ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Wednesday, May 20, 2009 3:03 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 174, FSAR Ch 9, Supplement 3
Attachments: RAI 174 Supplement 3 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 8 of the 49 questions of RAI No. 174 on February 27, 2009. Supplement 1 response to RAI No. 174 was sent on March 13, 2009 to address 4 of the remaining 41 questions. Supplement 2 response to RAI No. 174 was sent on April 3, 2009 to address 11 of the remaining 37 questions.

The attached file, "RAI 174 Supplement 3 Response US EPR DC.pdf" provides technically correct and complete responses to 14 of the remaining questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 174 Questions 09.02.02-9, 09.02.02-12, 09.02.02-28, 09.02.02-29, 09.02.02-31, 09.02.02-32, 09.02.02-37, and 09.02.02-44.

The following table indicates the respective pages in the response document, "RAI 174 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 174 — 09.02.02-7	2	2
RAI 174 — 09.02.02-8	3	3
RAI 174 — 09.02.02-9	4	5
RAI 174 — 09.02.02-12 (Parts 6, 7 and 8)	6	10
RAI 174 — 09.02.02-20	11	12
RAI 174 — 09.02.02-28	13	14
RAI 174 — 09.02.02-29	15	16
RAI 174 — 09.02.02-31	17	21
RAI 174 — 09.02.02-32	22	26
RAI 174 — 09.02.02-37	27	27
RAI 174 — 09.02.02-38	28	28
RAI 174 — 09.02.02-43	29	29
RAI 174 — 09.02.02-44	30	30
RAI 174 — 09.02.02-48	31	31

Since responses to the remaining questions remain in process, a revised schedule is provided in this email.

The schedule for technically correct and complete responses to the remaining questions has been changed as provided below:

Question #	Response Date
RAI 174 — 09.02.02-35	July 14, 2009
RAI 174 — 09.02.02-36	July 14, 2009
RAI 174 — 09.02.02-39	July 14, 2009

(Parts f and g)	
RAI 174 — 09.02.02-42	July 14, 2009
RAI 174 — 09.02.02-45	July 14, 2009
RAI 174 — 09.02.02-46	July 14, 2009
RAI 174 — 09.02.02-47	July 14, 2009
RAI 174 — 09.02.02-51	July 14, 2009
RAI 174 — 09.02.02-52	July 14, 2009
RAI 174 — 09.02.02-53	July 14, 2009
RAI 174 — 09.02.02-54	July 14, 2009
RAI 174 — 09.02.02-55	July 14, 2009

(Russ Wells on behalf of)
Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, April 03, 2009 5:08 PM
To: 'Getachew Tesfaye'
Cc: KOWALSKI David J (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 174, Supplement 2

Getachew,

AREVA NP Inc. provided responses to 8 of the 49 questions of RAI No. 174 on February 27, 2009. Supplement 1 response to RAI No. 174 was sent on March 13, 2009 to address 4 of the remaining questions.

The attached file, "RAI 174 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete responses to 11 of the remaining 37 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 174 Questions 09.02.02-11, 09.02.02-16, 09.02.02-18, 09.02.02-19, 09.02.02-21, 09.02.02-23, 09.02.02-24, 09.02.02-25, 09.02.02-30 and 09.02.02-34.

The following table indicates the respective pages in the response document, "RAI 174 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 174 — 09.02.02-11	2	2
RAI 174 — 09.02.02-16	3	5
RAI 174 — 09.02.02-18	6	8
RAI 174 — 09.02.02-19	9	12
RAI 174 — 09.02.02-21	13	14
RAI 174 — 09.02.02-22	15	16

RAI 174 — 09.02.02-23	17	18
RAI 174 — 09.02.02-24	19	19
RAI 174 — 09.02.02-25	20	20
RAI 174 — 09.02.02-30	21	22
RAI 174 — 09.02.02-34	23	24

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

Question #	Response Date
RAI 174 — 09.02.02-7	May 20, 2009
RAI 174 — 09.02.02-8	May 20, 2009
RAI 174 — 09.02.02-9	May 20, 2009
RAI 174 — 09.02.02-12 (Parts 6, 7 and 8)	May 20, 2009
RAI 174 — 09.02.02-20	May 20, 2009
RAI 174 — 09.02.02-28	May 20, 2009
RAI 174 — 09.02.02-29	May 20, 2009
RAI 174 — 09.02.02-31	May 20, 2009
RAI 174 — 09.02.02-32	May 20, 2009
RAI 174 — 09.02.02-35	May 20, 2009
RAI 174 — 09.02.02-36	May 20, 2009
RAI 174 — 09.02.02-37	May 20, 2009
RAI 174 — 09.02.02-38	May 20, 2009
RAI 174 — 09.02.02-39 (Parts f and g)	May 20, 2009
RAI 174 — 09.02.02-42	May 20, 2009
RAI 174 — 09.02.02-43	May 20, 2009
RAI 174 — 09.02.02-44	May 20, 2009
RAI 174 — 09.02.02-45	May 20, 2009
RAI 174 — 09.02.02-46	May 20, 2009
RAI 174 — 09.02.02-47	May 20, 2009
RAI 174 — 09.02.02-48	May 20, 2009
RAI 174 — 09.02.02-51	May 20, 2009
RAI 174 — 09.02.02-52	May 20, 2009
RAI 174 — 09.02.02-53	May 20, 2009
RAI 174 — 09.02.02-54	May 20, 2009
RAI 174 — 09.02.02-55	May 20, 2009

Sincerely,

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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, March 13, 2009 4:56 PM
To: 'Getachew Tesfaye'
Cc: KOWALSKI David J (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 174, Supplement 1

Getachew,

AREVA NP Inc. provided responses to 8 of the 49 questions of RAI No. 174 on February 27, 2009. The attached file, "RAI 174 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the remaining 41 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 174 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 174 — 09.02.02-39 (Parts a though e)	2	3
RAI 174 — 09.02.02-40	4	4
RAI 174 — 09.02.02-41	5	5
RAI 174 — 09.02.02-49	6	6
RAI 174 — 09.02.02-50	7	7

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

Question #	Response Date
RAI 174 — 09.02.02-7	May 20, 2009
RAI 174 — 09.02.02-8	May 20, 2009
RAI 174 — 09.02.02-9	May 20, 2009
RAI 174 — 09.02.02-11	April 3, 2009
RAI 174 — 09.02.02-12 (Parts 6, 7 and 8)	May 20, 2009
RAI 174 — 09.02.02-16	April 3, 2009
RAI 174 — 09.02.02-18	April 3, 2009
RAI 174 — 09.02.02-19	May 20, 2009
RAI 174 — 09.02.02-20	May 20, 2009
RAI 174 — 09.02.02-21	May 20, 2009
RAI 174 — 09.02.02-22	April 3, 2009
RAI 174 — 09.02.02-23	May 20, 2009
RAI 174 — 09.02.02-24	May 20, 2009
RAI 174 — 09.02.02-25	April 3, 2009
RAI 174 — 09.02.02-28	May 20, 2009
RAI 174 — 09.02.02-29	May 20, 2009
RAI 174 — 09.02.02-30	April 3, 2009

RAI 174 — 09.02.02-31	May 20, 2009
RAI 174 — 09.02.02-32	May 20, 2009
RAI 174 — 09.02.02-34	May 20, 2009
RAI 174 — 09.02.02-35	May 20, 2009
RAI 174 — 09.02.02-36	May 20, 2009
RAI 174 — 09.02.02-37	May 20, 2009
RAI 174 — 09.02.02-38	May 20, 2009
RAI 174 — 09.02.02-39 (Parts f and g)	May 20, 2009
RAI 174 — 09.02.02-42	May 20, 2009
RAI 174 — 09.02.02-43	May 20, 2009
RAI 174 — 09.02.02-44	May 20, 2009
RAI 174 — 09.02.02-45	May 20, 2009
RAI 174 — 09.02.02-46	May 20, 2009
RAI 174 — 09.02.02-47	May 20, 2009
RAI 174 — 09.02.02-48	May 20, 2009
RAI 174 — 09.02.02-51	May 20, 2009
RAI 174 — 09.02.02-52	May 20, 2009
RAI 174 — 09.02.02-53	May 20, 2009
RAI 174 — 09.02.02-54	May 20, 2009
RAI 174 — 09.02.02-55	May 20, 2009

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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, February 27, 2009 5:46 PM
To: 'Getachew Tesfaye'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 174, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 174 Response US EPR DC.pdf" provides technically correct and complete responses to 8 of the 49 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 174 Questions 09.02.02-10, 09.02.02-17 and 09.02.02-33.

The following table indicates the respective pages in the response document, “RAI 174 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 174 — 09.02.02-7	2	2
RAI 174 — 09.02.02-8	3	3
RAI 174 — 09.02.02-9	4	4
RAI 174 — 09.02.02-10	5	6
RAI 174 — 09.02.02-11	7	7
RAI 174 — 09.02.02-12	8	10
RAI 174 — 09.02.02-13	11	11
RAI 174 — 09.02.02-14	12	12
RAI 174 — 09.02.02-15	13	14
RAI 174 — 09.02.02-16	15	16
RAI 174 — 09.02.02-17	17	17
RAI 174 — 09.02.02-18	18	19
RAI 174 — 09.02.02-19	20	21
RAI 174 — 09.02.02-20	22	22
RAI 174 — 09.02.02-21	23	23
RAI 174 — 09.02.02-22	24	24
RAI 174 — 09.02.02-23	25	25
RAI 174 — 09.02.02-24	26	26
RAI 174 — 09.02.02-25	27	27
RAI 174 — 09.02.02-26	28	28
RAI 174 — 09.02.02-27	29	29
RAI 174 — 09.02.02-28	30	30
RAI 174 — 09.02.02-29	31	31
RAI 174 — 09.02.02-30	32	32
RAI 174 — 09.02.02-31	33	34
RAI 174 — 09.02.02-32	35	36
RAI 174 — 09.02.02-33	37	37
RAI 174 — 09.02.02-34	38	38
RAI 174 — 09.02.02-35	39	39
RAI 174 — 09.02.02-36	40	40
RAI 174 — 09.02.02-37	41	41
RAI 174 — 09.02.02-38	42	42
RAI 174 — 09.02.02-39	43	43
RAI 174 — 09.02.02-40	44	44
RAI 174 — 09.02.02-41	45	45
RAI 174 — 09.02.02-42	46	46
RAI 174 — 09.02.02-43	47	47
RAI 174 — 09.02.02-44	48	48
RAI 174 — 09.02.02-45	49	49
RAI 174 — 09.02.02-46	50	50
RAI 174 — 09.02.02-47	51	51
RAI 174 — 09.02.02-48	52	52
RAI 174 — 09.02.02-49	53	53

RAI 174 — 09.02.02-50	54	54
RAI 174 — 09.02.02-51	55	55
RAI 174 — 09.02.02-52	56	56
RAI 174 — 09.02.02-53	57	57
RAI 174 — 09.02.02-54	58	58
RAI 174 — 09.02.02-55	59	59

A complete answer is not provided for 41 of the 49 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	**Response Date**
RAI 174 — 09.02.02-7	May 20, 2009
RAI 174 — 09.02.02-8	May 20, 2009
RAI 174 — 09.02.02-9	May 20, 2009
RAI 174 — 09.02.02-11	April 3, 2009
RAI 174 — 09.02.02-12 (Parts 6, 7 and 8)	May 20, 2009
RAI 174 — 09.02.02-16	April 3, 2009
RAI 174 — 09.02.02-18	April 3, 2009
RAI 174 — 09.02.02-19	May 20, 2009
RAI 174 — 09.02.02-20	May 20, 2009
RAI 174 — 09.02.02-21	May 20, 2009
RAI 174 — 09.02.02-22	April 3, 2009
RAI 174 — 09.02.02-23	May 20, 2009
RAI 174 — 09.02.02-24	May 20, 2009
RAI 174 — 09.02.02-25	April 3, 2009
RAI 174 — 09.02.02-28	May 20, 2009
RAI 174 — 09.02.02-29	May 20, 2009
RAI 174 — 09.02.02-30	April 3, 2009
RAI 174 — 09.02.02-31	May 20, 2009
RAI 174 — 09.02.02-32	May 20, 2009
RAI 174 — 09.02.02-34	May 20, 2009
RAI 174 — 09.02.02-35	May 20, 2009
RAI 174 — 09.02.02-36	May 20, 2009
RAI 174 — 09.02.02-37	May 20, 2009
RAI 174 — 09.02.02-38	May 20, 2009
RAI 174 — 09.02.02-39 (Parts a though e) RAI 174 — 09.02.02-39 (Parts f and g)	March 13, 2009 May 20, 2009
RAI 174 — 09.02.02-40	March 13, 2009
RAI 174 — 09.02.02-41	March 13, 2009
RAI 174 — 09.02.02-42	May 20, 2009
RAI 174 — 09.02.02-43	May 20, 2009
RAI 174 — 09.02.02-44	May 20, 2009
RAI 174 — 09.02.02-45	May 20, 2009
RAI 174 — 09.02.02-46	May 20, 2009
RAI 174 — 09.02.02-47	May 20, 2009

RAI 174 — 09.02.02-48	May 20, 2009
RAI 174 — 09.02.02-49	March 13, 2009
RAI 174 — 09.02.02-50	March 13, 2009
RAI 174 — 09.02.02-51	May 20, 2009
RAI 174 — 09.02.02-52	May 20, 2009
RAI 174 — 09.02.02-53	May 20, 2009
RAI 174 — 09.02.02-54	May 20, 2009
RAI 174 — 09.02.02-55	May 20, 2009

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 28, 2009 3:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Larry Wheeler; John Segala; Peter Wilson; Peter Hearn; Joseph Colaccino; Michael Miernicki; Meena Khanna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 174 (1806, 1810),FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on January 9, 2009, and discussed with your staff on January 22, 2009. No changes were made to the draft RAI as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 514

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD4101810F7B)

Subject: Response to U.S. EPR Design Certification Application RAI No. 174, FSAR Ch 9, Supplement 3
Sent Date: 5/20/2009 3:03:27 PM
Received Date: 5/20/2009 3:03:35 PM
From: WELLS Russell D (AREVA NP INC)

Created By: Russell.Wells@areva.com

Recipients:
"Pederson Ronda M (AREVA NP INC)" <Ronda.Pederson@areva.com>
Tracking Status: None
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Tracking Status: None
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
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Files	**Size**	**Date & Time**
MESSAGE	15258	5/20/2009 3:03:35 PM
RAI 174 Supplement 3 Response US EPR DC.pdf	576556	

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

Response to

Request for Additional Information No. 174 (1806, 1810), Supplement 3

01/28/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
Application Section: 9.2.2

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 09.02.02-7:

Based on a review of the information provided in Tier 2 of the Final Safety Analysis Report (FSAR), Section 9.2.2, “Component Cooling Water System,” the staff found that the description of the component cooling water system (CCWS) is generally incomplete and does not adequately explain the compliance to the how design bases considerations by the proposed design, the applying of limiting assumptions, the excess margin available, the operating experience insights that are relevant and the methods by which they were addressed, and so forth. Consequently, Tier 1 and Tier 2 of the Design Control Document (DCD) needs to be revised to include information that is sufficient to demonstrate that the CCWS is capable of performing its design-bases functions, that applicable design considerations are satisfied by the proposed design, and that reasonable assurance exists that the availability and design-bases capability of the UHS will be maintained over the life of the plant. Regulatory Guide 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” provides guidance on the specific information that should be included in the application for evaluation by the staff.

