ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
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
Attachments: RAI 174 Response US EPR DC.pdf

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)	March 13, 2009

RAI 174 — 09.02.02-39 (Parts f and g)	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,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

From: 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: 274

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31B4BB17)

Subject: Response to U.S. EPR Design Certification Application RAI No. 174, FSAR Ch. 9
Sent Date: 2/27/2009 5:45:59 PM
Received Date: 2/27/2009 5:46:02 PM
From: Pederson Ronda M (AREVA NP INC)

Created By: Ronda.Pederson@areva.com

Recipients:
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"KOWALSKI David J (AREVA NP INC)" <David.Kowalski@areva.com>
Tracking Status: None
"Getachew Tesfaye" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	5942	2/27/2009 5:46:02 PM
RAI 174 Response US EPR DC.pdf	374098	

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), Revision 0

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:

A response to this question will be provided by May 20, 2009.

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 response to this question will be provided by May 20, 2009.

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 response to this question will be provided by May 20, 2009.

Question 09.02.02-10:

Standard Review Plan (SRP) 9.2.2 Section III, requires confirmation of the overall arrangement of the component cooling system (CCWS). Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.2 indicates that normal makeup water for the component cooling water system surge tank is automatically provided by non-safety related (NSR) demineralized water. FSAR Tier 1, Figure 2.7.1-1 and Tier 2 Figure 9.2.2-1 identify that the demineralized water safety related to non-safety related (SR/NSR) interface takes place at boundary valve 30KAA10 AA027 (typical). However, this valve is shown on Figures 2.7.1-1 and 9.2.2-1 as a generic manual valve. Also, valve 30KAA10 AA027 is identified as safety-related in FSAR Tier 1 Table 2.7.1-1 (Mechanical Equipment). However, it is also listed in instrumentation and controls (I&C) Electrical Equipment Table 2.7.1-2 with no 1E power source identified. Further, FSAR Tier 2 Table 3.9.6-2 (Valve IST) indicates that the valve is motor operated. Consequently, the staff requested that the applicant revise the FSAR to address the following considerations:

a. Describe the assurance in the FSAR for the isolation between this safety-related to non-safety-related (SR/NSR) interface.

b. Verify that valve 30KAA10 AA027 needs to be listed in both Tier 1 Table 2.7.1-1 (Component Cooling Water System (CCSW) Equipment Mechanical Design) and Tier 1 Table 2.7.1-2 (CCWS Equipment Instrumentation and Controls (I&C) Electrical Design).

c. Confirm in the FSAR that this valve is motor operated as implied by being included in Table 2.7.1-2 (1E power listed as NA in the Table and main control room (MCR) and remote shutdown station (RSS) displays listed as NA).

d. Describe in the FSAR the source of emergency makeup and its seismic qualification. FSAR Figure 9.2.2-1 indicated that the emergency makeup was provided by the Fire Protection system; however, FSAR Section 9.2.2 states that the emergency makeup was provided by the "water distribution system (FWDS)". Provide in the FSAR the basis for any emergency makeup power and justify that it is a manual operation to provide water to the surge tanks.

Response to Question 09.02.02-10:

a. The interface between the safety-related component cooling water system (CCWS) and the non-safety-related demineralized water system (DWS) takes place at valves 30KAA10/20/30/40 AA027. These valves are safety-related, motor-operated valves (MOV) within the CCWS.

   U.S. EPR FSAR Tier 2, Section 9.2.2.3.1 will be revised to reflect this additional information concerning the isolation valves between the CCWS and the DWS.

b. Valves 30KAA10/20/30/40 AA027 are currently listed in U.S. EPR FSAR Tier 1, Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design.

   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 list these valves with IEEE Class 1E power sources, MCR/RSS displays and MCR/RSS controls defined.

c. Valves 30KAA10/20/30/40 AA027 are safety-related MOVs. As noted in the response to Part b., they will be added to U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design.

   U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheets 1 through 4, and U.S. EPR FSAR Tier 2, Figure 9.2.2-1—Component Cooling Water System Trains 1 through 4 will be revised to depict these valves as MOVs.

d. The emergency makeup for the CCW surge tanks originates from the FWDS inside the nuclear island. Piping and components in this portion of the FWDS are Seismic II. Emergency makeup is a manual operation performed by inserting a spool piece and opening the manual valves KAA10/20/30/40 AA141/142.

   U.S. EPR FSAR Tier 2, Section 9.2.2.2.2 will be revised to reflect this additional information concerning the manual operation of the emergency CCW surge tank makeup.

FSAR Impact:

U.S. EPR FSAR Tier 1, Figure 2.7.1-1 and Table 2.7.1-2; and U.S. EPR FSAR Tier 2, Section 9.2.2.2.2, Section 9.2.2.3.1 and Figure 9.2.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-11:

NRC Generic Letter (GL) 96-06 identifies concerns with hydrodynamic effects of water hammer during design events such as loss of coolant accidents.

Justify that the design and operation of the U.S. EPR CCWS addresses the waterhammer and two-phase flow concerns discussed in GL 96-06, ”Assurance of Equipment Operability and Containment Integrity During design Basis Accident Conditions“, and justify that these issues do not pose a problem for CCWS. Note that guidance for water hammer prevention and mitigation is provided in NUREG-0927, “ Evaluation of Water Hammer Occurrence in Nuclear Power Plants”.

Response to Question 09.02.02-11:

A response to this question will be provided by April 3, 2009.

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 hydraulicaly 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/hydraulicaly 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:

1. Specific CCWS line sizing details are currently under development and will be identified later in the design process. The final determination of pipe sizes is based on CCW user loads and flow requirements. Pipe sizes will be determined to optimize fluid velocities during all operating scenarios.

