown.

16-311, Part 16-190(c)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2320. RCP Delta Pressure

Two RCP Delta Pressure sensors per pump (8 total) are required to be OPERABLE in MODES 1, 2, 3, and 4. These sensors support ESF 4.a: RCP Trip on Low Delta Pressure across RCP with SIS Actuation function.

2421. RCP Speed

16-311, Part 16-190(c)

Four Two RCP Speed sensors per pump (8 total) are required to be OPERABLE in MODE 1 when RTP is greater than or equal to approximately 10%. These sensors support the following reactor trips functions and permissives:

- Reactor Trip 1.a: Low DNBR,
- Reactor Trip 1.b: Low DNBR and (Imbalance or Rod Drop (1/4)),
- Reactor Trip 1.c: Low DNBR and Rod Drop (2/4),
- Reactor Trip 1.d: Low DNBR - High Quality,
- Reactor Trip 1.e: Low DNBR - High Quality and (Imbalance or Rod Drop (1/4)), and
- Reactor Trip 7: Low RCP Speed,.
- P7 permissive: RCP Speed Lower than Threshold, and
- P15 permissive: Hot Leg Pressure and Hot Leg Temperature Lower than Thresholds and RCPs Shutdown.

BASES

ACTIONS

The most common causes of division inoperability are outright failure or drift of the sensor sufficient to exceed the tolerance allowed by the plant specific setpoint analysis. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination is generally made during the performance of a CALIBRATION when the sensor is set up for adjustment to bring it to within specification. If ~~the~~ an as-found sensor calibration setting value ~~trip setpoint~~ is non-conservative with respect to the Allowable Value, the sensor~~division~~ is immediately declared inoperable~~ immediately~~, and the appropriate Condition(s) must be entered~~ immediately~~.

16-311, Part 16-182(b)

In the event that ~~the as-found sensor calibration setting values are a functions trip setpoint is found non-conservative with respect to the Allowable Values, or the~~ any sensor~~s~~, signal processor~~s~~, ~~Actuation Signal Voting processors,~~ or actuation device~~s are~~ is found inoperable, then all affected Trip/ESF/Permissive ~~f~~Functions provided by that sensor, signal processor, or actuation device ~~division~~ must be declared inoperable, and the unit must enter any applicable Condition for the particular Trip/ESF/Permissive ~~protection~~ Function affected.

When the number of inoperable sensors or signal processors in a Trip/ESF/Permissive ~~reactor trip or ESF~~ Function exceeds that specified in any related Condition, redundancy is lost and actions must be taken to restore the required redundancy.

A Note has been added to the ACTIONS. The Note has been added to clarify the application of the Completion Time rules. The Conditions of this Specification may be entered independently for each PS sensor, manual actuation switch, signal processor, and actuation device. The Completion Times of each inoperable sensor, manual actuation switch, signal processor, and actuation device will be tracked separately, starting from the time the Condition was entered for that sensor, manual actuation switch, signal processor, and actuation device.

BASES

SURVEILLANCE REQUIREMENTS (continued)

2. Notes b and c are not applied to Technical Specifications associated with mechanically operated safety relief valves. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Section XI testing program.
3. Notes b and c are not applied to SL-LSSS Functions and Surveillances which test only digital components. For purely digital components, such as actuation logic circuits and associated relays, there is no expected change in result between surveillance performances other than measurement and test errors (M&TE) and, therefore, comparison of Surveillance results does not provide an indication of Trip/Actuation Function or component performance.

An evaluation of the potential SL-LSSS Functions resulted in Notes b and c being applied to the Functions shown in the TS markups. Each licensee proposing to fully adopt this TSTF must review the potential SL-LSSS Functions to identify which of the identified functions are SL-LSSS according to the definition of SL-LSSS and their plant specific safety analysis. The two TSTF Notes are not required to be applied to any of the listed Functions which meet any of the exclusion criteria or are not SL-LSSS based on the plant specific design and analysis.