Response to Question 09.02.02-7:

See the Responses to RAI 174, Questions 09.02.02-8 through 09.02.02-34. Where necessary, the U.S. EPR FSAR as it relates to the component cooling water system (CCWS) in Tier 1, Section 2.7.1 and Tier 2, Section 9.2.2 will be revised as indicated in the individual responses to RAI 174 Questions 09.02.02-8 through 09.02.02-34.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.7.1 and U.S. EPR FSAR Tier 2, Section 9.2.2 will be revised as described in the responses to Questions 09.02.02-8 through 09.02.02-34 and indicated on the enclosed markups.

Question 09.02.02-8:

The component cooling water system (CCWS) must be able to withstand natural phenomena without the loss of function in accordance with General Design Criteria (GDC) 2 requirements. As specified in Standard Review Plan (SRP) Tier 2 Section 9.2.2, staff acceptance is based upon compliance with GDC 2, “Design Basis for Protection Against Natural Phenomena.” The staff considers the CCWS to be acceptable with respect to GDC 2 if it satisfies Position C1 and C.2 of Regulatory Guide 1.29, “Seismic Design Classification.” Position C1 specifies that safety-related SSCs should satisfy Seismic Category I specifications and Position C2 indicates that the design on non-safety-related SSCs is acceptable if failures do not adversely affect the control room or safety-related SSCs, or result in excessive radiological releases to the environment. Consequently, the applicant needs to include additional information in Tier 2 Section 9.2.2 of the Final Safety Analysis Report (FSAR) to fully describe and address the impact of failures of the non-safety-related parts of the CCWS on the control room and radiological release considerations.

Response to Question 09.02.02-8:

A fault in the component cooling water system (CCWS) piping will be recognized by redundant level indications on each CCWS surge tank. In the event that tank levels drop to MIN2, the non-safety-related branches isolate if there is a flow mismatch in the inlet and outlet of the users supply and return lines. Isolation of the non-safety-related branches will have no impact on the control room. This isolation is designed as an automatic function that requires no operator action. There are no radiological release considerations in this event. This event considers a fault in the non-safety-related branches that result in CCWS fluid leaking out of the system.

The CCWS is a closed-loop cooling water system. The only potential for radioactive in-leakage is from the higher pressure chemical and volume control system (CVCS) and reactor coolant system (RCS). There are additional indications and control functions that isolate the CCWS in the event of radioactive fluid in-leakage.

Refer to U.S. EPR FSAR Tier 2, Section 9.2.2.6.1, for a description of the emergency leak detection sequence.

FSAR Impact:

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

Question 09.02.02-9:

The component cooling water system (CCWS) must be able to withstand natural phenomena without the loss of function in accordance with General Design Criteria (GDC) 2 requirements. The system description does not explain the functioning and maximum allowed combined seat leakage of safety-related boundary isolation valves to ensure CCWS integrity and operability during seismic events and other natural phenomena. Consequently, the applicant needs to include additional information in Tier 2 Section 9.2.2 of the Final Safety Analysis Report (FSAR) to fully describe:

a. Describe in the FSAR the assurance of the CCWS integrity and operability by the safety-related boundary isolation valves so that common-cause simultaneous failure of all non-safety-related CCWS piping will not compromise the CCWS safety functions during seismic events.

b. Provide in the FSAR the maximum allowed combined seat leakage for the safety-related CCWS boundary isolation valves and the periodic testing that will be performed to ensure that the specified limit will not be exceeded.

c. Provide in the FSAR any other performance assumptions that pertain to the boundary isolation valves or other parts of the system that is necessary to assure the capability of the CCWS to perform its safety functions during natural phenomena.

Response to Question 09.02.02-9:

a. Component cooling water system (CCWS) equipment that provides cooling to the safety injection system (SIS) and residual heat removal system (RHRS); spent fuel pool; reactor coolant pump (RCP), including the thermal barrier; safety chillers; and equipment which performs a containment isolation function is classified Seismic Category I. This equipment is located in buildings designed to Seismic Category I requirements.

   CCWS system equipment that does not serve safety-related functions but is routed proximate to other safety-related structures, systems and components (SSC) is classified Seismic Category II to prevent loss of function of safety-related SSC.

   CCWS users, which are not classified Seismic Category I, can be isolated by Seismic Category I fast acting isolation valves in case of external hazards.

   U.S. EPR FSAR Tier 2, Section 9.2.2.2.1 will be revised to include this information related to seismic classifications.

b. Maximum allowed combined seat leakage for safety-related boundary isolation valves will be identified later in the design process. U.S. EPR FSAR Tier 2, Sections 3.9.6 and 6.6 describe inservice testing and inspections, respectively.

c. The Seismic Category I fast acting isolation valves for non-safety-related CCWS users are hydraulically operated and designed to close in less than 10 seconds. The CCWS common header switchover valves are also fast acting hydraulically operated valves, with a closure time of less than 10 seconds. These switchover valves can be used to isolate the common headers to conserve the system capacity to cool the safety-related SIS users directly associated with the CCWS train.

U.S. EPR FSAR Tier 2, Section 9.2.2.2.1 will be revised to include this information related to the fast acting isolation valves.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.2.2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-12:

Standard Review Plan (SRP) 9.2.2 Section III, requires confirmation of the overall arrangement of the component cooling water system (CCWS). While the piping and instrumentation diagrams (P&IDs) in FSAR Tier 2, Figure 9.2.2-1 shows the component cooling water system (CCWS) components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of the information is incomplete, inaccurate, or inconsistent. Revise Final Safety Analysis Report (FSAR) Tier 2, Figure 9.2.2-1 to address the following considerations in this regard:

1. Pipe sizes are not shown on the Tier 1 Figure 2.7.1-1, and the system description in Tier 2, Section 9.2.2 does not explain the criteria that were used in establishing the appropriate pipe sizes (such as limiting flow velocities).
2. The system description in Tier 2, Section 9.2.2 does not provide design details such as system operating temperatures, pressures, and flow rates for all operating modes and alignments.
3. FSAR Tier 2, Figure 9.2.2-1 does not show the location of the indications (e.g., local, remote panel, control room), and identify the instruments that provide input to a process computer and/or have alarm and automatic actuation functions.
4. FSAR Tier 2, Figure 9.2.2-1 does not show identify the normal valve positions, identify the valves locked in position, and identify automatic valve functions. Describe these design features.
5. FSAR Tier 2, Figure 9.2.2-1 does not show specific set point for alarms and relief valves, and the bases for these set points are not explained in the system description.
6. Provide a description and drawing of the common CCWS header cross-connect in FSAR Tier 2 Section 9.2.2 as well as in Tier 1 Sections 2.7.1.
7. Isolation valves for the non safety related (NSR) loads (1.b. header) in the nuclear auxiliary building (NAB) and radwaste building (RWB) are not all shown as hydraulic valves on FSAR Tier 1 Figure 2.7.1-1 and Tier 2 Figure 9.2.2-2 and 9.2.2-3. These drawings only show two hydraulically operated isolation valves (30KAB80 AA015 and AA016) in common header 1.b supply line to the operational chilled water system (OCWS) in the NAB. The return header isolation valves for this path include an motor operated valve (MOV) (30KAB80 AA019) and check valve AA020. In addition FSAR Tier 1 Table 2.7.1-2 (I&C/Electrical) indicates valve 30KAB80 AA019 is powered by division one. However, Tier 1 Mechanical Design Table 2.7.1-1 and Tier 2 IST Table 3.9.6-2 list valve 30KAB80 AA019 as hydraulically operated.
    a. Confirm in the FSAR that valve 30KAB80 AA019 is a hydraulically operated valve.
    b. Confirm in the FSAR that all the hydraulic valves (non safety load isolation) operate in the same manner as the switchover valves described in FSAR section 9.2.2 with a non interruptible powered pilot valve that opens allowing hydraulic fluid to escape from the operator and permitting valve closure by spring force.
    c. Describe in the FSAR the means used to avoid spurious isolation for 80AA015, 80AA016, and 80AA019, (logic and time delays) due to flow instrumentation sensitivity (plus different water densities between suction and discharge).

Describe the CCWS response to a spurious isolation and any adverse effects to the safety related functions of the CCWS.

d. Describe in the FSAR the basis for the two series NAB supply valves from header 1B and 2B being motor operated and both powered by division 1, (i.e., reliable isolation of safety-related portions of the system from non-safety-related portions should be provided).

8. Both of the common header 2.b SR supply isolation valves (30KAB50 AA001, AA006) for the NSR loads in the NAB and RWB are identified as motor operated (MOV) by FSAR Tier 1 Figure 2.7.1-1 and Tier 2 Figure 9.2.2-3. However, FSAR Table 3.9.6-2 (Valve IST) identifies valve 30KAB50 AA001 as hydraulically operated and does not include valve 30KAB50 AA006. Note that the corresponding return isolation valves are 30KAB50 004 (correctly shown as hydraulically operated) and check valve 30KAB50 008. For these valves Tier 1 Table 2.7.1-1 does not identify the operator type, however, Table 2.7.1-2 indicates that the three valves with operators are powered from 1E division four. The following considerations need to be addressed:

   a. Confirm in the FSAR that the safety-related supply isolation valves 30KAB50 AA001 and AA006 are motor operated/hydraulically operated.

   b. Describe in the FSAR the basis for the two series connected RWB and NAB supply valves (50AA001, 50AA006, and 50AA004) being motor operated and both powered by division 4, (i.e., reliable isolation of safety-related portions of the system from non-safety-related portions should be provided).

   c. Explain in the FSAR if the valves are hydraulic with uninterruptible power to the pilot valve; the uninterruptible power basis (e.g., same 1E uninterruptible bus).

   d. Describe in FSAR Tier 1 Table 2.7.1-1 the valve operator type for these valves.

   e. Confirm in the FSAR that all the hydraulic valves (non safety load isolation) operate in the same manner as the switchover valves described in FSAR section 9.2.2 with a non interruptible powered pilot valve that opens allowing hydraulic fluid to escape from the operator and permitting valve closure by spring force.

Response to Question 09.02.02-12:

Items 1 through 5 have been previously answered in the original response to RAI 174.

6. Either common header 1.b or 2.b can provide cooling to the reactor coolant pump (RCP) thermal barriers. There is a cross-connect in the header that supplies cooling to the thermal barriers downstream of the containment isolation valves (CIV) on each common header. To maintain strict train separation of the redundant component cooling water system (CCWS) division, supplying either common header to make sure that a fault affects no more than one train, the CIVs on each common header are interlocked. The CIVs from common header 1.b must be closed prior to opening the CIVs from common header 2.b, and vice versa.

   The RCP thermal barrier cross tie is depicted in U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheets 12 of 24 and 18 of 24; U.S. EPR FSAR Tier 2, Figure 9.2.2-2—Component Cooling Water System Common

Loop 1, Sheet 2 of 7; and Figure 9.2.2-3—Component Cooling Water System Common Loop 2, Sheet 2 of 8.

U.S. EPR FSAR Tier 1, Section 2.7.1 will be revised to include this information related to the RCP thermal barrier cross tie.

Refer to the Response to RAI 174 Supplement 2, Question 09.02.02-19 for additional discussion concerning the RCP thermal barrier cross tie.

7a. Valve 30KAB80 AA019 is a hydraulically operated valve.

U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheet 11 of 24, and U.S. EPR FSAR Tier 2, Figure 9.2.2-2—Component Cooling Water System Common Loop 1, Sheet 1 of 7, will be revised to indicate valve KAB80 AA019 is hydraulically operated.

U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design will be revised to include the operator detail (Hydraulic) in the valve description for the following valves:

- 30KAB80 AA015/016/019
- 30KAB50 AA001/004/006
- 30KAA10 AA006/010/032/033
- 30KAA20 AA006/010/032/033
- 30KAA30 AA006/010/032/033
- 30KAA40 AA006/010/032/033

U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design will also be revised to include a note explaining the IEEE Class 1E power for the solenoid-operated pilot valves for these hydraulically operated valves.

7b. Hydraulically operated valves in the CCWS operate in the same manner as the switchover valves described in U.S. EPR FSAR Tier 2, Section 9.2.2.2.2. The difference between the switchover valves and non-safety load isolation valves is in the actuation of the pilot valves. The switchover valve pilots are energized to open and bleed off the hydraulic fluid while the non-safety load isolation valve pilots are de-energized to open.

U.S. EPR FSAR Tier 2, Section 9.2.2.1 will be revised to include this information concerning the operation of hydraulic valves in the CCWS.

7c. Means to avoid spurious isolation of hydraulically operated valves (logic and time delay details) will be identified later in the design process.

Spurious isolation of these non-safety load isolation valves would not have an adverse effect on the safety-related function of the CCWS. The CCWS supply to the safety-related loads would remain intact. The required response to this spurious isolation would be to manually actuate these hydraulically operated valves to restore CCWS cooling flow to the non-safety-related operational loads.

7d. The two series NAB supply valves from headers 1.b and 2.b are not motor-operated valves. Valves 30KAB80 AA015/016/019 are hydraulically operated supply and return valves from the 1.b header, while valves 30KAB50 AA001/004/006 are hydraulically operated supply and return valves from the 2.b header. Each hydraulically operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy.

U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design will be revised as described in the Response to Question 09.02.02-12 (Part 7a) for the subject valves.

8a. Valves 30KAB50 AA001/006 are hydraulically operated valves.

U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheet 15 of 24, and U.S. EPR FSAR Tier 2, Figure 9.2.2-3—Component Cooling Water System Common Loop 2, Sheet 6 of 8, will be revised to indicate valves KAB50 AA001/006 are hydraulically operated.

8b. Valves 30KAB50 AA001/004/006 are hydraulically operated supply and return valves from the 2.b header. Each hydraulically operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy.

U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design will be revised as described in the Response to Question 09.02.02-12 (Part 7a) for the subject valves.

8c. Refer to the Response to Question 09.02.02-12 (Part 8b).

8d. U.S. EPR FSAR Tier 1, Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design will be revised to include the operator detail (Hydraulic) in the valve description for valves 30KAB50 AA001/004/006.

8e. Refer to the Response to Question 09.02.02-12 (Part 7b).

FSAR Impact:

6. U.S. EPR FSAR Tier 1, Section 2.7.1 will be revised as described in the response and indicated on the enclosed markup.

7. U.S. EPR FSAR Tier 1, Table 2.7.1-2 and Figure 2.7.1-1; and U.S. EPR FSAR Tier 2, Section 9.2.2.1 and Figure 9.2.2-2 will be revised as described in the response and indicated on the enclosed markup.

8. U.S. EPR FSAR Tier 1, Tables 2.7.1-1 and 2.7.1-2, and Figure 2.7.1-1; and U.S. EPR FSAR Tier 2, Figure 9.2.2-3 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-20:

Standard Review Plan (SRP) 9.2.2 Section II entitled "Acceptance Criteria" requirement 4.G states as follows:

Demonstration by testing that reactor coolant pumps (RCPs) withstand a complete loss of cooling water for 20 minutes and instrumentation in accordance with Institute of Electrical and Electronics Engineers Standard (IEEE Std) 603, as endorsed by Regulatory Guide (RG) 1.153 with control room alarms detecting loss of cooling water so a period of 20 minutes is available for the operator to have sufficient time to initiate manual protection of the plant.