2. Specific CCWS operating temperatures, pressures and flow rates for all operating modes and alignments are currently under development and will be identified later in the design process. The final determination of these parameters depends on user loads and flow requirements and well as various plant operating scenarios. The CCWS will be designed in accordance with applicable codes and standards to provide the required flow and cooling to all system users under all operating scenarios.

3. Specific CCWS indicator locations (e.g., local, remote or control room) will be identified later in the design process. Instrumentation that provides input to a process computer, alarm or automatic function will be finalized later in the design process.

4. Specific CCWS design features (e.g., identification of normal valve positions, valves locked in position and automatic valve functions) will be identified later in the design process.

5. Specific CCWS alarm and relief valve setpoints will be identified later in the design process. This information will depend on CCW user loads and flow requirements as well as plant operating modes.

6. A response to Part 6 of this question will be provided by May 20, 2009.

7. A response to Part 7 of this question will be provided by May 20, 2009.

8. A response to Part 8 of this question will be provided by May 20, 2009.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of Parts 1 through 5 of this question.

Question 09.02.02-13:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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 for the staff to confirm that the CCWS has been adequately sized, the applicant needs to include additional information in Tier 2 of the Final Safety Analysis Report (FSAR), Section 9.2.2, that fully describes and explains the minimum system heat transfer and flow requirements for normal operating, refueling, and accident conditions, the bases for these requirements including limiting assumptions that apply (such as temperature considerations), the excess margin available and the method to determine this and the limiting system temperatures and pressures assumed with supporting basis.

Response to Question 09.02.02-13:

Specific details about CCWS minimum heat transfer and flow requirements for the various plant operating modes and accident conditions will be identified later in the design process. The final determination of these design values depends on CCW user heat loads and flow requirements. The CCWS will be designed to satisfy these minimum heat transfer and flow requirements for each user under plant operating scenarios.

FSAR Impact:

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

Question 09.02.02-14:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with General Design Criterion (GDC) 44 requirements. The Final Safety Analysis Report (FSAR) system description does not adequately explain the basis for sizing the CCWS pumps. Considerations that need to be addressed include head losses in the cooling water inlet piping based on full power flow conditions, fluctuations in the supplied electrical frequency, increased pipe roughness due to aging and fouling, fouled filters, maximum pressure drop through the system heat exchangers, and the actual amount of excess margin that is provided by the CCWS pump design including the basis for this determination. In order for the staff to confirm that the CCWS pumps have been adequately sized, the applicant needs to include additional information in Tier 2 FSAR Section 9.2.2 to address these considerations.

Response to Question 09.02.02-14:

Specific details about CCWS pump sizing will be identified later in the design process. The final pump sizing determination depends on a number of factors. CCW user flow requirements will form the basis for the CCW pump sizing. Based on these calculations, the required pump size will be adjusted to account for pump degradation, grid frequency deviation and pipe degradation. The CCWS pumps will be sized to satisfy the minimum flow requirements for each user under plant operating scenarios.

FSAR Impact:

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

Question 09.02.02-15:

General Design Criterion (GDC) 44 provides requirements for the transfer of heat from systems, structures and components (SSCs) important to safety to a heat sink during both normal and accident conditions assuming a single failure. Both accident and normal component cooling water system (CCWS) heat exchanger (HX) heat loads are provided in Final Safety Analysis Report (FSAR) Tier 2 Table 9.2.5-1 (the Ultimate Heat Sink - UHS). However, additional information is required with respect to component heat load and flow requirements (both safety and non-safety) that are assumed to be in service during these conditions. As specified in Standard Review Plan (SRP) Section 9.2.2, this information is needed in order for the staff to determine whether minimum system/equipment heat transfer and flow demands are specified and can be met. Therefore, the following additional information is needed and FSAR needs to be revised as appropriate to address the following considerations:

a. Provide in the FSAR key assumptions and conclusions in FSAR Section 9.2.2 for calculations related to component cooling water system (CCWS) flow and heat load calculations that demonstrate adequacy of the selected pump capacity (including normal degradation) to provide the minimum required flow plus margin to system users during various possible operating/accident alignments. The FSAR should also include the necessary flow rates and heat loads for all safety related and major components cooled by CCWS. These calculations should be made available for staff audit.

b. Provide in the FSAR key assumptions and conclusions in FSAR Section 9.2.2 for calculations related to the CCW HX normal and accident heat loads identified in FSAR Tier 2 Table 9.2.5-1. These calculations should be made available for staff audit.

c. Explain in the FSAR how the minimum required CCWS flow to the CCWS heat exchanger (HX) was determined for meeting the heat load identified in FSAR Tier 2 Table 9.2.2-1 (291.3 MBTU/hr); provide update to FSAR Table 9.2.2-1.

d. Describe in FSAR Tier 2 Table 9.2.2-2 the minimum flow that is needed for all other system loads. Examples of other important loads include (for example): (1) medium head safety injection (MHSI) pump motor coolers, (2) low head safety injection (LHSI) pump motor coolers, (3) CCWS pump motor coolers, (4) chemical and volume control system (CVCS) high pressure coolers, (5) reactor coolant pump (RCP) motor and bearing coolers, (6) reactor building heating ventilation and air conditioning (HVAC), (7) reactor coolant drain tank (RCDT), (8) charging pump motor, oil and water coolers, (9) sampling coolers in the fuel building.

e. FSAR Tier 2 Section 9.2.2 indicates that the CCWS pump motors are cooled by an air/water heat exchanger supplied by CCWS. This flow path should be shown on FSAR Tier 1 Figure 2.7.1-1 and Tier 2 Figure 9.2.2-1.