The Limiting Trip Setpoint column for reactor trip functions is modified by two footnotes as identified in Table 3.3.1-12. The selected Functions are those Functions that are LSSS for protection system instrument functions that protect reactor core or RCS pressure boundary SLs. CALIBRATION Surveillance Requirements apply to both the sensors and any associated signal conditioning components that are subject to drift. Some components (e.g., mechanical devices which have an on or off output or an open/close position such as limit switches, float switches, and proximity detectors) are not calibrated in the traditional sense and do not have as-left or as-found conditions values that would be indicative indicate drift of the component setpoint drift. These devices are considered not trendable and the requirements of the footnotes are not required to be applied to the The mechanical portion of the functionsdevice is not subject to CALIBRATION. Where a non-trendable component provides signal input to other Trip/Actuation Function/Permissive components that can be trended, the remaining components must be evaluated in accordance with the footnotes.

16-311, Part 16-182(b)

BASES

SURVEILLANCE REQUIREMENTS (continued)

Footnote (b)The first NoteCALIBRATION requires evaluation of sensor Trip/Actuation Function's performance for the condition where the as-found sensor calibration setting values aresetting for the setpoint is outside its of the as-found tolerance but conservative with respect to the Allowable Value. For digital components, the as-found tolerance may be identical to the as-left tolerance since drift may not be an expected error.

In these cases an Trip/Actuation Function's as-found sensor calibration setting value outside the as-left condition may be cause for component assessment. Evaluation of instrument performance will verify that the instrument will continue to behave in accordance with design-basis assumptions. The purpose of the assessment is to ensure confidence in the instrument performance prior to returning the instrument to service. These conditions will also be identified in the Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition for continued OPERABILITY.

Footnote (c)The second Note CALIBRATION also requires that the sensor shall be calibrated such that the as-left sensor calibration setting values are within the as-left tolerance around the calibration settings at the completion of the Surveillance.as-left setting for the instrument be returned to within the as-left tolerance of the LTSP. Where a setpoint more conservative than the LTSP is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the SL and/or Analytical Limit is maintained. If the as-left instrument setting cannot be returned to a setting within the as-left tolerance, then the sensorTrip/Actuation Function shall immediately be declared inoperable. The second footnote also requires that the LTSP and the methodologies for calculating the as-left and the as-found tolerances be in a document controlled under 10 CFR 50.59.

16-311, Part 16-182(b)

The digital PS provides continual online automatic monitoring of each of the input signal in each division, performs software limit checking (signal online validation) against required acceptance criteria, and provides hardware functional validation so that a divisional check is continuously being performed. If any PS input signal is identified to be in a failure status, this condition is alarmed in the Control Room. As such, a periodic "CHANNEL CHECK" is no longer necessary.

16-311, Part 16-194

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.2

Space- and time- dependent power density distribution of the U.S. EPR is accurately assessed using the SPNDs inside the core. For neutron flux measurement, incore neutron detectors are more accurate than excore neutron detectors. CALIBRATION of SPND instrumentation is performed to compensate for a decrease in SPND sensitivity during the fuel cycle and to account for peak power density factor change over the fuel cycle. The Aeroball Measurement System (AMS) assists in generating the measured relative neutron flux density in the core, which is used in conjunction with the predicted power distribution based on actual core operation to calibrate the incore SPND instrumentation. Because both the power-to-signal ratio of an SPND and the reference power distribution change with core burnup, SPND signals are matched to reference signals provided by the AMS every 15 EFPD (Ref. 7).

The CALIBRATION includes provisions for the following:

1. Evaluation of sensor performance to verify that the sensor is functioning as required prior to returning the sensor to service if the as-found sensor calibration setting values are outside their predefined as-found tolerance for the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), but conservative with respect to the Allowable Value, and
2. Declaring the sensor immediately inoperable if the sensor cannot be calibrated such that the as-left sensor calibration setting values are within the specified as-left tolerance around the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), at the completion of the surveillance.

16-311, Part 16-182(b)

The Note clarifies that 12 hours are allowed for performing the first Surveillance after reaching 20% RTP. A reactor power level of 20% RTP is chosen based on plant stability, (i.e., automatic rod control capability and turbine generator synchronized to the grid).