The staff found no evidence that RCP pump seals were tested for 20 minutes of total loss of cooling water. Furthermore the station blackout timeline identified in FSAR Tier 2 Section 8.4.2.6 includes step 3 at two minutes into the station blackout (SBO), the SBO event that assumes all four RCP seals will fail resulting in RCS leakage of 25 gpm per RCP until the stationary seal system is engaged at the 15 minute point in the event.

- Describe how the item described above has been addressed by the U.S. EPR design.

Response to Question 09.02.02-20:

1. Pursuant to Standard Review Plan (SRP) 9.2.2, Section II 4.G ii, the U.S. EPR component cooling water system (CCWS) supply to each reactor coolant pump (RCP) is designed to withstand a single, active failure or a moderate-energy line crack as defined in Branch Technical Position ASB 3-1; and to Seismic Category I, Quality Group C, and American Society of Mechanical Engineers (ASME) Section III Class 3 requirements.

   Either CCWS common header 1.b or 2.b can provide cooling to the RCP thermal barriers. This allows for thermal barrier cooling from any of the four main trains of CCWS. To maintain strict CCWS train separation for the RCP thermal barrier cooling, an interlocking function is required. The containment isolation valves (CIV) in the RCP thermal barriers cooling path on the supply and return side of CCWS common header 1.b cannot be opened unless the CIVs on both the supply and return side of common header 2.b are closed, and vice versa. If one CCWS train is inoperable, RCP thermal barrier cooling is aligned to the CCWS common header with two OPERABLE CCWS trains.

   The CCWS also provides safety-related cooling for the RCP motor coolers and upper and lower bearing oil coolers. RCPs 1 and 2 are supplied from CCWS common header 1.b, while RCPs 3 and 4 are supplied from common header 2.b.

   The U.S. EPR design protects the RCP on a complete loss of cooling water. This includes multiple RCP motor high temperature alarms, loss of RCP CCW flow alarms and an RCP motor thrust bearing high temperature RCP trip. Such alarms provide timely opportunity for mitigation of the loss of cooling water by plant operators. In the event operator intervention is not successful, the RCP can be tripped prior to any RCP motor, shaft sealing or pump damage.

2. At the onset of a station blackout (SBO) event, there is no power available to run RCPs and their operation is terminated. For this beyond design basis event (no other failures are assumed during SBO), RCP cooling systems operations are also terminated due to

unavailability of power. Thus, at this time, RCP operation has been terminated and the plant has transitioned to the hot standby condition (MODE 3). In the absence of RCP seal injection and thermal barrier heat exchanger operation, both become inoperative at the onset of an SBO event and the RCP shaft seal average leakage is assumed to be ≤ 25 gpm until the standstill seal system closes. Subsequent to specific vendor selection, the shaft seal will be SBO tested to determine the average leakage prior to closure of the standstill seal system. Prior to the SBO test, an analysis will be performed to evaluate O-ring extrusion gaps and clearances within the shaft seal during SBO conditions.

U.S. EPR FSAR Tier 2, Section 8.4.2.6.2, SBO Timeline, states:

> "Two minutes into the event, all RCP seals are assumed to fail."

The term "fail" means that the shaft seal controlled leakage is assumed to increase during SBO conditions.

For this situation, RCP operation is terminated when RCP cooling is lost, the plant is in a safe shutdown condition and the reactor coolant pressure boundary is maintained by the standstill seal. Operator corrective actions to initiate manual protection of the plant (i.e., maintain safe shutdown) are not necessary for up to 10 minutes following the onset of an SBO event. Within 10 minutes of the onset of an SBO, the operator will commence manual actions to load equipment onto the SBO diesel generators as necessary to maintain safe shutdown—hot standby (MODE 3) for the duration of the 8 hour SBO coping duration.

FSAR Impact:

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

Question 09.02.02-28:

General Design Criteria (GDC) 46 requires that the component cooling water system (CCWS) be designed for appropriate periodic pressure and function testing to ensure the leak-tight integrity and operability of components, as well as the operability of the system as a whole, at conditions as close to the design basis as practical. The staff found that the CCWS design provides the capability of periodic pump flow testing via a recirculation line back to the surge tank (Final Safety Analysis Report (FSAR) Tier 1 Table 2.7.1-3, ITAAC Item 7.8). However, the staff found that Tier 2 FSAR Figure 9.2.2-1 indicates that the only surge tank recirculation line from the outlet of the CCWS pumps is only 4 inches in pipe size compared to a pump discharge line of 28 inches. Additionally, the figure does not show a flow instrument that can be used for flow testing. Since the CCWS pump capacity was identified in Table 9.2.2-1 as 67.2 m^3/min (17,758 gpm) at 0.6 MPa (199.7 ft), the size of the recirculation line appears to be too small for this purpose. Consequently, the FSAR needs to be revised to address the following considerations:

a. Describe how the 4 inch surge tank recirculation line supports CCWS pump testing at conditions that are “as close to the design basis as possible.”

b. Explain how the CCW pump flow rate will be determined when testing is being performed.

Response to Question 09.02.02-28:

a. The 4 inch surge tank recirculation line is not used for full flow testing of the component cooling water (CCW) pumps. This line allows for mixing the contents of the surge tank.

   During normal operation of the CCWS, one or two trains can be in operation in each pair of associated trains (Train 1 & 2 or 3 & 4) cooling the common sets of users—common 1.b (2.b), with or without common 1.a (2.a). The CCWS design allows for one train to be in standby with the other train cooling all of the common users. In this type of configuration, the train cooling the common users can be flow tested during normal operation under conditions “as close to the design basis as possible.” The CCW pump that is in standby can also be aligned to the safety injection system (SIS) users for that train to provide an additional flow path to test the pump while the other associated train is aligned to the common header.

   U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, ITAAC Item 7.8, will be revised to replace “a flow test line” with “normal system alignment."

   U.S. EPR FSAR Tier 2, Section 9.2.2.5 will be revised to include this information related to flow testing of the CCW pumps.

b. CCW pump flow rates are determined using the flow element (FE) located downstream of valve 30KAA30 AA005 shown on U.S. EPR FSAR Tier 2, Figure 9.2.2-1—Component Cooling Water System Trains 1 through 4, Sheet 1 of 2. This flow element is configured for the connection of two flowmeters. One flowmeter is permanently installed with a transmitter to provide flow indication in the main control room (MCR) during normal plant operation. The additional flowmeter is locally connected for flow testing of the CCW pumps.

FSAR Impact:

a. U.S. EPR FSAR Tier 1, Table 2.7.1-3 and U.S. EPR FSAR Tier 2, Section 9.2.2.5 will be revised as described in the response and indicated on the enclosed markup.

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

Question 09.02.02-29:

General Design Criteria (GDC) 46 requires cooling water systems to be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leak tight integrity of its components, (2) the operability and the performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical. The component cooling water system (CCWS) includes four safety-related trains in pairs (trains 1 and 2 are one pair and trains 3 and 4 the second). Each pair feeds one of two common headers that supply several important operational loads as well as safety functions (e.g. reactor coolant pumps (RCP) thermal barriers, RCP motor coolers, Safety Chilled Water System etc.). In order to maintain separation between trains each common header is typically aligned to only one safety train of a pair with the other safety train isolated from the common header by automatic switchover valves. Loss of the train feeding the common header will initiate an automatic switchover to the opposite safety train by closing the switchover valves of the failed train and opening the switchover valves of the other. The switchover valves therefore provide a key safety function; as such these valves are typically included in the inservice testing (IST) program as represented by Final Safety Analysis Report (FSAR) Tier 2 Table 3.9.6-2. However, based upon a review of the CCWS description and supporting information, the staff found that the FSAR needs to be revised to address the following considerations:

a. FSAR Tier 2 Table 3.9.6-2 lists valve IST requirements. Examples of the common header safety-related switchover valves identified in this Table include valves 30KAA30 AA006 and 30KAA30 AA010 (common header 2b supply and return, respectively). Table 3.9.6 indicates that quarterly stroke time and exercise tests are required on each of these valves. The valves are also required to be subject to actuation testing every 24 months by FSAR Tier 2 Section 16, Technical Specification Surveillance Test (ST) 3.7.7.2. The performance of quarterly stroke time and exercise testing of these valves during plant operation and the impact on common loads and how train separation is maintained need to be described.

b. Describe how Technical Specification 3.7.7, Note A.1, relative to redundancy of the thermal barrier cooling supply is met during quarterly testing.

c. Verify that the common header valves 30KAA30 AA013 and 30KAA30 AA014 (shown on FSAR Figure 9.2.2-1) are not listed in either FSAR Tier 1 Tables 2.7.1-1, 2.7.1-2 or FSAR Tier 2 IST Table 3.9.6-2 since they are manual valves with position indication (POS). Describe the bases for using these manual POS valves verses motor operated valves (MOVs) or hydraulic operators.

d. Describe any design provisions that are necessary to facilitate testing of the common header switchover valves.

Response to Question 09.02.02-29:

a. During normal plant and component cooling water system (CCWS) operation, switchover of the common headers is periodically done by the plant operators to verify the operability of the CCWS trains (system surveillances) and to equalize the run time of each CCW pump. This is a normal operator action. There is no impact on the common loads and train separation will continue to be maintained. Control features and interlocks are described in U.S. EPR FSAR Tier 2, Section 9.2.2.6.1, including the requirement for the switchover valves on the off-going train to close prior to the opening of the switchover valves on the on-coming train. During the switchover sequence, there is a minimal amount of time (<20 seconds) where cooling flow to CCWS users on the associated common header is interrupted.

U.S. EPR FSAR Tier 2, Section 9.2.2.3.1, Normal System Operation, will be revised to include the preceding information concerning switchover of the common headers.

b. Refer to the response to Part a of Question 09.02.02-29 for a discussion of quarterly testing during normal plant operation. Quarterly testing of the common header switchover valves will not result in a CCWS train becoming inoperable. RCP thermal barrier cooling can still be aligned to either of the two common headers (1.b or 2.b) as either common header will still maintain the ability to be supplied by either of the two main trains that support the respective common headers.

c. Valves 30KAA20/30 AA013 are manually operated isolation valves downstream of the supply header to the safety chilled water system (SCWS). The supply header to the SCWS is also downstream of the hydraulically operated common header switchover valve. These valves allow manual isolation of the common header 1.b or 2.b from CCWS trains 2 and 3, respectively. This alignment maintains the availability of the safety chillers during normal plant operation when only two CCWS trains are operating, and also helps to equalize run times of each CCW pump. This alignment also maintains the availability of the safety chillers during maintenance of the CCWS common headers.

   Any operating condition that results in the need to close these valves is an abnormal operating condition. There are no time requirements associated with the opening or closing of these valves; therefore, quick closing hydraulically operated valves or motor-operated valves are not necessary. As described, these valves allow for isolation of the common 1.b or 2.b headers for common header maintenance, while still allowing the hydraulically operated common header switchover valve to remain open to provide cooling to the safety chillers.

d. No design provisions are necessary to facilitate testing of the common header switchover valves.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.2.3.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-31:

10 CFR 52.47(b)(1) requires the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that the plant will be built in accordance with the certification. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed to revise the Tier 1 information to address the following considerations in this regard:

a. Although the Introduction Section in Chapter 1 of the Tier 1 Final Safety Analysis Report (FSAR) states that the information in the Tier 1 portion of the FSAR is extracted from the detailed information contained in Tier 2, the staff found that much of the information provided in FSAR Tier 1 is not described in Tier 2 FSAR Section 9.2.2 (e.g., equipment locations, valve functional requirements, indication and control information, priority actuation and control system description and functions, automatic actuation and interlock details, valve failure modes, and harsh environment considerations). In addition, the 24 component cooling water system (CCWS) sheets are difficult to follow and lack header labels such as 1a, 1b, 2a and 2b.

b. FSAR Tier 1, Section 2.7.1 does not stipulate that the CCWS is accessible for performing periodic inspections as required by General Design Criteria (GDC) 45.

c. FSAR Tier 1, Section 2.7.1 does not stipulates that the CCWS design provide for flow testing of the pumps during operation is incomplete in that it does not specify provisions for flow testing all the individual component flow paths to verify flow balance requirements are satisfied.

d. FSAR Tier 1, Section 2.7.1 does not assure that the filters satisfy design and performance requirements, and to confirm alarm functions, are not provided. The system filters are not shown on the Tier 1 drawings.

e. FSAR Tier 1, Section 2.7.1 does not assure that the relief valves satisfy design and performance requirements are not provided.

f. Figure 2.7.1-1, “Component Cooling Water System Functional Arrangement,” does not show nominal pipe sizes, which are necessary for design certification.

g. Figure 2.7.1-1 does not show flow control valves for the individual flow paths of the components being cooled and these components are not listed in the applicable tables, which is necessary for design certification.

h. Tables 2.7.1-1 and -2, do not describe the CCWS pump upstream filters, 30KAA10/20/30/40 AT001.

i. The point of Note 2 for Table 2.7.1-2 is not clear since it does not appear to pertain to anything on the table. The “to be determined (TBD)” notation for valves under the “EQ-Harsh” column header needs to be determined.

j. Sixteen switchover valves safety function is to only close – as shown in table 2.7.1-1. Verify that the switchover valves do not have a safety function to also open.

k. KAB60 AA116 shows an open/close function, KAB70 AA116 only shows a close function only. Verify the safety function of KAB70 AA116 is only to close.

l. KAA80 AP201 dedicated makeup pump missing from Tier 1 Figure 2.7.1.1.

m. Quantitative acceptance criteria need to be established for all ITAAC as applicable (flow rates, heat transfer rates, completion times, etc.).

n. Items 4.6 and 4.9 (CCSW pump trip) appear to be the same.

Response to Question 09.02.02-31:

a. For the component cooling water system (CCWS), Tier 2 information is also located in U.S. EPR FSAR sections other than U.S. EPR FSAR Tier 2, Section 9.2.2. For example:

- Equipment locations and environmental qualification (EQ) information, including functions, such as reactor trip (RT), engineered safeguards (ES), and post accident monitoring (PAM), is provided in U.S. EPR FSAR Tier 2, Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment, and Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment.

- Indication and control requirements, as well as interlock details, are addressed in U.S. EPR FSAR Tier 2, Sections 7.3 through 7.6.

- Function of priority and actuator control system (PACS) modules is described in U.S. EPR FSAR Tier 2, Section 7.3.

- Valve functional requirements are discussed in U.S. EPR FSAR Tier 2, Section 9.2.2.3. Automatic actuation and interlock details are discussed in U.S. EPR FSAR Tier 2, Section 9.2.2.6.1

  For continuation labels on the figures, the sheet number in the label refers to the native file name shown in the lower right corner of the figures, and not to the sheet number listed above the figure with the figure title. The native file name consists of three parts: the system designation, native sheet number, and an indication of either Tier 1 or Tier 2. If a continuation label refers to a figure of a different system, it is identified in the continuation label with the system designation preceding the native sheet number of the continuation figure. If the continuation is on a native sheet number within the same system, the system designation on the continuous label is not included.

b. Information regarding accessibility for Inservice Inspection (ISI) is not required in Tier 1 as discussed in SRP 14.3, Appendix C, Fluid Systems Review Checklist:

  “(xii) Accessibility for ISI Testing and Inspection. The accessibility does not have to be addressed in Tier 1, but should be addressed in Tier 2. The NRC does not intend to grant reliefs to the ISI requirements after design certification.”