Response to Question 09.02.02-15:

a. Specific details about CCWS pump and heat exchanger sizing will be identified later in the design process. The final equipment sizing determination depends on a number of factors, including detailed design calculations for safety-related and non-safety-related components cooled by the CCWS. Based on these calculations, the CCWS pumps and heat exchangers will be sized to satisfy the minimum flow requirements and maximum heat transfer requirements for each user under plant operating scenarios.

b. Refer to response to Part a of this question.

c. Refer to response to Question 09.02.02-14,

d. Refer to response to Part a of this question.

e. This flowpath is currently shown on U.S. EPR FSAR Tier 1, Figure 2.7.1-1—Component Cooling Water System Functional Arrangement, Sheets 1 through 4, and U.S. EPR FSAR Tier 2, Figure 9.2.2-1—Component Cooling Water System Trains 1 through 4, Sheet 1 of 2, as a continuation arrow “TO CCW PUMP.”

FSAR Impact:

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

Question 09.02.02-16:

Standard Review Plan (SRP) 9.2.2 Section III, requires confirmation of the overall arrangement of the component cooling system (CCWS). Tier 2 FSAR Sections 9.2.2.2.2 and 7.6.1.2.3 provide a description of the hydraulic operated common header switchover valves and switchover of the common headers is mentioned in several areas of the text. In order for the staff to complete its evaluation associated with the switchover valves, the FSAR needs to be revised as appropriate (including Piping and Instrumentation Diagrams) to provide clarification as discussed below.

The FSAR Tier 2 Section 9.2.2.2.2 discussion states “They (the switchover valves) 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.”

a. Describe the specific process control signals that initiate automatic switchover of a common header. In addition to loss of a component cooling water system (CCWS) or essential service water system (ESWS) pump, describe other signals that will initiate switchover (e.g. low CCWS flow). These should be clearly listed in the FSAR.

b. If not previously running, describe if a loss of a CCWS pump automatically start the ESWS pump (i.e. in addition to the CCWS pump) in the opposite train.

c. If a switchover is initiated by a signal other than loss of a CCWS pump (e.g. loss of an ESWS pump), state if the CCWS pump on the train associated with the failed ESWS pump will automatically trip.

d. Describe how the switchover sequence is initiated by the operators if a safety-related CCWS train is to be removed from service.

e. If a safety injection actuation signal is received and a safety train feeding the common header is lost, describe if spent fuel pool cooling automatically switches over to the redundant train or if the control room operators need to initiate the transfer similar to what is described in Section 9.2.2.6.1 for normal operation.

f. Section 9.2.2.2.2 states that “The (switchover) valves are interlocked so that two trains may not be simultaneously connected to the same common header.” This indicates that the valve connected to the initial safety related CCWS train must close before the switchover valve from the opposite header begins to open in order to maintain train separation. Since this is an important system design feature, it should be described in Section 9.2.2.6, “Control Features and Interlocks,” and the description should make reference to Section 7.6.1.2.3 for a more detailed description.

g. The switchover sequence as presented by the applicant results in a lapse in cooling flow while the switchover valves on one train are closed and the redundant train switchover valves begin to open. Describe how long this lapse in flow exists, how much time is required for switchover completion, and what impact this has on the common header loads.

h. Explain what constitutes excessive valve seat leakage for the single isolation valves that are used between safety-related CCWS trains, what the basis for this determination is, and how performance will be monitored to ensure that excessive seat leakage does not exist. Also, describe the consequences of a failure of one common header switchover valve, discuss operating experience that pertains to these valves and the potential for and likelihood of common mode failures that can occur.

Response to Question 09.02.02-16:

A response to this question will be provided by April 3, 2009.

Question 09.02.02-17:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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, which includes single failure criteria. Single failure of a train related to thermal barrier protection is noted in the Technical Specifications (TS) Basis under B3.7.7, which states “To meet single failure criteria for the reactor coolant pumps (RCP) thermal barrier cooling function, the load is required to be cooled by a common header which is capable of being connected to two OPERABLE CCW trains. A single failure of a train initiates an automatic system response to transfer the common header to the remaining train.” The staff noted that Tier 2 FSAR Section 9.2.2 provides no discussion of this condition. Therefore, FSAR Section 9.2.2 needs to be revised to include this information.

Response to Question 09.02.02-17:

U.S. EPR FSAR Tier 2, Section 9.2.2.2.1 will be revised to reflect the addition of information included in U.S. EPR FSAR Tier 2, Chapter 16 Technical Specifications, Bases Section B3.7.7 regarding single-failure criteria for reactor coolant pump thermal barrier cooling.

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 09.02.02-18:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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 CCWS design must assure that the minimum net positive suction head (NPSH) for the CCWS pumps will be met for all postulated conditions, including consideration of vortex formation. The staff found that the NPSH requirement for the CCWS pumps was not specified and Tier 2 Final Safety Analysis Report (FSAR) Section 9.2.2 did not describe how the CCWS design will assure that the NPSH requirement for the CCWS pumps is satisfied (including consideration of vortex formation) and how much excess margin is provided by the CCWS design for the most limiting assumptions. Consequently, the FSAR needs to be revised to address the following considerations:

a. The minimum NPSH that is needed for CCWS operation needs to be specified and explained, including 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.

b. The bases for the MIN-MAX surge tank setpoints needs to be explained. Surge tank design details such as system internal volume, temperature extremes that are accommodated by the design, and the maximum leakage rate that is assumed including justification are some of the factors that need to be addressed. Provide in the FSAR key assumptions and conclusion from the design calculations used for sizing the component cooling water system surge tank. These calculations should be made available for staff audit.