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.3

SR 3.3.1.3 is the performance of a ADOT every 31 days. This test shall verify OPERABILITY by actuation of the ~~Reactor Trip Circuit Breakers~~RTBs and Reactor Trip Contactors. The ADOT may be performed by means of any series of sequential, overlapping, or total steps.

SR 3.3.1.4

The online boron meters are a half shell design and are not in contact with the reactor coolant. The concentration of boron is measured by using the neutron absorption effect of B-10. The boron concentration is calculated using the measured count rate. To improve the accuracy of the measurement, the temperature of the reactor coolant at the measuring point is used to adjust the boron concentration. The temperature instruments are not included as part of this Surveillance. The frequency of the boron meter CALIBRATION is conservative considering instrument reliability.

The CALIBRATION includes provisions for the following:

1. Evaluation of sensor performance to verify that the sensor is functioning as required prior to returning the sensor to service if the as-found sensor calibration setting values are outside their predefined as-found tolerance for the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), but conservative with respect to the Allowable Value, and
2. Declaring the sensor immediately inoperable if the sensor cannot be calibrated such that the as-left sensor calibration setting values are within the specified as-left tolerance around the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), at the completion of the surveillance.

16-311, Part 16-182(b)

SURVEILLANCE REQUIREMENTS (continued)

The CALIBRATION includes provisions for the following:

1. Evaluation of sensor performance to verify that the sensor is functioning as required prior to returning the sensor to service if the as-found sensor calibration setting values are outside their predefined as-found tolerance for the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), but conservative with respect to the Allowable Value, and
2. Declaring the sensor immediately inoperable if the sensor cannot be calibrated such that the as-left sensor calibration setting values are within the specified as-left tolerance around the specified calibration settings (e.g., 0, 25, 50, 75, and 100 percent), at the completion of the surveillance.

These provisions are not applicable to CALIBRATION of manual actuation switches.

16-311, Part 16-182(b)

SR 3.3.1.7

The features of continuous self-monitoring of the Protection System are described in Reference 8. Additional tests, which require the processor to be inoperable are not normally performed during operation. These EXTENDED SELF TESTS are performed at start-up of a computer each cycle. The startup sequence is as follows:

- Hardware basic test using the internal diagnosis monitor,
- Start-up self test of the operating system, and
- Switch over to normal operation after approximately two minutes.

Additional information is provided in Section 2~~3~~ of Reference 8.

16-311, Part 16-193(a)

SR 3.3.1.8

SR 3.3.1.8 is the performance of an ADOT every 24 months. The ADOT may be performed by means of any series of sequential, overlapping, or total steps.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.9

SR 3.3.1.9 verifies that the ~~NominalLimiting Trip Setpoint~~NTSPs~~, Design Limits, and including the permissive values,~~ have been properly loaded into the applicable APUs.

SR 3.3.1.10

SR 3.3.1.10 verifies that the individual division actuation response times are less than or equal to the maximum values assumed in the accident analysis. Response time testing acceptance criteria are included in a document controlled under 10 CFR 50.59. Individual component response times are not modeled in the analyses.

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the trip setpoint value at the sensor to the point at which the equipment reaches the required functional state (i.e., control and shutdown rods fully inserted in the reactor core, pumps at rated discharge pressure, or valves in full open or closed position).

For divisions that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer function set to one, with the resulting measured response time compared to the appropriate FSAR response time. Alternately, the response time test can be performed with the time constants set to their nominal value, provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

----------------------------------REVIEWER'S NOTE----------------------------------

~~Applicable portions of NRC approved Topical Reports may be utilized to modify the requirements for response time surveillance testing. These applicable portions of NRC approved Topical Reports should be referenced and discussed.~~

The following Bases apply to plants that have obtained NRC approval to utilize allocations for selected components based on NRC-approved U.S. EPR-applicable Topical Reports.

16-311, Part 16-193(a)

BASES

SURVEILLANCE REQUIREMENTS (continued)

[Response time may be verified by actual response time tests in any series of sequential, overlapping or total division measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the division. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. NRC-approved U.S. EPR-applicable Topical Report provides the basis and methodology for using allocated sensor response times in the overall verification of the division response time for specific sensors identified in the report. Response time verification for other sensor types must be demonstrated by test.