  The CCWS safety-related trains are designed to permit appropriate periodic inspection of important components to provide for integrity and capability of the system (GDC 45). Refer to U.S. EPR FSAR Tier 2, Section 9.2.2.1.

c. There are no specific features added for flow testing of the CCWS that require ITAAC. An item is included in U.S. EPR FSAR Tier 1 and has ITAAC only if it meets the "safety-significant" guidance provided in SRP 14.3 and is evidenced in the previous design certifications. ITAAC are specified only for the most safety-significant features. Flow balancing of individual component flow paths is not "safety significant"; however, the performance of the system to meet its safety-significant function is safety significant. System performance ITAAC for the CCWS safety-significant function to transfer heat to the essential service water system (ESWS) are provided in U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC. ITAAC 7.8 in this table addresses flow testing of the CCW pumps during plant operation. The current treatment of information in U.S. EPR FSAR Tier 1, Section 2.7.1 is consistent with previous design certifications.

d. The CCWS filters in question (KAA10/20/30/40 AT001) are strainers to be used for commissioning only. After commissioning, these strainers will be removed and replaced with flanged pipe spools.

e. Manual valves and other passive ASME Code Section III equipment do not need to be specifically addressed in Tier 1 since their pressure boundary function is adequately addressed by ASME Code Section III system ITAAC that result in the N-5 data report for the system. Adding additional ITAAC would be redundant to the system ITAAC. The system relief valves do not have an active safety-related function and are not credited in analyses discussed in the U.S. EPR FSAR; therefore, they do not provide a safety-significant active function. Relief valves such as those on the steam generators and pressurizer are credited in analyses described in the U.S. EPR FSAR and subsequently have performance-related ITAAC associated with them.

f. Refer to SRP 14.3, Appendices A and C, along with previous design certifications, as well as NUREG-1789, NRC Inspection Manual Chapter (IMC) 2501, IMC 2502, IMC 2503, and IMC 2504. There will be non-ITAAC related inspections (IMCs 2501, 2502 and 2504) and ITAAC related inspections (IMC 2503). An item is included in U.S. EPR FSAR Tier 1 and has ITAAC only if it meets the "safety-significant" guidance provided in SRP 14.3 and is evidenced in the previous design certifications. ITAAC are specified only for the most safety-significant features. The specific size of piping is not "safety significant"; however, the performance of the system to meet its safety-significant function is safety significant. System performance ITAAC for the CCWS safety-significant function to transfer heat to the ESWS are provided in U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC. The treatment of information in U.S. EPR FSAR Tier 1, Section 2.7.1 is consistent with previous design certifications and SRP 14.3 figures checklists.

g. SRP 14.3, Appendix C, Fluid Systems Review Checklist, Item II.B.xi, states the following:

"(xi) <u>Flow Control Valves</u>. In general, the flow control capability of control valves does not have to be tested in ITAAC. However, flow control valves should be shown on the figure if they are required to fail-safe or receive a safety actuation signal. The fail-safe position should be noted on the figure, or discussed in the DD if there is no figure."

Components that will have flow control valves will be identified later in the design process. There are no specific performance requirements for components that will have flow control valves.

For some users, the CCWS flow rate will be automatically controlled, while the rest stay at fixed flow resistance during all operating conditions. Flow rates through CCWS users are adjusted once during plant commissioning with the most penalizing configuration (system flow balancing). The minimum required user flow rate is provided in any operating condition.

h. The CCWS filters in question (KAA10/20/30/40 AT001) are strainers to be used for commissioning only. After commissioning, these strainers will be removed and replaced with flanged pipe spools.

i. Note 2 in U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design does apply. There are components in the table that are supplied standby power in an alternate feed alignment.

   U.S. EPR FSAR Tier 1, Table 2.7.1-2 will be revised to include the normal and alternate feed notations for components that have alternate feeds and to remove the "TBD" from valves in the EQ-Harsh column.

j. The CCWS switchover valves serve to connect the common headers to the safeguards trains, while maintaining train separation. These switchover valves have an open and close function.

   U.S. EPR FSAR Tier 1, Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design will be revised to include the Open/Close function for these valves.

k. Valves KAB60 AA116 and KAB70 AA116 are motor-operated valves on the outlet of the chemical and volume control system (CVCS) high pressure (HP) coolers. The CVCS HP coolers are operational, non-safety-related loads that are cooled by the CCWS. The function of each of these valves is to close.

   U.S. EPR FSAR Tier 1, Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design will be revised to show valve KAB60 AA116 has a close function.

l. U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheet 8 of 24, will be revised to include the dedicated makeup pump KAA80 AP201.

m. Quantitative acceptance criteria have been provided for ITAAC as applicable. For design commitment 7.1, related to the CCWS heat exchanger capacity, the primary function of the heat exchangers is to transfer heat to the ESWS. For this commitment, it is not practical to test the design heat load, since it incorporates many heat loads associated with safety injection conditions. As stated in U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, ITAAC item 7.1:

   > "Tests and analyses will be performed to demonstrate the capability of the CCWS heat exchanger as listed in Table 2.7.1-1 to transfer heat load to the ESWS."

n. Item 4.9 was deleted in the Response to RAI 174 Supplement 2, Question 09.02.02-34 (Part d).

FSAR Impact:

U.S. EPR FSAR Tier 1, Figure 2.7.1-1, Table 2.7.1-1 and Table 2.7.1-2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-32:

10 CFR 52.47(b)(1) requires the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that the plant will be built in accordance with the certification. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed to revise the Tier 1 information to address the following considerations in this regard:

(1) Missing specific acceptance criteria for some ITAAC items in Table 2.7.1-3;

   a. Item 7.1- Component cooling water system (CCWS) heat exchanger (HX) capability to transfer the required heat to essential service water system (ESWS) but no specific heat removal rate is identified.

   b. Item 7.2 needs to specify that CCWS pump testing to demonstrate adequate net positive suction head will be completed at the maximum CCWS flow rate conditions, with the inventory in the surge tank at the lowest allowable level (as corrected to account for actual temperature). The maximum CCWS flow rate and minimum allowable surge tank water level, along with the corresponding design basis water temperature that apply need to be listed to assure that test conditions are properly established. The acceptance criteria for an acceptable test need to be specified.

   c. Item 7.3- Acceptance criteria states that “A report exists and concludes that the following required time in response to an safety injection system (SIS) actuation signal.” However, no time has been provided. Item 2.1 only refers to functional arrangement, but it should refer to functional arrangement and design details since nominal pipe size is an important consideration that needs to be verified.

(2) ITAAC items were not provided to assure required flow to some important users:

   a. Low head safety injection and residual heat removal (LHSI/RHR) pump coolers (trains 2 and 3).

   b. Medium head safety injection (MHSI) pump coolers.

   c. CCWS pump motor coolers.

   d. Reactor coolant pump (RCP) Thermal Barrier crosstie system functional capability.

   e. Emergency surge tank makeup capability.

   f. Chemical and volume control system (CVCS) high pressure cooler (containment).

   g. CVCS pump coolers.

(3) Several control interlocks identified in Final Safety Analysis Report (FSAR) Section 9.2.2.6.1 were not included;

   a. Pump low flow protection by closing fuel pool cooling (FPC) heat exchanger (HX) valve to minimum flow stop.

   b. Surge Tank MIN 2 level blocks automatic switchover of common header.

   c. Surge Tank MAX 2 and MIN 3 on trains connected to the same common header auto isolates the common header.

   d. Thermal barrier automatic isolation on flow differential between inlet and outlet.

   e. Partial switchover of the common header as described in 9.2.2.6.1.

(4) ITAAC items that were not adequately addressed:

a. ITAAC for verification of water hammer prevention design features such as adequate high point vents and or operational procedures for the avoidance of water hammer.
b. ITAAC for American Society of Mechanical Engineers (ASME) III relief valve testing verification and set point verification for water-filled systems inside containment.
c. The staff considers that any CCW HX bypass valve automatic controls that function during an accident (e.g. automatic closure or valve position override etc.) are of sufficient importance to warrant addition to FSAR Tier 1 Section 2.7.1 as an inspections, tests, analyses, and acceptance criteria (ITAAC) item.
d. ITAAC item to provide initial confirmation that all the CCWS radiation monitors are capable of performing their design functions (includes HP CVCS HXs automatic isolation and alarms).
e. ITAAC item for verification of automatic isolation of fuel pool cooling on a safety injection actuation signal.
f. ITAAC item for verification of the fire protection water supply to the CCWS surge tanks.

(5) The acceptance criteria for the inspections, tests, analyses, and acceptance criteria (ITAAC) that are included in Tier 1 of the DCD are largely specified in terms of report documentation (an report exists) and quantitative acceptance criteria are generally not provided. The NRC review criteria that are provided in SRP Section 14.3, “Inspections, Tests, Analyses, and Acceptance Criteria,” calls for numeric performance values as ITAAC acceptance criteria when values consistent with the design commitments are possible. Therefore, the acceptance criteria that are specified for the Tier 1 ITAAC need to be revised to specify numeric performance values to the maximum extent possible, and the use of report documentation should be limited to those cases where the detailed supporting information in Tier 2 of the DCD does not lend itself to concise verification.

Response to Question 09.02.02-32:

(1)a. Refer to the Response to RAI 174, Question 09.02.02-31 (Part m).

(1)b. U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, Acceptance Criteria Item 7.2, will be revised to specify that CCWS pump testing to demonstrate adequate net positive suction head (available vs. required)—NPSHA must be greater than NPHSR. The testing will be completed at the maximum CCWS flow rate conditions with consideration for the inventory in the surge tank at the lowest allowable level (as corrected to account for actual temperature and atmospheric pressure conditions).

(1)c. Refer to the Response to RAI 128, Question 14.03.07-20. U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, Acceptance Criteria Item 7.3, was revised to delete the statement related to response time to a safety injection signal.

(2)a. This is not defined as a major safety-significant design feature per SRP 14.3. The major safety-significant design features for the U.S. EPR CCWS that require individual ITAAC are defined in U.S. EPR FSAR Tier 1, Section 2.7.1.

(2)b. This is not defined as a major safety-significant design feature per SRP 14.3. The major safety-significant design features for the U.S. EPR CCWS that require individual ITAAC are defined in U.S. EPR FSAR Tier 1 Section 2.7.1.

(2)c. This is not defined as a major safety-significant design feature per SRP 14.3. The major safety-significant design features for the U.S. EPR CCWS that require individual ITAAC are defined in U.S. EPR FSAR Tier 1, Section 2.7.1.

(2)d. Refer to the Response to Question 09.02.02-32 (Part 3) for a discussion on interlocks that require individual ITAAC.

The reactor coolant pump (RCP) thermal barrier crosstie is a connection in the supply piping to the thermal barriers that allows cooling to be supplied from either CCWS common header 1.b or 2.b. If cooling is aligned from the common 1.b header, the containment isolation valves (CIV) from the common 1.b header are opened and the common 2.b header CIVs for thermal barrier cooling are held closed by an interlock; and vice versa, if cooling is supplied from the common 2.b header.

ITAAC for CCWS CIV performance are addressed in U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, Acceptance Criteria Item 7.9.

(2)e. The fire water makeup to the CCWS surge tanks is for post seismic events only. To activate this makeup source, a pipe spool must be manually installed, followed by the opening of two manually operated isolation valves. This function does not meet the safety-significant criteria as defined in SRP 14.3, Appendix C, Fluid Systems Review Checklist.

(2)f. Cooling of the chemical and volume control system (CVCS) high pressure coolers is a non-safety-related function of CCWS. This is a non-safety-related operational load. This function does not meet the safety-significant criteria as defined in SRP 14.3, Appendix C, Fluid Systems Review Checklist.

(2)g. Cooling of the CVCS pump coolers is a non-safety-related function of the CCWS. This is a non-safety-related operational load. This function does not meet the safety-significant criteria as defined in SRP 14.3, Appendix C, Fluid Systems Review Checklist.

(3) SRP 14.3, Appendix C, Fluid Systems Review Checklist, Item II.B.viii, states the following:

"(viii) <u>Interlocks</u>. Interlocks needed for direct safety functions should be included in the system design description and ITAAC. Examples include the interlocks to prevent ISLOCA and an interlock that switches the system or component from one mode to a safety function mode. Other interlocks that are more equipment protective in nature, are only in the DCD Tier 2. All of the interlocks are not tested in the system ITAAC because the overall logic is checked in the I&C ITAACs for the safety system logic."

(3)a. This control feature and interlock is for equipment protection during normal plant operation. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(3)b. This control feature and interlock is for equipment protection during normal operation. This interlock is a secondary function in place to avoid transferring the leak. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(3)c. This control feature and interlock is for equipment protection during normal plant operation. This interlock is a secondary function in place to conserve the safety-related function of both trains. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(3)d. This control feature is for equipment protection of the RCP thermal barrier. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(3)e. This control feature and interlock is for equipment protection during normal plant operation. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(4)a. A hydraulic transient analysis of the CCWS will be performed later in the design process to identify the system behavior during normal startup, normal shutdown, and abnormal conditions to determine the system maximum and minimum pressures for various system mechanical and piping components. Sizing, selection and location of permanent surge control devices (high point vents) and determination of any required operational procedures will also be confirmed. This analysis will consider pump and surge tank details, as well as the pipe sizes and piping physical arrangement. The analysis will confirm that (a) the dynamic pulse loadings for piping and equipment as a result of various transient events are fully accounted for and designed against for all segments of the piping system, and (b) the component and piping system are properly designed within the maximum internal transient pressure allowable.

As discussed in U.S. EPR FSAR Tier 2, Section 9.2.2.1, the CCWS is designed to permit appropriate periodic pressure and functional testing in accordance with GDC 46. Preoperational testing will be performed on the CCWS as described in U.S. EPR FSAR Tier 2, Section 14.2, Test #046 to demonstrate the proper operation of the CCWS in all operational configurations, including flow balancing and the absence of water hammer.

The valves that maintain proper operation of the CCWS are periodically tested in accordance with ASME OM Code as described in U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications Section 5.5.7.

(4)b. Manual valves and other passive ASME Code Section III equipment do not need to be specifically addressed in Tier 1 since their pressure boundary function is adequately addressed by ASME Code Section III system ITAAC that result in the N-5 data report for the system. Adding additional ITAAC would be redundant to the system ITAAC. The system relief valves do not have an active safety-related function and are not credited in analyses discussed in the U.S. EPR FSAR; therefore, they do not provide a safety-significant active function. Relief valves such as those on the steam generators and pressurizer, are credited in analyses described in the U.S. EPR FSAR and subsequently have performance related ITAAC associated with them.