c. FSAR Tier 2 Section 9.2.2 surge tank component description states that in case of a seismic event a seismically qualified water supply is available from the fire water system with sufficient capacity to provide for seven days of makeup water. The basis for this conclusion (e.g. required makeup rate and volume) needs to be explained. Also, because makeup water is needed in order to ensure that the CCWS is capable of performing its safety function for at least seven days, the source of water and flow path to the surge tanks should be safety-related, protected from internal and external hazards, and capable of performing its makeup function in the event of a single failure with and without off-site power available. These considerations need to be addressed. Describe how the makeup volume is assured, indications and alarms that are available in the control room and at the remote shutdown panels, and actions that plant operators have to take to provide makeup water to the surge tanks. Isolation valves AA141 and AA142 (which are shown in FSAR Tier 2 Figure 9.2.2-1) should be included on the system diagram in FSAR Tier 1 Section 2.7.1, and appropriate Tier 1 requirements need to be established for the makeup function.

d. As discussed in FSAR Tier 2, Section 9.2.2.6.1, a receipt of a MIN3 surge tank level signal due to water loss from one CCWS safety-related train will block transfer and initiate isolation of the common header associated with that train. The impact of this loss of a common CCWS header on plant operation needs to be explained, including operator actions that are required.

e. As discussed in FSAR Tier 2, Section 9.2.2.6.1, if the surge tank water loss continued to MIN4 surge tank level, the CCWS pump on the affected train will trip. The impact of this pump trip on plant operation with the associated common header blocked (i.e. initiated by the MIN3 signal) needs to be explained, including operator actions that are required.

Response to Question 09.02.02-18:

A response to this question will be provided by April 3, 2009.

Question 09.02.02-19:

The component cooling water system (CCWS) provides essential cooling to the reactor coolant pumps (RCP) thermal barrier. Potential thermal barrier leakage is a concern with such a large pressure differential between the reactor coolant system (RCS) and CCWS. Accordingly, Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.2 includes the following thermal barrier isolation descriptions.

1. Section 9.2.2.2, “System Description,” from page 4 states: “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.”
2. Section 9.2.2.3, “System Operation,” discusses potential RCS dilution from a thermal barrier tube rupture as follows: “The possibility of diluting the RCS via a faulty RCP thermal barrier exists only when the RCS is in a low pressure state. After a predetermined time delay (≈15 minutes), which allows for RCP coast down and when the RCS pressure is low, the CCWS will be automatically isolated from the RCP thermal barrier via the CCWS inlet and outlet isolation valves.”
3. Section 9.2.2.4, “Safety Evaluation,” last sentence states: “Remote manual isolation of the RCP thermal barrier coolers is provided to isolate the thermal barrier in the event of a leak in the HX.”
4. Section 7.6.1.2.3, “Interlocks Isolating Redundant CCWS Trains” states that the interlock function for the thermal barriers provides CCWS train separation, thus either common header 1b or 2b are in service for all four RCP thermal barriers.
5. Section 9.2.2.6.1, “Control Features and Interlocks” states: “Leakage detection for the RCP thermal barriers is provided by detection of a difference in CCW inlet and outlet flow to the barrier which initiates automatic isolation of CCWS flow from the thermal barrier HX.”

The staff identified the following questions in regard to these considerations:

Questions:

a. With regard to item 1 above, the description implies that elevated temperature and radiation in thermal barrier return flow in addition to high return flow rate initiate automatic isolation of the RCP thermal barrier heat exchangers (HXs). Describe in detail any instrumentation and controls (I&C) logic/permissive (need to also show on piping and instrumentation diagrams (P&IDs) and setpoints for automatic isolation and instrumentation that is available for leak detection. Describe how the thermal barrier cross-tie is affected related to this logic.

b. With regard to item 2 above; describe the initiating parameter for RCP isolation due to thermal barrier in leakage, and describe the condition of the RCP (manually or automatically tripped). Describe I&C logic/permissive and setpoints for the isolation based on the 15 minute time delay. Describe how the thermal barrier cross-tie is affected with respect to this logic.

c. With regard to item 3 above; this statement appears to imply that manual isolation of the RCP thermal barriers is required in case of a leaking heat exchanger. Since this is in the safety evaluation section of FSAR Tier 2 Section 9.2.2.4, describe if automatic isolation of a leaking thermal barrier is available during accident conditions and if the thermal barrier cross-tie is affected.

d. Include a discussion in Section 9.2.2 to explain how CCWS train separation is maintained for the thermal barriers similar to what is provided in Section 7.6.1.2.3.

e. The specified action to realign RCP thermal barrier cooling (from Technical Specifications 3.7.7) when one CCW pump is inoperable was not explained in Section 9.2.2.

f. Related to item 4 above, describe how cooling water to the thermal barrier (and RCP seals) is maintained during the following scenario:

   1. Pre-event:

      essential service water (ESW) trips (division 2) with charging pump out of service (no TS LCO) (division 4)

   2. Systems in service:

      charging pump (Div 1), ESW Pump (Div 1) , and CCW pump Div 1 (1b CCW header) with required flow to all 4 RCP thermal barriers– 2b CCW header is interlocked closed with 1b in service due to train separation criteria.

   3. Transient:

      loss-of-offsite power – Div 2, 3, 4 start and load safety buses with a single failure of Div 1 EDG .

g. The following questions are related to item 5 above:

   1. Describe in detail (need to also show on P&IDs) the automatic RCP thermal barrier return flow isolation (and setpoint) capability described above as it applies to the individual RCPs. Describe which valves receive automatic closure signals

   2. The FSAR describes instrumentation that measures the difference between RCP thermal barrier inlet and outlet CCWS flow. Show all the flow instruments provided for each RCP thermal barrier path (only outlet flow instruments were located on P&IDs).