NRC-approved U.S. EPR-applicable Topical Report (Provide reference) provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the Protection System division response time.

16-311, Part 16-193(a)

The allocations for sensor, signal conditioning, and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. One example where response time could be affected is replacing the sensing assembly of a transmitter.]

16-311, Part 16-193(a)

~~The Protection System has been designed to meet the guidance contained in BTP 7-21 (Reference 9). The design features that provide for real-time deterministic behavior are described in EMF-2110 (NP)(A) (Reference 10).~~

As appropriate, each division's response must be verified every 24 months on a STAGGERED TEST BASIS. Testing of the final actuation devices is included in the testing. Response times cannot be determined during unit operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.3.1.10 is modified by a Note stating that neutron detectors are excluded from PS RESPONSE TIME testing. The Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

BASES

REFERENCES

1. ANP-10275P-A, "U.S. EPR Instrument Setpoint Methodology Topical Report," ~~February~~ January 2008.

2. 10 CFR 100.

3. 10 CFR 50, Appendix A, GDC 21.

4. ANP-10287P, "Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report," November 2007.

5. FSAR Chapter 15.

6. 10 CFR 50.49.

7. ANP-10282P, "POWERTRAX/E Online Core Monitoring Software for the U.S. EPR Technical Report," November 2007.

8. ANP-10315P, "U.S. EPR Protection System Surveillance Testing and Teleperm XS Self-Monitoring Technical Report," March 2011.~~EMF-2341(P), Revision 1, "Generic Strategy for Periodic Surveillance Testing of TELEPERM XS Systems in U.S. Nuclear Generating Stations," March 2000.~~

[9. NRC-approved U.S. EPR-applicable Topical Report that provides the basis and methodology for using allocated sensor response times (Provide reference).

10. NRC-approved U.S. EPR-applicable Topical Report that provides the basis and methodology for using allocated signal processing and actuation logic response times (Provide reference).]

~~9. BTP 7-21, "Guidance on Digital Computer Real-Time Performance," U.S. Nuclear Regulatory Commission, Standard Review Plan, Branch Technical Position, Rev. 3, March 2007.~~

~~10. EMF-2110(NP)(A), Revision 1, "TELEPERM XS: A Digital Reactor Protection System," Siemens Power Corporation, July 2000.~~

16-311, Part 16-193(a)

BASES

LCO (continued)

In addition, tie breakers between redundant safety related AC, DC, and AC vital bus power distribution subsystems, if they exist, must be open unless they are being utilized to align the alternate feed.

16-313, Part 16-51

Each division can be aligned to power a subset of loads ("alternate fed loads") in the other division in its divisional pair by means of an "alternate feed." An alternate feed provides a standby source of power to required safety systems, safety support systems, or components that do not have the required redundant trains to support maintenance. An OPERABLE EDG supporting the alternate feed loads and the remaining OPERABLE EDG(s) can power the minimum required ESF functions and achieve completion of required safety function following an AOO or postulated accident~~, regardless of which two EDGs are inoperable~~. The alternate feed is interlocked to prevent sources from two divisions supplying a bus at the same time. In addition, interlocks prevent inadvertently paralleling two EDGs together. Open tie breakers prevent any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s). With a tie breaker closed to implement alternate feed, a fault within the alternate fed divisional pair may affect two redundant subsystems within the divisional pair. ~~During alternate feed, this is acceptable since the other divisional pair power distribution subsystems are available to support redundant subsystems.~~ The inter-divisional alternate feeds have a protection and coordination scheme to provide protection so that a fault on one division does not degrade the other division below an acceptable level. The alternate feed circuit protection scheme uses circuit breakers so that a malfunction of the components performing the alternate feed function or a malfunction of the components being alternately fed does not result in unacceptable influences in the division that supplies the power. This applies to the onsite, safety related redundant electrical power distribution subsystems. It does not, however, preclude redundant Class 1E 6.9 kV buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated accident.