(4)c. Normally, the CCWS heat exchanger (HX) bypass control valve is manually positioned to maintain a normal CCWS outlet temperature slightly greater than the minimum allowable. An alarm in the main control room (MCR) alerts the operator if the outlet temperature approaches the low temperature limit (decreasing temperature). If the outlet temperature continues to decrease, the CCWS HX bypass control valve automatically throttles open to maintain a CCWS user minimum cooling water inlet temperature greater than the minimum allowable. During warmer operating periods, the HX bypass control valve normally remains closed. In the event of a CCWS HX high outlet temperature condition combined with a bypass valve open signal, which indicates the bypass valve has failed open, the bypass valve automatically closes. This control feature and interlock is for equipment protection to make sure CCWS users receive cooling water in the allowable temperature range. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(4)d. Refer to SRP 14.3, Appendix C, Fluid Systems Review Checklist. This control feature and interlock is for equipment protection. This is not a safety-significant design feature as described in U.S. EPR FSAR Tier 2, Section 14.3.

(4)e. Fuel pool cooling is not automatically isolated on a safety injection actuation signal.

(4)f. The fire water makeup to the CCWS surge tanks is for post-seismic events only. To activate this makeup source, a pipe spool must be manual installed followed by the opening of two manually operated isolation valves. This function does not meet the safety-significant criteria as defined in SRP 14.3 Appendix C, Fluid Systems Review Checklist.

(5) Quantitative acceptance criteria have been provided for ITAAC as applicable. For design commitment 7.1, related to the CCWS heat exchanger capacity, the primary function of the heat exchangers is to transfer heat to the ESWS. For this commitment, it is not practical to test the design heat load, since it incorporates many heat loads associated with safety injection conditions. As stated in U.S. EPR FSAR Tier 1, Table 2.7.1-3—Component Cooling Water System ITAAC, ITAAC item 7.1:

> “Tests and analyses will be performed to demonstrate the capability of the CCWS heat exchanger as listed in Table 2.7.1-1 to transfer heat load to the ESWS.”

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.7.1-3 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-37:

The safety chilled water system (SCWS) must be able to withstand natural phenomena without the loss of function in accordance with general design criteria (GDC) 2 requirements. While these boundaries (including valves) are properly classified as safety-related (with the exception of break flanges identified in RAI 9.2.8-01), Seismic Category I, the system description does not explain the functioning of safety-related boundary to non safety related boundary to ensure SCWS integrity and operability during seismic events and other natural phenomena. Consequently, additional information needs to be included in Section 9.2.8 of the Final Safety Analysis Report (FSAR) to fully describe:

a. how SCWS integrity and operability is assured by the safety-related boundary isolation so that common-cause simultaneous failure of all non-safety-related SCWS piping will not compromise the SCWS safety functions during seismic events, and

b. any other performance assumptions that pertain to the boundary isolation or other parts of the system that are necessary to assure the capability of the SCWS to perform its safety functions during natural phenomena.

Response to Question 09.02.02-37:

a. The safety chilled water system (SCWS) does not have any non-safety-related piping within the scope of design certification.

   Non-safety-related piping, components and associated pipe supports, located near or forming an interface with or extension of safety-related system piping and components, are classified and designed as Seismic Category II. As a minimum, any interfacing non-safety-related system piping is seismically analyzed up to the boundary anchor. A Seismic Category II classification provides that loss of physical integrity of non-safety-related structures, systems and components (SSC) as a result of natural phenomena will not result in an adverse interaction with a safety-related SSC that potentially compromises the capability of the safety-related SSC to perform its safety function. The safety-related boundaries are classified and designed as Seismic Category I. The non-seismic items are evaluated for seismic interactions (refer to U.S. EPR FSAR Tier 2, Section 3.7.3.8).

b. SSC in the SCWS, which provide cooling for safety-related equipment, are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, and external missiles without loss of capability to perform their safety-related functions (GDC 2). Structures housing the system, as well as the system components, are capable of withstanding the effects of earthquakes. The seismic design of this system meets the guidance of RG 1.29 (Position C.1 for the safety-related portion). Refer to U.S. EPR FSAR Tier 2, Section 3.2 for quality group classifications.

   U.S. EPR FSAR Tier 2, Section 9.2.8.1 will be revised to reflect this information.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.8.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-38:

General design criteria (GDC) 2 requires structures housing the system to have the capability to withstand the effects of natural phenomena like earthquakes, tornadoes, hurricanes, and floods without loss of safety-related functions. The safety chilled water systems are located in the Seismic Category I safeguard buildings, which are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other natural phenomena. However, the Final Safety Analysis Report (FSAR) does not indicate how the air-cooled chiller units for Divisions 1 and 4 receive cooling while remaining within the Safeguards Building.

- Specifically describe how cooling air is supplied to these units while retaining the protection against natural phenomena such as tornado generated external missiles and differential pressure effects.

Response to Question 09.02.02-38:

The intake/ducting arrangement used to supply air to the air-cooled chiller units for Divisions 1 and 4 is a Seismic Category I tornado missile-protected part of the fully-hardened SB structure. Air supply flows from intakes, located on the sides of the SBs, through the air-cooled condensers via a winding flow path before being discharged from the protected structure on the building roof. The location and sizing of the intake and exhaust openings will provide sufficient fresh air capacity under design outside air conditions (including all forms of precipitation). The design details of the intake structure will be determined later in the design process.

Outside air enter the SCWS condensers through the main air intakes in SB Divisions 1 and 4. The air enters the main air intakes through protective screens in an upward vertical direction, which turns horizontal and inward through the system condensers. The airflow from the condensers turns from the horizontal to vertical (upward) direction, before again turning in the horizontal direction outward toward the remaining portion of the air flow path before discharge in the horizontal direction on the roof.

The air intake opening is equipped with an electrically heated rain/weather protection grille to prevent ice formation. The air intake is equipped with a fine wire mesh grille, which can be periodically cleaned to avoid the ingress of insects. Moreover, each condenser unit is protected against incoming pollution of outside air by a filter unit, which is installed in the SB at the same level as the condenser.

In SB Divisions 1 and 4, spatial separation maintains that only one division will be lost in case of an airplane hazard. The SCWS components are protected so that ventilation cooling to vital SB systems is maintained until the reactor is safely shut down.

FSAR Impact:

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

Question 09.02.02-43:

The safety chilled water system (SCWS) must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. In order to satisfy system flow requirements, the SCWS design must assure that the minimum net positive suction head (NPSH) for the SCWS pumps will be met for all postulated conditions, including consideration of vortex formation. The staff found that the NPSH requirement for the SCWS pumps was not specified and Tier 2 Final safety Analysis Report (FSAR) Section 9.2.8 did not describe how the SCWS design will assure that the NPSH requirement for the SCWS pumps is satisfied (including consideration of vortex formation) and how much excess margin is provided by the SCWS design for the most limiting assumptions. Consequently, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.8 to specify what the minimum net positive suction head (NPSH) requirement is for the SCWS pumps and to fully explain how this minimum NPSH requirement is satisfied by the system design when taking vortex formation into consideration, and how much excess margin is available for the most limiting case. Sufficient information is needed to enable the staff to independently confirm that the design is adequate in this regard, including limiting assumptions that were used along with supporting justification.

Response to Question 09.02.02-43

Safety chilled water system (SCWS) pump sizing, including net positive suction head (NPSH) requirements, will be determined after the final pump pressures and flow rates are determined, later in the design process. Pump pressures and flow rates will depend on SCWS user loads and flow requirements. Net positive suction head available (NPSHA), as well as excess margin, will be based on SCWS pump net positive suction head required (NPSHR) for the limiting SCWS line up. NPSHA will be greater than NPSHR at the minimum expansion tank level. The possibility of vortex formation will also be considered in this evaluation.

FSAR Impact:

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

Question 09.02.02-44:

The safety chilled water system (SCWS) must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Based on Final safety Analysis Report (FSAR) Tier 2 Section 9.2.8.2, a diaphragm expansion tank is utilized with a nitrogen fill connection with relief valve protection for each division. Piping voids are precluded by the constant pressure from the divisionalized nitrogen-charged expansion tank; however, there is no FSAR detailed description of waterhammer consideration in the design. Describe the waterhammer design considerations in the FSAR.

Response to Question 09.02.02-44:

Each safety chilled water system (SCWS) division contains a diaphragm expansion tank, which utilizes a nitrogen fill connection and has relief valve protection. Piping voids associated with potential waterhammer are precluded by the constant pressure maintained in the nitrogen charged expansion tank in each division.

The diaphragm expansion tank is also used for the equalization of pressure and volumetric expansion and maintains the requisite static system pressure. A relief valve on the connecting line prevents exceeding the line design pressure.

Additionally, a hydraulic analysis of the SCWS will be performed later in the design process to identify the system requirements during normal startup, normal shutdown and abnormal conditions to confirm the minimum and maximum system pressures for various system mechanical and piping components. The analysis will consider pump details, as well as the pipe sizes and piping physical arrangement. Based on this analysis, an evaluation of waterhammer concerns will be performed to confirm that the system pressures are within the maximum allowed internal pressures. Sizing of the permanent surge control devices will also be confirmed.

In addition, since the system piping and equipment are primed and full, immediate startup of the standby SCWS pump is not expected to result in a transient pressure beyond design.

U.S. EPR FSAR Tier 2, Section 9.2.8.3.1 will be revised to reflect the additional information concerning potential waterhammer.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.8.3.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-48:

The safety chilled water system (SCWS) must be capable of removing heat from SSCs important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC 44) requirements. Also, 10 CFR 52.47(a)(22) requires that information demonstrating how operating experience insights have been incorporated into the plant design be included in the Final Safety Analysis Report (FSAR). During a recent review of industry operating experience, the staff found that some licensees were experiencing significant wall thinning of pipe downstream of butterfly valves that were being used to throttle service water flow. In order to assure that this will not occur in the SCWS for the Evolutionary Power Reactor (EPR) design, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.8 to describe to what extent butterfly valves will be used to throttle SCWS flow and design provisions that will be implemented to prevent consequential pipe wall thinning from occurring.

Response to Question 09.02.02-48:

The safety chilled water system (SCWS) uses high quality demineralized water in a closed loop system. There are no butterfly valves in the design of the U.S. EPR SCWS. Therefore, U.S. EPR FSAR Tier 2, Section 9.2.8 does not contain any discussion concerning the use of butterfly valves to throttle SCWS flow.

FSAR Impact:

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

U.S. EPR Final Safety Analysis Report Markups

2.7 Support Systems

2.7.1 Component Cooling Water System

1.0 Description

The component cooling water system (CCWS) is a safety related closed loop cooling water system comprising four divisions that remove heat generated from safety related and non-safety related components connected to the CCWS. Heat transferred from these components to the CCWS is rejected to the essential service water system (ESWS) via the component cooling water heat exchangers.

The CCWS provides the following significant safety related functions:

- The CCWS provides the transport of the heat from the safety injection system (SIS) and residual heat removal system (RHRS) to the ESWS.

09.02.02-12

- The CCWS provides the cooling of the thermal barrier of the reactor coolant pump (RCP) seals during all plant operating modes when the RCPs are running. There is a cross-connect in the header that supplies cooling to the RCP thermal barriers to allow thermal barrier cooling from either CCWS Common 1b or 2b headers. The cross-connect is inside containment, downstream of the CIVs on each of the Common 1b and 2b headers.
- The CCWS provides heat removal from the safety chilled water system (SCWS) divisions 2 and 3.
- The CCWS provides the removal of the decay heat from the fuel pool cooling water heat exchanger and the spent fuel pool cooling system pump room ventilation coolers.
- The CCWS containment isolation valves close upon receipt of a containment isolation signal.

The CCWS provides the following significant non-safety-related functions:

- The non-safety-related dedicated CCWS train removes heat from the severe accident heat removal system (SAHRS).

2.0 Arrangement

2.1 The functional arrangement of the CCWS is as shown in Figure 2.7.1-1—Component Cooling Water System Functional Arrangement.

2.2 The location of CCWS equipment is as listed in Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design.

2.3 Physical separation exists between divisions of the CCWS.

Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design (10 Sheets)

Equipment Description	Equipment Tag Number [(1)]	Equipment Location	ASME Code Section III	Function	Seismic Category
Heat Exchanger Bypass Temperature Control Valve	KAA10AA112	Safeguards Building Division 1	Yes	Temperature control	I
Heat Exchanger Bypass Temperature Control Valve	KAA20AA112	Safeguards Building Division 2	Yes	Temperature control	I
Heat Exchanger Bypass Temperature Control Valve	KAA30AA112	Safeguards Building Division 3	Yes	Temperature control	I
Heat Exchanger Bypass Temperature Control Valve	KAA40AA112	Safeguards Building Division 4	Yes	Temperature control	I
Demineralized Water Makeup Supply To Surge Tank	KAA10AA027	Safeguards Building Division 1	Yes	Open/Close	I
Demineralized Water Makeup Supply To Surge Tank	KAA20AA027	Safeguards Building Division 2	Yes	Open/Close	I
Demineralized Water Makeup Supply To Surge Tank	KAA30AA027	Safeguards Building Division 3	Yes	Open/Close	I
Demineralized Water Makeup Supply To Surge Tank	KAA40AA027	Safeguards Building Division 4	Yes	Open/Close	I
CCWS Common Header 1a Switchover Valve	KAA10AA033	Safeguards Building Division 1	Yes	Open/Close	I
CCWS Common Header 1a Switchover Valve	KAA10AA032	Safeguards Building Division 1	Yes	Open/Close	I
CCWS Common Header 1a Switchover Valve	KAA20AA033	Safeguards Building Division 2	Yes	Open/Close	I
CCWS Common Header 1a Switchover Valve	KAA20AA032	Safeguards Building Division 2	Yes	Open/Close	I
CCWS Common Header 2a Switchover Valve	KAA30AA033	Safeguards Building Division 3	Yes	Open/Close	I

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Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design (10 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME Code Section III	Function	Seismic Category
CCWS Common Header 2a Switchover Valve	KAA30AA032	Safeguards Building Division 3	Yes	Open/Close	I
CCWS Common Header 2a Switchover Valve	KAA40AA033	Safeguards Building Division 4	Yes	Open/Close	I
CCWS Common Header 2a Switchover Valve	KAA40AA032	Safeguards Building Division 4	Yes	Open/Close	I
CCWS Common Header 1b Switchover Valve	KAA10AA006	Safeguards Building Division 1	Yes	Open/Close	I
CCWS Common Header 1b Switchover Valve	KAA10AA010	Safeguards Building Division 1	Yes	Open/Close	I
CCWS Common Header 1b Switchover Valve	KAA20AA006	Safeguards Building Division 2	Yes	Open/Close	I
CCWS Common Header 1b Switchover Valve	KAA20AA010	Safeguards Building Division 2	Yes	Open/Close	I
CCWS Common Header 2b Switchover Valve	KAA30AA006	Safeguards Building Division 3	Yes	Open/Close	I
CCWS Common Header 2b Switchover Valve	KAA30AA010	Safeguards Building Division 3	Yes	Open/Close	I
CCWS Common Header 2b Switchover Valve	KAA40AA006	Safeguards Building Division 4	Yes	Open/Close	I
CCWS Common Header 2b Switchover Valve	KAA40AA010	Safeguards Building Division 4	Yes	Open/Close	I
Low Head Safety Injection Heat Exchanger Isolation Valve	KAA12AA005	Safeguards Building Division 1	Yes	Open	I
Low Head Safety Injection Heat Exchanger Isolation Valve	KAA22AA005	Safeguards Building Division 2	Yes	Open	I

Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design (10 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME Code Section III	Function	Seismic Category
Common Header 2b Containment Return Isolation Valves	KAB30AA056	Safeguards Building Division 4	Yes	Close (Manually Initiated)	I
Common Header 2b Containment Supply Isolation Check Valve	KAB30AA054	Reactor Building	Yes	Close	I
Common Header 1b Containment Supply Isolation Valve (mov)	KAB40AA001	Safeguards Building Division 1	Yes	Close	I
Common Header 1b Containment Return Isolation Valve (mov)	KAB40AA006	Reactor Building	Yes	Close	I
Common Header 1b Containment Return Isolation Valve (mov)	KAB40AA012	Safeguard Building Division 1	Yes	Close	I
Common Header 1b Containment Supply Isolation Check Valve	KAB40AA002	Reactor Building	Yes	Close	I
Common Header 2b Nuclear Auxiliary Building and Radwaste Building Isolation Supply Valve (Hydraulic)	KAB50AA001	Safeguards Building Division 4	Yes	Close	I
Common Header 2b Nuclear Auxiliary and Radwaste Building Supply Isolation Valve (Hydraulic)	KAB50AA006	Safeguards Building Division 4	Yes	Close	I
Common Header 2b Nuclear Auxiliary and Radwaste Building Return Isolation Valve (Hydraulic)	KAB50AA004	Safeguards Building Division 4	Yes	Close	I
Common Header 2b Auxiliary and Waste Building Return Isolation Check Valve	KAB50AA008	Safeguards Building Division 4	Yes	Close	I

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Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design (10 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME Code Section III	Function	Seismic Category
Common Header 1b Containment Supply Isolation Valve (mov)	KAB60AA013	Safeguards Building Division 1	Yes	Close	I
Common Header 1b Containment Return Isolation Valve (mov)	KAB60AA018	Reactor Building	Yes	Close	I
Common Header 1b Containment Return Isolation Valve (mov)	KAB60AA019	Safeguards Building Division 1	Yes	Close	I
Common Header 1b CVCS HP Cooler 1 and RCP Coolers 1/2 Containment Supply Isolation Check Valve	KAB60AA014	Reactor Building	Yes	Prevent Backflow	I
Common Header 1b CVCS HP Cooler 1 Downstream Control Valve (mov)	KAB60AA116	Reactor Building	Yes	~~Open/~~Close	I
Common Header 2b Containment Supply Isolation Valves	KAB70AA013	Safeguards Building Division 4	Yes	Close	I
Common Header 2b Containment Return Isolation Valves	KAB70AA018	Reactor Building	Yes	Close	I
Common Header 2b Containment Return Isolation Valves	KAB70AA019	Safeguards Building Division 4	Yes	Close	I
Common Header 2b Containment Supply Isolation Check Valve	KAB70AA014	Reactor Building	Yes	Prevent Backflow	I
Common Header 2b CVCS HP Cooler 2 Downstream Control Valve (mov)	KAB70AA116	Reactor Building	Yes	Close	I

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Component Cooling Water Pump	KAA10AP001	Safeguards Building Division 1	1	Yes	Yes	On-Off	Start-Stop
Component Cooling Water Pump	KAA20AP001	Safeguards Building Division 2	2	Yes	Yes	On-Off	Start-Stop
Component Cooling Water Pump	KAA30AP001	Safeguards Building Division 3	3	Yes	Yes	On-Off	Start-Stop
Component Cooling Water Pump	KAA40AP001	Safeguards Building Division 4	4	Yes	Yes	On-Off	Start-Stop
Train Switchover Valve (Hydraulic)	KAA10AA006	Safeguards Building Division 1	1NA (3)	TBDYes	YesNo	Pos	Start-Stop Open-Close
Train Switchover Valve (Hydraulic)	KAA10AA010	Safeguards Building Division 1	NA (3) 1	TBDYes	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA10AA032	Safeguards Building Division 1	NA (3) 1	YesTBD	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA10AA033	Safeguards Building Division 1	NA (3) 1	TBDYes	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA20AA006	Safeguards Building Division 2	NA (3) 2	YesTBD	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA20AA010	Safeguards Building Division 2	NA (3) 2	TBDYes	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA20AA032	Safeguards Building Division 2	NA (3) 2	TBDYes	YesNo	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA20AA033	Safeguards Building Division 2	NA (3) 2	Yes	No	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets) 09.02.02-12

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Equipment Description	Equipment Tag Number [1]	Equipment Location	IEEE Class 1E [2]	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Train Switchover Valve (Hydraulic)	KAA30AA006	Safeguards Building Division 3	NA [3] ~~3~~	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA30AA010	Safeguards Building Division 3	NA [3] ~~3~~	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA30AA032	Safeguards Building Division 3	NA [3] ~~3~~	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA30AA033	Safeguards Building Division 3	NA [3] ~~3~~	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA40AA006	Safeguards Building Division 4	NA [3] 4	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA40AA010	Safeguards Building Division 4	NA [3] 4	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA40AA032	Safeguards Building Division 4	NA [3] 4	Yes	No	Pos	Open-Close
Train Switchover Valve (Hydraulic)	KAA40AA033	Safeguards Building Division 4	NA [3] 4	Yes	No	Pos	Open-Close
Heat Exchanger Bypass Valve	KAA10AA112	Safeguards Building	1[N] 2[A]	Yes	No	Pos	Open-Close
Heat Exchanger Bypass Valve	KAA20AA112	Safeguards Building	2[N] 1[A]	Yes	No	Pos	Open-Close
Heat Exchanger Bypass Valve	KAA30AA112	Safeguards Building	3[N] 4[A]	Yes	No	Pos	Open-Close
Heat Exchanger Bypass Valve	KAA40AA112	Safeguards Building	4[N] 3[A]	Yes	No	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number [(1)]	Equipment Location	IEEE Class 1E [(2)]	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Surge Tank Level	KAA10CL094	Safeguards Building	1	No	No	Level	NA / NA
Surge Tank Level	KAA10CL099	Safeguards Building	1	No	No	Level	NA / NA
Surge Tank Level	KAA20CL094	Safeguards Building	2	No	No	Level	NA / NA
Surge Tank Level	KAA20CL099	Safeguards Building	2	No	No	Level	NA / NA
Surge Tank Level	KAA30CL094	Safeguards Building	3	No	No	Level	NA / NA
Surge Tank Level	KAA30CL099	Safeguards Building	3	No	No	Level	NA / NA
Surge Tank Level	KAA40CL094	Safeguards Building	4	No	No	Level	NA / NA
Surge Tank Level	KAA40CL099	Safeguards Building	4	No	No	Level	NA / NA
LHSI HX Isolation Valve	KAA12AA005	Safeguards Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close
LHSI HX Isolation Valve	KAA22AA005	Safeguards Building	2[N] 1[A]	Yes	Yes	Pos	Open-Close
LHSI HX Isolation Valve	KAA32AA005	Safeguards Building	3[N] 4[A]	Yes	Yes	Pos	Open-Close
LHSI HX Isolation Valve	KAA42AA005	Safeguards Building	4[N] 3[A]	Yes	Yes	Pos	Open-Close
LHSI Pump Seal Cooler Isolation Valve	KAA22AA013	Safeguards Building	2[N] 1[A]	Yes	Yes	Pos	Open-Close
LHSI Pump Seal Cooler Isolation Valve	KAA32AA013	Safeguards Building	3[N] 4[A]	Yes	Yes	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

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Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 2b Auxiliary Building and Waste Building Isolation Valve (Hydraulic)	KAB50AA001	Safeguards Building	~~4~~ NA(3)	No	No	Pos	Open-Close ~~/ TBD~~
Common Header 2b Auxiliary Building and Waste Building Isolation Valve (Hydraulic)	KAB50AA004	Safeguards Building	~~4~~ NA(3)	No	No	Pos	Open-Close
Common Header 2b Auxiliary Building and Waste Building Isolation Valve (Hydraulic)	KAB50AA006	Safeguards Building	~~4~~ NA(3)	No	No	Pos	Open-Close
Common Header 1b Auxiliary Building Isolation Valve (Hydraulic)	KAB80AA015	Safeguards Building	~~1~~ NA(3)	No	No	Pos	Open-Close
Common Header 1b Auxiliary Building Isolation Valve (Hydraulic)	KAB80AA016	Safeguards Building	~~1~~ NA(3)	No	No	Pos	Open-Close
Common Header 1b Auxiliary Building Isolation Valve (Hydraulic)	KAB80AA019	Safeguards Building	~~1~~ NA(3)	No	No	Pos	Open-Close

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 1b Non-Safety Loads Containment Isolation Valve	KAB40AA001	Safeguards Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close
Common Header 1b Non-Safety Loads Containment Isolation Valve	KAB40AA006	Safeguards Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close
Common Header 1b Non-Safety Loads Containment Isolation Valve	KAB40AA012	Reactor Building	4[N] 3[A]	Yes	Yes	Pos	Open-Close
Common Header 1b Safety Related Loads Containment Isolation Valves	KAB60AA013	Safeguards Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close
Common Header 1b Safety Related Loads Containment Isolation Valves	KAB60AA018	Reactor Building	4[N] 3[A]	Yes	Yes	Pos	Open-Close
Common Header 1b Safety Related Loads Containment Isolation Valves	KAB60AA019	Safeguards Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number [(1)]	Equipment Location	IEEE Class 1E [(2)]	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 2b Safety Related Loads Containment Isolation Valves	KAB70AA013	Safeguards Building	4[N] 3[A]	Yes	Yes	Pos	Open-Close
Common Header 2b Safety Related Loads Containment Isolation Valves	KAB70AA018	Reactor Building	1[N] 2[A]	Yes	Yes	Pos	Open-Close
Common Header 2b Safety Related Loads Containment Isolation Valve	KAB70AA019	Safeguards Building	4[N] 3[A]	Yes	Yes	Pos	Open-Close
Common Header 1b RCP Thermal Barriers Containment Isolation Valve	KAB30AA049	Safeguards Building	1[N] 2[A]	Yes	No	Pos	Open-Close
Common Header 1b RCP Thermal Barriers Containment Isolation Valve	KAB30AA051	Reactor Building	4[N] 3[A]	Yes	No	Pos	Open-Close
Common Header 1b RCP Thermal Barriers Containment Isolation Valve	KAB30AA052	Safeguards Building	1[N] 2[A]	Yes	No	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 2b RCP Thermal Barriers Containment Isolation Valve	KAB30AA053	Safeguards Building	4[N] 3[A]	Yes	No	Pos	Open-Close
Common Header 2b RCP Thermal Barriers Containment Isolation Valve	KAB30AA055	Reactor Building	1[N] 2[A]	Yes	No	Pos	Open-Close
Common Header 2b RCP Thermal Barriers Containment Isolation Valve	KAB30AA056	Safeguards Building	4[N] 3[A]	Yes	No	Pos	Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA10AA027	Safeguards Building	1[N] 2[A]	No	No	Pos	Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA20AA027	Safeguards Building	2[N] 1[A]	No	No	Pos	Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA30AA027	Safeguards Building	3[N] 4[A]	No	No	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA40AA027	Safeguards Building	4[N] 3[A]	No	No	Pos	Open-Close
Common Header 1a Fuel Pool Cooling Heat Exchanger 1 Downstream Control Valve	KAB10AA134	Safeguards Building	1[N] 2[A]	No	No	NA / NA	NA / NA
Common Header 1a Fuel Pool Cooling Heat Exchanger 2 Downstream Control Valve	KAB20AA134	Safeguards Building	~~2~~4[N] 3[A]	No	No	NA / NA	NA / NA
Common Header 1b Safety Related Loads CVCS HP Cooler 1 Downstream Control Valve	KAB60AA116	Reactor Building	~~1~~NA	No	No	Pos	Open-Close
Common Header 2b Safety Related Loads CVCS HP Cooler 2 Downstream Control Valve	KAB70AA116	Reactor Building	~~4~~NA	No	No	Pos	Open-Close
Dedicated CCWS Surge Tank Isolation Valve	KAA80AA020	Safeguards Building	~~NA~~4[N] 3[A]	No	No	Pos	Open-Close

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number [1]	Equipment Location	IEEE Class 1E [2]	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Dedicated CCWS Surge Tank Nitrogen Supply Valve	KAA80AA021	Safeguards Building	~~NA~~4[N] 3[A]	No	No	Pos	Open-Close
Dedicated CCWS Demin Water Makeup Water Supply Valve	KAA80AA202	Safeguards Building	~~NA~~4[N] 3[A]	No	No	Pos	Open-Close
Dedicated CCWS Pump	KAA80AP001	Safeguards Building	~~NA~~4	No	No	On-Off / NA	Start-Stop / NA
Dedicated CCWS Demin Water Makeup Pump	KAA80AP201	Safeguards Building	~~NA~~4	No	No	On-Off / NA	Start-Stop / NA
Safety Chilled Water Chiller CCWS Flow Control Valve	KAA22AA101	Safeguards Building	2[N] 1[A]	No	No	NA / NA	NA / NA
Safety Chilled Water Chiller CCWS Flow Control Valve	KAA32AA101	Safeguards Building	3[N] 4[A]	No	No	NA / NA	NA / NA
Operational Chilled Water Temp Control	KAB50AA111	Safeguards Building	NA	No	No	NA / NA	NA / NA
Operational Chilled Water Temp Control	KAB50AA112	Safeguards Building	NA	No	No	NA / NA	NA / NA
Operational Chilled Water Temp Control	KAB50AA113	Safeguards Building	NA	No	No	NA / NA	NA / NA

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Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (11 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
CVCS HP Cooler 2 Inlet Radiation Monitor	KAB70CR001	Reactor Building	NA	Yes	No	NA / NA	NA / NA
CVCS HP Cooler 2 Outlet Radiation Monitor	KAB70CR002	Reactor Building	NA	Yes	No	NA / NA	NA / NA

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

2) N denotes the division the component is normally powered from; A denotes the division the component is powered from when alternate feed is implemented.

3) Each hydraulically operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy.

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Table 2.7.1-3—Component Cooling Water System ITAAC (7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.1	The CCWS heat exchanger as listed in Table 2.7.1-1 has the capacity to transfer the design heat load to the ESWS system.	Tests and analyses will be performed to demonstrate the capability of the CCWS heat exchanger as listed in Table 2.7.1-1 to transfer the heat load to the ESWS.	A report exists and concludes that the ESWS has the capacity to remove the design heat load via the heat exchanger listed in Table 2.7.1-1.
7.2	The pumps listed in Table 2.7.1-1 have sufficient NPSHA.	Testing and analyses will be performed to verify NPSHA for pumps listed in Table 2.7.1-1.	A report exists and concludes that the pumps listed in Table 2.7.1-1 have NPSHA that is greater than net positive suction head required (NPSHR) at system run-out flow with consideration for minimum allowable surge tank water level (as corrected to account for actual temperature and atmospheric conditions).
7.3	The CCWS delivers water to the LHSI/RHRS heat exchangers at the design flow rate to provide cooling.	Tests and analyses will be performed to determine the CCWS delivery rate under design conditions.	The CCWS delivers the following design flow rate to each LHSI/RHR heat exchanger: 2.19 x 106 lb/hr.
7.4	The CCWS delivers water to the RCP thermal barrier coolers.	Tests and analyses will be performed to determine the CCWS delivery rate under design conditions.	A report exists and concludes that the CCWS delivers the following design flowrate to the thermal barrier coolers (0.0198 x 10^6 lb/hr).
7.5	The CCWS delivers water to divisions 2 and 3 Safety Chilled Water Chillers.	Tests and analyses will be performed to determine the CCWS delivery rate under design conditions.	A report exists and concludes that the CCWS delivers the following design flowrate to the safety chilled water chillers (0.373 x 10^6 lb/hr).
7.6	The CCWS delivers water to the spent fuel pool heat exchangers.	Tests and analyses will be performed to determine the CCWS delivery rate under design conditions.	A report exists and concludes that the CCWS delivers the following design flowrate to the spent fuel pool cooling heat exchangers (0.8818 x 10^6 lb/hr).