Response to Question 09.02.02-19:

A response to this question will be provided by May 20, 2009.

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:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-21:

General Design Criteria (GDC) 57 requires at least one shutoff valve for each line that penetrates the containment and is part of a closed system inside containment. Further the isolation valve(s) “shall be either automatic, or locked closed, or capable of remote manual operation.” For the U.S EPR design the component cooling water system return lines that penetrate the containment address this requirement with two motor operated valves one inside and the other outside the containment. Further Final Safety Analysis Report (FSAR) Tier 2 Section 6.2.4.2 states that “Each non essential containment penetration has two isolation barriers in series, and each is actuated by a different protection system division.” However, the following penetrations were found during this review that do not meet this requirement (NOTE there may be others).and the FSAR needs to be revised accordingly to address these apparent discrepancies:

a. Tier 1 FSAR Table 2.7.1-2 and Figure 2.7.1-1 indicate that some containment penetrations have inside and outside safety-related motor operated isolation valves supplied by the same power source. The component cooling water system return line from the containment ventilation coolers provides one such example (Penetration #60BQ114). Describe or verify these valves automatically isolate on a stage 1 containment isolation, describe the basis behind having both the inside (30KAB40 AA012) and outside (30KAB40 AA006) valves identified by Table 2.7.1-2 with power from the same division (1). Note this may be a documentation discrepancy, since FSAR Tier 2 Table 6.2.4-1 (Containment Isolation Valves) lists division 4 power for 30KAB40 AA012.

b. Describe the basis for a similar example provided by the return line from RCP thermal barrier containment isolation valves 30KAB30 AA051 (inside) and AA052 (outside), which are both identified with division 1 power by Table 2.7.1-2; identified as containment penetration #60BQ118 in FSAR Tier 2 Table 6.2.4-1. This also appears for penetration 60BQ108 and valve KAB60 AA018, for penetration 60BQ408 and valve KAB70 AA018, for penetration 60BQ118 and KAB30 AA51, and penetration 60BQ421 and valve KAB30-AA055 related to Table valve IEEE power on Table 2.7.1-2.

Response to Question 09.02.02-21:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-22:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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. Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.2.3 and Section 9.2.2.6 both describe the response sequence of the component cooling water system (CCWS) for a safety injection actuation. Section 9.2.2.3 indicates that the low head safety injection (LHSI) heat exchanger valves (which are normally closed) are opened before the CCWS pumps are started. However, the safety injection sequence identified in Section 9.2.2.6 indicates that the CCWS pump starts before the LHSI valves are opened.

a. Determine which FSAR description is correct and provide clarification as appropriate. State how the CCW pump minimum flow is satisfied if the CCWS pump is started before the LHSI paths opens (state valve opening time) and describe explain this basis in the FSAR.

b. Clarification is needed for the description “isolation of non-safety common header loads outside of containment.” This clarification is requested since review of system piping classifications (discussed in Section 9.2.2.4 of this evaluation) found some loads outside of containment such as charging pumps and sampling sink coolers that are also provided with Seismic Category I piping. Specifically, identify what CCWS common header loads are isolated verses what loads are not isolated on a safety injection actuation.

Response to Question 09.02.02-22:

A response to this question will be provided by April 3, 2009.

Question 09.02.02-23:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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. Final Safety Analysis Report (FSAR) Tier 2 section 9.2.2.6, "Instrumentation Requirements," discusses the system response to a safety injection signal. The following statement with respect to the component cooling water system (CCWS) heat exchanger is included: "There is no automatic order from the protection system to configure heat exchanger bypass control valves." This statement appears to conflict with FSAR Tier 2 Section 14.2, Special Test 46, Step 3.4b, which includes verification that the CCWS heat exchanger bypass valves close on a safety injection actuation signal (SIAS). Since CCWS heat exchanger heat loads can significantly increase during loss of coolant accident (LOCA), the following considerations need to be addressed:

a. Determine if the CCWS heat exchanger bypass valves automatically close on a safety injection.
b. Clarify whether or not the bypass valves are controlled remote-manually with automatic high and low temperature control overrides during normal operation to maintain acceptable CCW HX outlet temperature.
c. Determine if the bypass valves are automatically controlled (considered a safety function) and determine if the controls remain functional on a safety injection signal. If the valves do not automatically close and do not have functional automatic controls on an accident, describe the controls that are in place for the operators to control the CCW heat exchanger outlet temperature.

Response to Question 09.02.02-23:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-24:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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. System design features, operating procedures, and surveillance testing must provide adequate assurance that the CCWS safety functions will not be compromised due to damaging water hammer events. Two of the four safety-related trains are normally in operation with the remaining two trains in standby. During an outage, four CCWS trains maybe in operation at the same time as described in Tier 2, Section 9.2.2.3.1. The CCWS description does not adequately consider and address water hammer vulnerabilities in the Final Safety Analysis Report (FSAR) and does not explain how system design features, operating procedures, and periodic surveillance tests provide adequate assurance that the CCWS safety functions will not be compromised by water hammer events.

Response to Question 09.02.02-24:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-25:

The component cooling water system (CCWS) must be capable of removing heat from systems, structures 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. 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 (Information Notice 2007-06, Potential Common Cause Vulnerabilities in Essential Service Water Systems, dated February 9, 2007), 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 CCWS for the EPR design, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.2 to describe to what extent butterfly valves will be used to throttle CCWS flow and design provisions that will be implemented to prevent consequential pipe wall thinning from occurring.