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Table 2.7.1-3—Component Cooling Water System ITAAC
(7 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.7	Class 1E valves listed in Table 2.7.1-2 perform the function listed in Table 2.7.1-1 under system design conditions.	Tests and analyses or a combination of tests and analyses will be performed to demonstrate the ability of the valves listed in Table 2.7.1-2 to change position as listed in Table 2.7.1-1 under system design conditions.	The as-installed valves change position as listed in Table 2.7.1-1 under system design conditions. 09.02.02-28
7.8	The CCWS provides for flow testing of CCWS pumps during plant operation.	A test will be performed.	~~A flow test line~~Normal system alignment allows testing of each CCWS pump during plant operation.
7.9	Containment isolation valves listed in Table 2.7.1-1 close within the containment isolation response time following initiation of a containment isolation signal.	Tests will be performed to demonstrate the ability of the containment isolation valves listed in Table 2.7.1-1 to close within the containment isolation response time following initiation of a containment isolation signal.	Containment isolation valves listed in Table 2.7.1-1 close within 60 seconds following initiation of a containment isolation signal.

Next File

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
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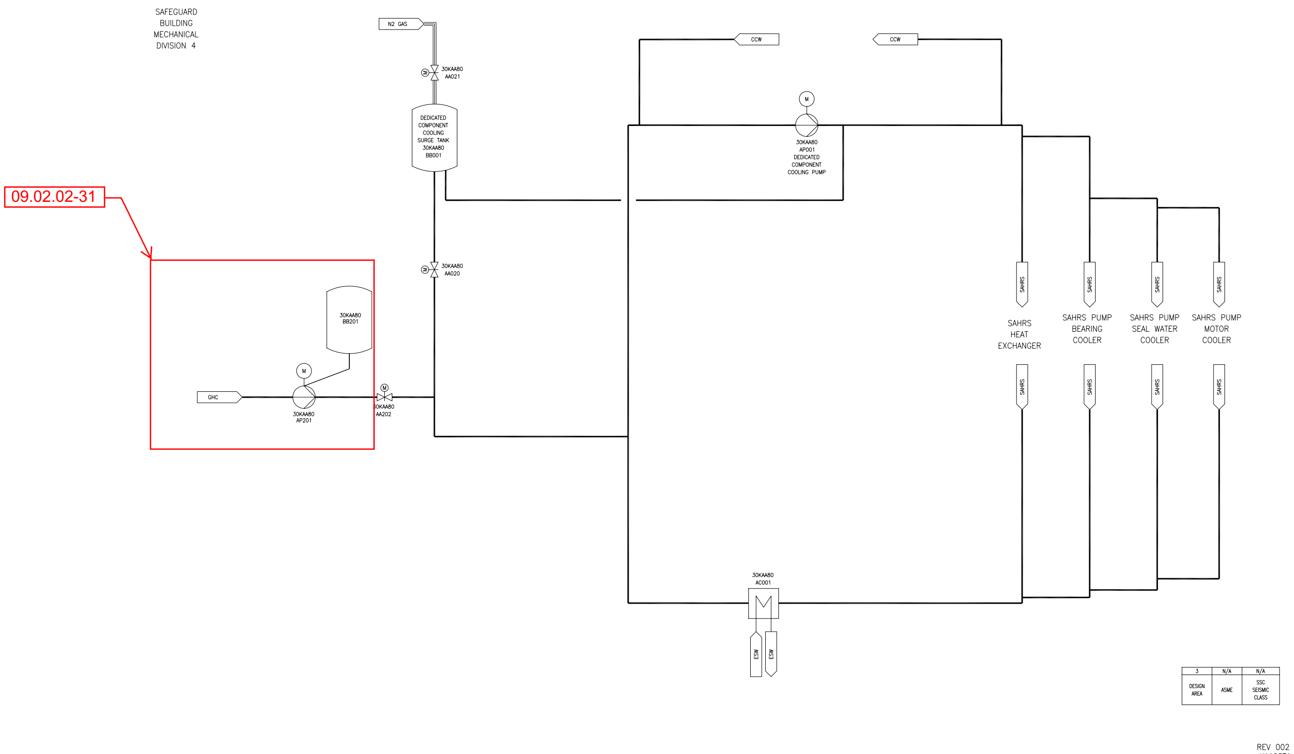

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
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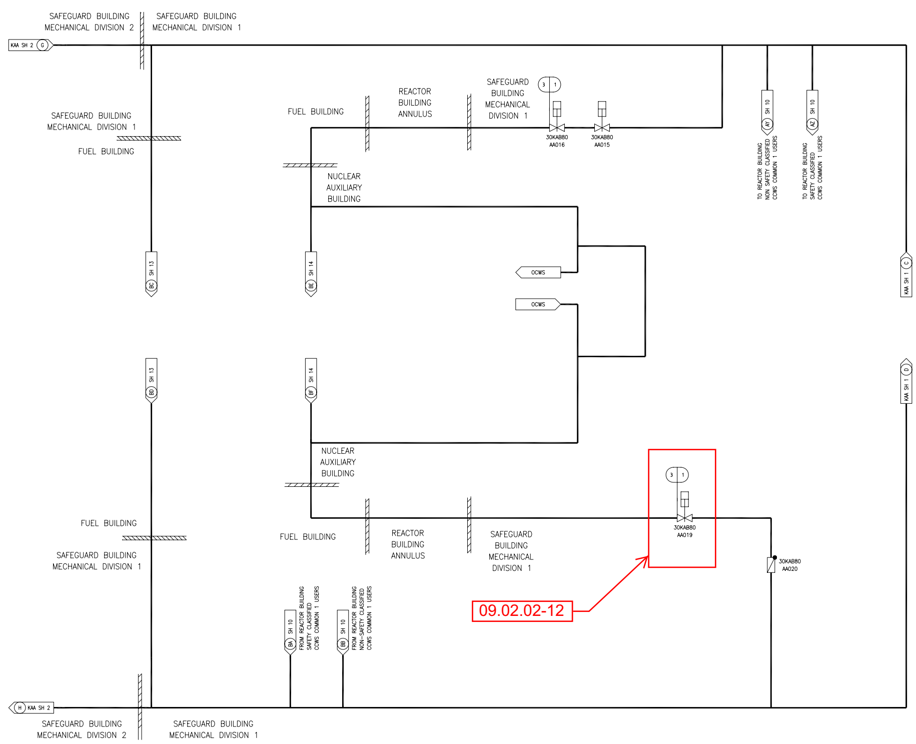

3	N/A	N/A
1	III	I
DESIGN AREA	ASME	SSC SEISMIC CLASS

REV 002
KAB03T1

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
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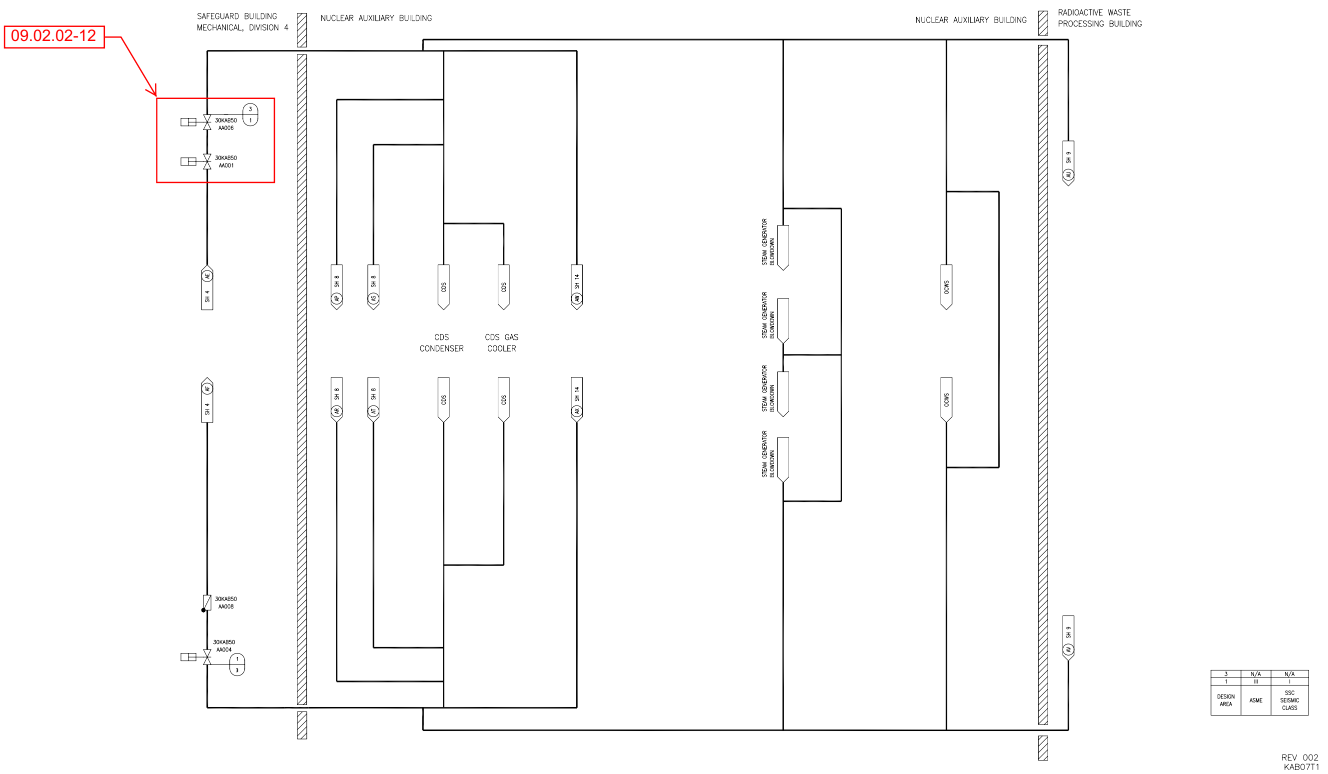

For the accident analysis it is assumed that one CCWS train is unavailable due to maintenance or other activity and a second train fails to perform its function, leaving only two trains available for the event. Upon receipt of a safety injection and containment isolation Stage 1 actuation, the reactor protection system starts the CCWS pumps and opens the low head safety injection/residual heat removal (LHSI/RHR) isolation valves (CCWS flow to the LHSI/RHR HXs and LHSI pump coolers in trains 2 and 3) of the trains not initially in operation. The non-safety-related common users outside of the RB and the containment ventilation and reactor coolant drain tank (RCDT) cooler inside the RB are isolated. A subsequent containment isolation Stage 2 signal isolates the RCP and CVCS loads inside the RB except for the RCP seals thermal barrier coolers.

For the analysis, the accident is assumed to occur with coincident loss of offsite power (LOOP). The loss of one train is assumed to occur due to single failure, the most limiting of which is loss of one electrical division. This loss also results in the incidental loss of the associated emergency core cooling system (ECCS) and ESWS trains. This sequence is detailed in Chapter 15. Throughout accident mitigation and recovery, one of the remaining available CCWS trains cools the LHSI/RHR HX and the other provides additional cooling to the remaining safety loads, with both CCWS trains cooled by their associated ESWS trains.

Leaks in the CCWS, either in or out, will be apparent from various indications, and must be promptly isolated for repair or other corrective action. For instance, leakage of reactor coolant into the CCWS from an RHR HX tube, RCP seal thermal barrier, or other source is identified by increased activity in the CCWS fluid as detected by a continuous monitor or routine sampling, and is also indicated by an unexpected increasing level in the surge tank. The RCP thermal barrier leakage is detected by indication of a high outlet flow from the barrier or an elevated return temperature (or both) which results in an automatic isolation of the CCWS flow through the barrier. The operational pressure gradient of the cooling chain makes in-leakage of service water unlikely. Out-leakage from the system is indicated by an unexpected decrease in surge tank level, indicated by a noticeable increase in automatic makeup flow, visible leakage in the accessible areas or change in reactor coolant chemistry identified during routine sampling. For significant out-leakage from the CCWS, a rapid drop of the CCW level in the corresponding surge tank would trigger automatic inhibition of common users transfer of that train on sufficiently low level, and subsequent isolation of the common header upon reaching the low level isolation setpoint. This conserves the system capacity to cool the safety-related SIS users directly associated with the CCWS train. The system configuration also enables all such leaks to be readily isolated to prevent release of radioactive fluid, excessive dilution or chemical contamination of the reactor coolant.

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CCWS equipment that provides cooling to the SIS/RHRS; spent fuel pool; reactor coolant pump (RCP), including the thermal barrier; safety chillers; and equipment

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which performs a containment isolation function is classified Seismic Category I. This equipment is located in buildings designed to Seismic Category I requirements.

CCWS equipment that does not serve safety-related functions but is routed proximate to other safety-related structures, systems and components (SSC) is classified Seismic Category II to prevent loss of function of safety-related SSC.

CCWS users, which are not classified Seismic Category I, can be isolated by Seismic Category I fast-acting isolation valves in case of external hazards.

The Seismic Category I fast-acting isolation valves for non-safety-related CCWS users are hydraulically operated and designed to close in less than 10 seconds. The CCWS common header switchover valves are also fast-acting hydraulically operated valves with a closure time of less than 10 seconds. These switchover valves can be used to isolate the common headers to conserve the system capacity to cool the safety-related SIS users directly associated with the CCWS train.

The four separate, independently powered safety cooling trains of the CCWS, combined with high standards for system design, installation and maintenance, provides assurance that the system will fulfill its safety-related function under the most demanding postulated conditions in spite of its most limiting credible single failure.

During severe accidents, containment heat is removed by the dedicated cooling chain, consisting of the SAHRS, dedicated CCWS, and dedicated ESWS. This dedicated CCWS train is normally in standby operation and is manually started if needed. In case of loss of the dedicated CCWS or ESWS division, the SAHRS cooling chain is lost. This condition is outside the DBA.

Each physically separated CCWS safety-related train includes:

- A main system pump fitted with a recirculation line and pump motor cooling line.
- An HX, cooled by ESWS, with a parallel flow bypass line with control valve to maintain CCW minimum temperature during cold weather and low-load operation.
- A concrete, steel lined surge tank connected to the pump suction line with sufficient capacity to compensate for CCWS normal leaks or component draining.
- A sampling line with continuous radiation monitor.
- A chemical additive supply line.
- Isolation valves to separate the safety-related train from the common load set.

valve. Closure of the valve is accomplished by energizing the pilot valve to bleed off the hydraulic fluid pressure, while the actuator spring closes the valve.

The valves provide the physical train separation for the support of the common cooling loads. They are used to transfer cooling of the common users during normal plant operation or in the event of a failure during a design basis event.