Response to Question 09.02.02-25:

A response to this question will be provided by April 3, 2009.

Question 09.02.02-26:

The component cooling water system (CCWS) must be designed so that periodic inspections of piping and components can be performed to assure that the integrity and capability of the system will be maintained over time in accordance with General Design Criteria (GDC) 45 requirements. The staff finds the design to be acceptable if the Final Safety Analysis Report (FSAR) describes inspection program requirements that will be implemented and are considered to be adequate for this purpose. While Tier 2 FSAR Section 9.2.2.5 indicates that periodic inspections will be performed, the extent and nature of these inspections and procedural controls that will be implemented to assure that the CCWS is adequately maintained over time were not described. Consequently, the applicant needs to provide additional information in the FSAR to describe the extent and nature of inspections that will be performed and procedural controls that will be implemented commensurate with GDC 45 requirements.

Response to Question 09.02.02-26:

U.S. EPR FSAR Tier 2, Section 6.6 provides details concerning the extent and nature of inservice inspection of Class 2 and 3 components. Implementing procedures will be developed later in the design process.

FSAR Impact:

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

Question 09.02.02-27:

The component cooling water system (CCWS) must be designed so that periodic pressure and functional testing of components can be performed in accordance with General Design Criteria (GDC) 46 requirements to assure the structural and leak tight integrity of system components, the operability and performance of active components, and the operability of the system as a whole and performance of the full operational sequences that are necessary for accomplishing the CCWS safety functions. The staff finds the design to be acceptable if the Final Safety Analysis Report (FSAR) describes pressure and functional test programs that will be implemented that are considered by the staff to be adequate for this purpose. While Tier 2 FSAR Section 9.2.2.5 indicates that periodic testing will be performed, the extent and nature of these tests and procedural controls that will be implemented to assure continued CCWS structural and leak tight integrity and system operability over time were not described. Consequently, the applicant needs to provide additional information in the FSAR to describe the extent and nature of testing that will be performed and procedural controls that will be implemented commensurate with GDC 46 requirements.

Response to Question 09.02.02-27:

Details concerning the extent and nature of inservice testing programs are addressed in U.S. EPR FSAR Tier 2, Section 3.9.6. Implementing procedures will be developed later during the design process.

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 response to this question will be provided by May 20, 2009.

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 response to this question will be provided by May 20, 2009.

Question 09.02.02-30:

Regulatory Guide (RG) 1.21, "Measuring, Evaluation and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquids and Gaseous Effluents from Light Water Cooled Nuclear Power Plants," indicates that monitoring should be included for anticipated operational occurrences. Standard Review Plan (SRP) 9.2.2, Areas for Review Section I.10, specifies review of the means provided for detecting leakage of radioactivity from one system to another and for precluding its release to the environment. The staff noted that FSAR Tier 2 Section 9.2.2.6 indicates that radiation monitors are provided in a recirculation line for the component cooling water system (CCWS) heat exchanges, part of the thermal barrier piping discharge, and in the return path from the high pressure (HP) chemical and volume control system (CVCS) and coolers inside containment. Furthermore, the applicant stated in FSAR Section 9.2.2.6.1 that automatic isolation is provided (i.e. both CCWS and CVCS) in case of a reactor coolant system (RCS) fluid leak into the CWCS from the HP CVCS cooler that results in a high radiation signal. The CCW heat exchanger recirculation line radiation instrument provides continuous monitoring. The staff found that the following considerations need to be addressed in the FSAR:

a. Many current plants have provisions for automatic isolation of the CCWS surge tank vent on a high radiation signal. Describe the basis for not providing this capability to avoid inadvertent contaminating the ventilation system and in particular, how the requirements specified by 10 CFR 20.1406 are satisfied in this regard.
b. The CCWS radiation monitors are relied upon for satisfying 10 CFR 20.1406 and GDC 64 requirements and are considered to be important system design features. Therefore, these monitors should be identified on FSAR Tier 1 Figure 2.7.1-1.
c. The CCWS and chemical and volume control system (CVCS) valves that close automatically on a high radiation alarm associated with the CCWS return flow from the high pressure CVCS heat exchanger need to be described.

Response to Question 09.02.02-30:

A response to this question will be provided by April 3, 2009.

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 response to this question will be provided by May 20, 2009.

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:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-33:

General Design Criteria (GDC) 44 provides requirements for the transfer of heat from systems, structures and components (SSCs) important to safety to a heat sink during both normal and accident conditions assuming a single failure. Pump operability is an important factor needed to meet these requirements. Avoiding excessive pump flow rates is one means of assuring pump operability.

Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.2.6.1 second bullet indicates that the component cooling water system (CCWS) pumps are protected from excessive flow by closing of the fuel pool cooling outlet control valve to its minimum flow mechanical stop position. Review of FSAR Figures 2.7.1-1 and 9.2.2-3 show a manual valve at the outlet of the fuel pool coolers (KAB20 AA134 is typical). However, valve 30KAB20 AA134 is identified in Tier 1 Table 2.7.1-1 as a motor operated valve. Additionally, FSAR Table 2.7.1-2 also lists motor operated valve KAA20 134 with the same service. These inconsistencies need to be addressed in the FSAR as follows:

a. Describe the correct valve (motor operated or manual).
b. Describe the fuel pool cooling flow rate when the valve is on its mechanical stop and determine the basis for this flow rate.
c. Determine if valves KAB10(20) AA134 and KAA10(20)AA134 listed in FSAR Tier 1 Tables 2.7.1-1 and 2.7.1-2 respectively, is the same valve.