The valves are interlocked so that two trains may not be simultaneously connected to the same common header. The stroke time of these fast-acting valves is sufficient to minimize the interruption of cooling to the CCWS loads.

To provide reliability of the switchover function, an uninterruptible power supply (UPS) is provided to the hydraulic actuation pilot valves. A failure of the electrical distribution system does not inhibit the transfer of the common header to the non-faulted train.

09.02.02-12

The non-safety load isolation valves are also fast-acting, hydraulically operated valves that operate in the same manner as the switchover valves. The difference between the isolation and switchover valves is in the actuation of the pilot valves. The pilot valves for the non-safety load isolation valves are de-energized to open and bleed off the hydraulic fluid pressure.

LHSI Heat Exchanger Isolation Valves

These valves are motor-operated valves. The valves are normally closed to prevent dilution of the LHSI fluid and may be opened when necessary to provide an adequate flow path to support long term pump operation. The valves automatically open when the train associated LHSI system is placed into service.

LHSI Pump Seal Fluid Cooler Isolation Valves

These valves are motor-operated valves. The valves are normally closed to prevent dilution of the LHSI fluid and automatically open when the train associated LHSI system is placed into service.

Containment Isolation Valves

The CCWS containment isolation valves are motor-operated valves. The normally open valves provide the means for containment isolation to maintain the integrity of the containment penetrations and thus prevent the release of potentially radioactive material during a design based accident. The containment isolation valves for non-safety-related loads are automatically closed by containment isolation actuation signals. The containment isolation valves for the RCP thermal barrier coolers are not provided with a containment isolation signal but may be remote manually closed from the control room if required.

CCWS leakage (e.g., valve packing and pump seals) is compensated for by a makeup of demineralized water to the CCWS surge tanks. This makeup is controlled by the automatic opening and closing of the DWDS supply isolation valve. This isolation valve is a motor-operated safety-related valve that is part of the CCWS.

Depending upon the ESWS temperature, the CCWS temperature could be too low. The HX bypass control valve is positioned in order to maintain a CCWS HX outlet temperature greater than the minimum allowable.

09.02.02-29

During normal plant and system operation, switchover of the common headers is periodically done by the plant operators to verify the operability of the CCWS trains (system surveillances).

Hot Shutdown

After the reactor is shut down, the RCS is cooled by the steam generators down to a temperature of 250°F. During the beginning of this state, CCWS has the same configuration as in power operation. At the end of this state, four CCWS trains will be in operation.

Two CCWS trains are in operation, aligned and ready to remove residual heat from the RCS via the associated LHSI trains as soon as they are placed in RHR operation.

The remaining two CCWS trains continue to cool the two common headers, and are ready to provide their SIS functions if necessary.

Cool Down Procedure

Cooling by Two CCWS trains—RCS Temperature < 250°F

Two LHSI trains are operating in the residual heat removal (RHR) mode and are removing residual heat from the RCS to the heat sink. The associated CCWS trains cool the LHSI/RHR HXs. The other two trains cool the common 1 header (trains 1 or 2) and common 2 header (trains 3 or 4).

This configuration is the same as for Hot Shutdown.

During the plant cooldown and before depressurization of the RCS, it is necessary to purify the RCS fluid. The two CVCS charging pumps are running and the two CVCS HP coolers are supplied by the CCWS.

Cooling by Four CCWS trains—RCS Temperature <212°F

The two CCWS trains cooling the common headers are connected to their corresponding LHSI/RHR trains. Within these two trains, heat to be removed from conjunction with the CCWS. System testing provides the following verifications of system performance:

- Satisfactory generation and transmission of the accident signal.
- Proper operation of the EDGs, including sequential load pickup.
- Within specification valve operating times.
- Within specification pump starting times.
- Within specification pump delivery rates.

Refer to Section 14.2, Test # 046, for initial plant testing of the CCWS.

09.02.02-28

The installation and design of the CCWS provides accessibility for the performance of periodic testing and inservice inspection with limited personnel exposure. Normal operation of the CCWS with alignments to the common headers allows for pump flow testing at conditions as close to design basis as possible. Periodic testing of all safety-related equipment verifies its availability and ability to fulfill its functions. Inservice testing and inspection requirements are in accordance with the ASME BPV Code, Section XI (Reference 5).

Section 3.9 and Section 6.6 outline the inservice testing and inspections. Refer to technical specifications in Chapter 16 (SR 3.7.7) for surveillance requirements that provide for the continued operability of the CCWS.

9.2.2.6 Instrumentation Requirements

The CCWS trains are monitored and controlled from the main control room (MCR) through the process information and control system (PICS), which provides the normal indication, manual control, alarm functions, and the safety information and control system (SICS). These systems process and display information provided through the safety automation system (SAS) from the protection system (PS), which actuates the CCWS function as required by plant process safety parameters, and the process automation system (PAS), which monitors less critical process information.

Upon receipt of a safety injection signal, automatically initiated by the PS, the four CCWS trains start supplying all MHSI pump motor coolers and LHSI pump and motor coolers (except the train 1 and 4 LHSI pumps and motor coolers, which are cooled by SCWS), and the four LHSI HXs. The non-safety-related users outside of the RB are isolated. The progression of this sequence is:

1. The CCWS pumps start.
2. The LHSI HX isolation valves open.

9.2.8 Safety Chilled Water System

The safety chilled water system (SCWS) supplies refrigerated chilled water to the safety-related heating, ventilation and air conditioning (HVAC) systems and the low head safety injection system (LHSI) pumps and motors in Safeguard Buildings (SB) 1 and 4. The SCWS consists of four separate and independent divisions, numbered 1 to 4.

9.2.8.1 Design Bases

The SCWS provides chilled water as a heat sink to the safety-related HVAC systems, which in turn provides an acceptable environment for safety-related equipment and main control room (MCR) habitability in the event of a design basis accident (DBA) (GDC 44). The SCWS is classified as a safety-related system and has safety-related design functions. The system is designed Seismic Category I. Safety-related systems are required to function following a DBA and are required to achieve and maintain a safe shutdown condition.

09.02.02-37

- Each SCWS division is protected from the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, and floods (GDC 2). The SCWS are located in Seismic Category I Safeguard Buildings, which are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles, and other natural phenomena.
- Each division remains functional and performs its intended functions for all postulated environmental conditions or dynamic effects, such as pipe breaks (GDC 4).
- Safety functions are performed assuming a single active component failure coincident with the loss of offsite power (GDC 44).
- The SCWS is not shared with any other plant unit (GDC 5).
- Active components of the SCWS divisions are capable of being periodically tested and required inspections can be performed during plant operation (GDC 45 and GDC 46).

The SCWS divisions use design and fabrication codes consistent with the safety classification and seismic design criteria provided in Section 3.2. The quality group classification meets the requirements of RG 1.26. The seismic design of the system components meets the guidance of RG 1.29. The power and control functions are designed in accordance with RG 1.32.

The SCWS operates continuously as described for the safety-related function when the plant is in normal conditions of startup, shutdown, power operation, and outages.

evaporator, and associated piping and controls. Environmentally safe refrigerants are used in these chillers.

Diaphragm Expansion Tank

Each SCWS division contains a diaphragm expansion tank with a nitrogen fill connection in each of the SBs. These tanks are provided with overpressure protection.

Cooling Coils

Multiple HVAC cooling coils in each division receive chilled water for heat removal from selected HVAC users.

Safety Valves

A safety valve located in each SCWS division protects the chilled water closed loop against high pressure.

Chiller Bypass Valve

The chiller bypass valve installed in the closed loop of each SWCS division varies flow returning to the chiller to prevent freezing at the evaporator coil.

9.2.8.3 System Operation

9.2.8.3.1 Normal Operation

All four SCWS divisions supply chilled water to plant components when the plant is in power operation under normal conditions. Each of the four SBs is supplied by one of four divisions of the SCWS. Each SCWS division is designed with a closed single pumping loop and one refrigeration unit for chilled water production. Chilled water production and chilled water distribution are grouped together to form a single closed system.

09.02.02-44

Each of the four divisions has one SCWS pump in service and one in standby, to circulate the chilled water in a closed loop between the HVAC users and the evaporator of the refrigeration unit. The chilled water distribution circuit operates with a variable flow rate that is governed by the position of the control valves associated with supplied user loads. A regulated chilled water bypass line is provided between the refrigeration–evaporator outlet line and the return line to prevent freezing. A diaphragm expansion tank is used for equalization of pressure and volumetric expansion and helps maintain the requisite static system pressure. A safety valve on the connecting line prevents the line design pressure from being exceeded. Piping voids associated with potential waterhammer are precluded by the constant pressure maintained in the nitrogen-charged expansion tank in each division.

Figure 9.2.2-2—Component Cooling Water System Common Loop 1
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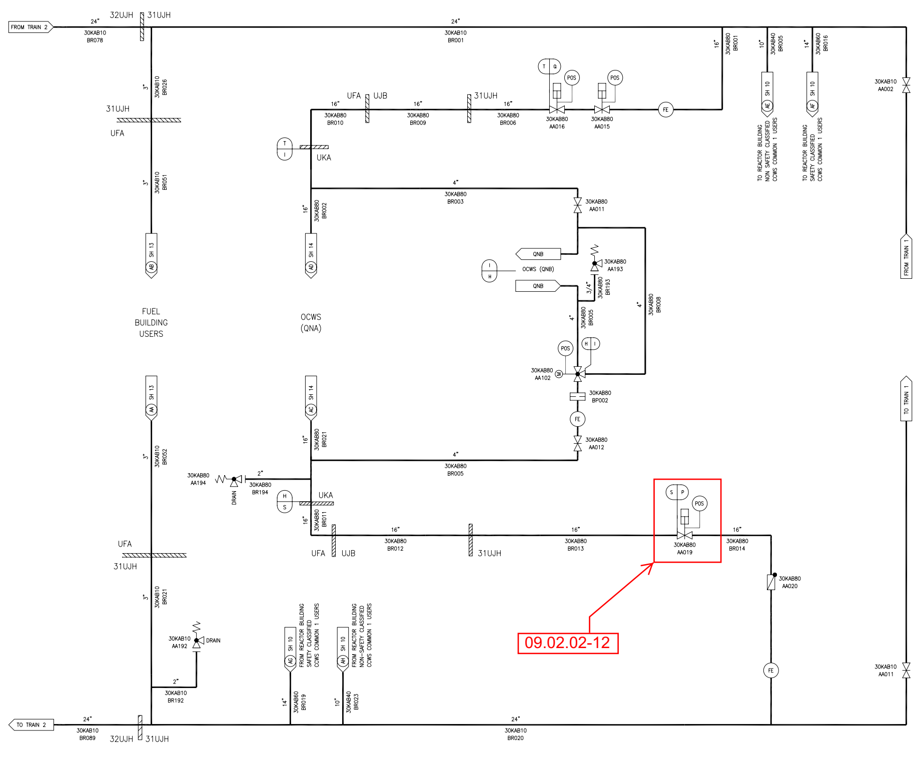

KAA – COMPONENT COOLING WATER SYSTEM SUPPLY TRAIN
KAB – COMPONENT COOLING WATER SYSTEM COMMON HEADER
QNA – OPERATIONAL CHILLED WATER SYSTEM
QNB – OPERATIONAL CHILLED WATER SYSTEM FOR GASEOUS WASTE PROCESSING SYSTEM

UFA – FUEL BUILDING
UJB – REACTOR BUILDING ANNULUS
UKA – NUCLEAR AUXILIARY BUILDING
31UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 1
32UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 2

NOTE:

CCWS TRAINS 1 AND 2 COMMON 1 HEADER SUPPLY.

DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS
T	E	175	225	NSC
S	E	175	225	NSC
I	E	175	225	NSC
H	E	175	225	NSC
P	C	175	225	I
Q	C	175	225	I

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Figure 9.2.2-3—Component Cooling Water System Common Loop 2
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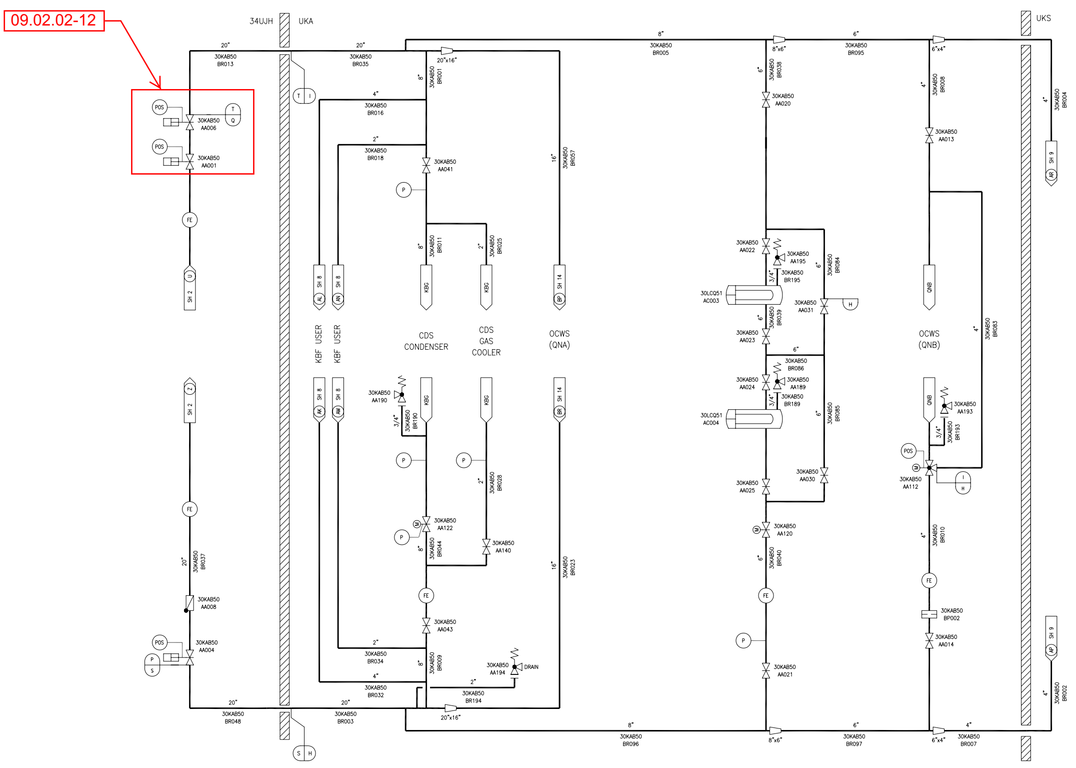

KAB – COMPONENT COOLING WATER SYSTEM COMMON HEADER
KBF – COOLANT TREATMENT SYSTEM
KBG – COOLANT DEGASSIFICATION SYSTEM
LCQ – STEAM GENERATOR BLOWDOWN SYSTEM
QNB – OPERATIONAL CHILLED WATER SYSTEM FOR GASEOUS WASTE PROCESSING SYSTEM

UKA – NUCLEAR AUXILIARY BUILDING
UKS – RADIOACTIVE WASTE PROCESSING BUILDING
34UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 4

NOTE:

COMMON 2 HEADER NAB AND RWPB USERS.

T	E	175	225	NSC
S	E	175	225	NSC
I	E	175	225	NSC
H	E	175	225	NSC
P	C	175	225	I
Q	C	175	225	I
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

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