Response to Question 09.02.02-33:

a. Valve 30KAB20 AA134 is a motor-operated valve.

b. The fuel pool cooling flow rate when these valves are on their mechanical stop will be identified later in the design process.

c. Valves KAB10/20 AA134 listed in U.S. EPR FSAR Tier 1, Table 2.7.1-1—Component Cooling Water System Equipment Mechanical Design is the same valve as KAA10/20 AA134 listed in U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design.

   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 correctly identify these valves as KAB 10/20 AA 134.

FSAR Impact:

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

Question 09.02.02-34:

10CFR50, Appendix B, Section III Design Control, states that measures be established to assure that applicable design bases for SSCs are correctly translated into specifications, drawings, procedures, and instructions. Revise the FSAR to address the following:

a. Several locations in Tier 1 Section 2.7.1 and Tier 2 Section 9.2.2 describe the component cooling water system (CCWS) function for the thermal barriers as “Provides cooling to the thermal barrier of the reactor coolant pump (RCP) seals when seal injection is not available.” This statement implies that CCWS thermal barrier cooling is provided only when chemical and volume control system (CVCS) seal injection is lost. Verify the basis of the thermal barrier cooling and make necessary corrections to include Tier 2, FSAR Section 9.2.2 and Tier 1, FSAR 2.7.1.

b. FSAR Tier 1 Section 2.7.1 Paragraph 4.2 states “The CCWS equipment controls are provided in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.7.1-1.” The reference should be corrected to Table 2.7.1-2, which addresses instrumentation and controls (I&C) and electrical equipment design.

c. In the same Tier 1 Section paragraph 4.4 correct “Residual Head Removal” to Residual Heat Removal AND low CCWS flow automatically opens the low head safety injection (LHSI) and residual heat removal (RHR) heat exchanger inlet valve not the outlet valve as stated. The latter item also needs to be corrected in the commitment item description of ITAAC Table 2.7.1-3.

d. Additionally, in FSAR Tier 1 Section 2.7.1 paragraphs 4.6 and 4.9 both state that the CCWS pump is tripped if surge tank level reaches MIN4. Similarly, ITAAC Table 2.7.1-3 have redundant line items that address both paragraphs 4.6 and 4.9, which are the same. One of the paragraph and the corresponding ITAAC should be deleted.

e. Editorial- FSAR Tier 2 Section 9.2.2.4 safety evaluation, page 9.2.2-30 6^{th} paragraph states “The CCWS is initially tested following the program given in Chapter 14. Periodic inservice functional testing is done in accordance with Section 9.2.2.4.” Correct reference to Section 9.2.2.5.

f. The Cold Shutdown description at the bottom of Tier 2 Section 9.2.2 page 9.2-24, first sentence, states “Cooling by Two CCWS trains—RCS Temperature < 250°F.” However, the FSAR Tier 2 Section 16 Table 1.1-1 definition of “Cold Shutdown” (MODE 5) identifies that “Cold Shutdown” is ≤ 200˚F. Revise FSAR page 9.2-24 description as required.

Response to Question 09.02.02-34:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-35:

RAI 9.2.8-01 (ID1810/6763); Based on a review of the information provided in Tier 2 of the Final Safety Analysis Report (FSAR), Section 9.2.8, “Safety Chilled Water System,” the staff found that the description of the safety chilled water system (SCWS) is generally incomplete and does not adequately explain how design bases considerations are satisfied by the proposed design, what limiting assumptions apply, how much excess margin is available, what operating experience insights are relevant and how 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 SCWS 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 SCWS 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 09.02.02-35:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-36:

RAI 9.2.8-02 (ID1810/6765); Standard Review Plan (SRP) Section 9.2.2, which is being utilized as guidance for the review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS). The staff noted that Tier 1 Figure 2.7.2-1 (sheets 1 thru. 4) and Tier 2 Figure 9.2.8-1 (sheets 1 and 2) has inaccurate and incomplete information relating to safety related to non-safety piping interfaces.

a. Final Safety Analysis Report (FSAR) figures (Tier 1 Figure 2.7.2-1 and Tier 2 Figure 9.2.8-1) show the class break from the demineralized water make-up connection at a piping flange, with no check valve or other seismic isolation valve. This needs to be clarified to the exact location of the safety related to non-safety related class break.
b. FSAR figures (Tier 1 Figure 2.7.2-1 and Tier 2 Figure 9.2.8-1) do not show the nitrogen fill connection to the expansion tank and therefore the safety related to non-safety related class break is not shown.
c. FSAR figures (Tier 1 Figure 2.7.2-1 and Tier 2 Figure 9.2.8-1) do not properly show the class break for the relief valve tail pipe from the expansion tank.
d. FSAR figures (Tier 1 Figure 2.7.2-1 and Tier 2 Figure 9.2.8-1) do not properly show the class break to the hydrazine fill connection or the other adjacent hose connection (not specifically identified).

Response to Question 09.02.02-36:

A response to this question will be provided by May 20, 2009.

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 response to this question will be provided by May 20, 2009.

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:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-39:

Standard Review Plan (SRP) 9.2.2 Section III, requires confirmation of the overall arrangement of the component cooling system (CCWS) which is being utilized as guidance for the review of the SCWS. The safety chilled water system (SCWS) description and piping and instrumentation diagrams (P&ID), Tier 2, FSAR Figure 9.2.8-1, were reviewed to assess the design adequacy of the SCWS for performing its heat removal functions. While the P&ID shows the SCWS 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. Consequently, the applicant needs to revise the Final Safety Analysis Report (FSAR) to address the following considerations in this regard:

a. Pipe sizes are not shown on the Tier 2, FSAR Figure 9.2.8-1, and the system description does not explain the criteria that were used in establishing the appropriate pipe sizes (such as limiting flow velocities).

b. The system description does not provide design details such as system operating temperatures, pressures, and flow rates for all operating modes and alignments.

c. Tier 2, FSAR Figure 9.2.8-1 does not show where indications are displayed (e.g., local, remote panel, control room), and what instruments provide input to a process computer and/or have alarm and automatic actuation functions.

d. Tier 2, FSAR Figure 9.2.8-1 does not show what the normal valve positions are, what valves are locked in position, and what valves have automatic functions; and these design features are not described.

e. Tier 2, FSAR Figure 9.2.8-1 does not show specific set point for system alarms (including head tank) and relief and the bases for these set points are not explained in the system description.

f. Isolation valves for taking components out of service for maintenance are not shown on the Tier 2, FSAR Figure 9.2.8-1.

g. Describe in Section 9.2.8 why filters are shown in the return lines from some but not all HVAC units.

Response to Question 09.02.02-39:

A response to Parts a through e of this question will be provided by March 13, 2009.

A response to Parts f and g of this question will be provided by May 20, 2009.

Question 09.02.02-40:

The safety chilled water system (SCWS) must be capable of removing heat from structures, system 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 for the staff to confirm that the SCWS has been adequately sized, the applicant needs to include additional information in Tier 2 of the Final Safety Analysis Report (FSAR), Section 9.2.8, to fully describe and explain what the minimum system heat transfer and flow requirements are for normal operating, refueling, and accident conditions, the bases for these requirements including limiting assumptions that apply (such as temperature considerations), how much excess margin is available and how this was determined, and what limiting system temperatures and pressures are assumed with supporting basis.

Response to Question 09.02.02-40:

A response to this question will be provided by March 13, 2009.

Question 09.02.02-41:

General design criteria (GDC) 44 requires the transfer of heat from systems, structures and components (SSC) important to safety to a heat sink during both normal and accident conditions assuming a single active component failure coincident with the loss of offsite power. The Final Safety Analysis Report (FSAR) indicates that the safety chilled water system (SCWS) chillers are rated at 275 tons (Divisions 1 and 4) and 250 tons (divisions 2 and 3) but does not provide a basis for these capacities.

- Provide information on the major heat loads in the various SCWS divisions for which the chillers have been sized. Information should include both normal operations and postulated accident conditions.

Response to Question 09.02.02-41:

A response to this question will be provided by March 13, 2009.

Question 09.02.02-42:

General design criteria (GDC) 44 requires the safety chilled water system (SCWS) must be capable of removing heat from structures, system and components (SSCs) important to safety during normal operation. The system description (Section 9.2.8.2.) indicates that the SCWS design includes two 100% pumps (with one in standby); however, fluctuations in the supplied electrical frequency, increased pipe roughness due to aging and fouling, fouled debris filters, and maximum pressure drop through the system HXs, the actual amount of excess margin that is provided by the SCWS pump design and the basis for this determination was not explained. This information should be provided in the FSAR section 9.2.8.

Response to Question 09.02.02-42:

A response to this question will be provided by May 20, 2009.

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

A response to this question will be provided by May 20, 2009.

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:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-45:

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. Under seismic or post-accident conditions where demineralized water may be unavailable for safety chilled water system (SCWS) makeup, the expansion tanks should contain sufficient water volume to assure reliable system operation without makeup for at least seven days. The Final Safety Analysis Report (FSAR) does not discuss expansion tank capabilities in the event of a makeup source interruption.

a. Describe the most limiting system leak rate that is assumed during normal operating and accident conditions, the bases for these assumptions, and how many days of operation the expansion tank is sized for should the makeup source be unavailable.

b. Describe how are these lines are treated with regard to expansion tank capabilities, and how are nitrogen relief valves routed to safe areas for discharge. Verify hose connections and safety related and seismic interface at the pump suction.

Response to Question 09.02.02-45:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-46:

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. The Final Safety Analysis Report (FSAR) does not adequately describe the various operating modes and operator actions that are required and how the SCWS control system functions, such as how/when protective measures are called for (i.e., chilled water system “Protection OFF” alarms, refrigeration unit shuts down, chilled water circulating pump shuts down). These considerations need to be fully described in FSAR Tier 2 Section 9.2.8, including (for example):

a. how the safety chilled water system (SCWS) system performs the process of selecting a particular system measure to initiate when the pressure falls below the second set limit,

b. schematics showing all circuit process components with associated signal inputs and control signal outputs (the schematic provided should be of the type provided by Figure RAI 19-1, page 5, and Figure RAI 19-2, page 6, in “Response to Second Request for Additional information”, Attachment A, ANP-10284Q2P),

c. failure positions for the flow control valves,

d. a discussion of normal power and alternate power (as shown in Tier 1 FSAR Table 2.7.2-2),

e. a discussion of how alternate supplies are implemented while maintaining divisional separation,

f. the bases for the trip setpoint for low expansion tank pressure,

g. SBO operation (FSAR Tier 2 Section 8.4 indicates that the Division 1 and 4 compressors are powered, but the SCWS pumps are not listed), and

h. instrumentation and controls (I&C) related to SCWS operation such as starts signals, trip signals, and permissives (the schematic that is provided should be of the type provided by Figure RAI 19-1, page 5, and Figure RAI 19-2, page 6, in “Response to Second Request for Additional information”, Attachment A, ANP-10284Q2P).

Response to Question 09.02.02-46:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-47:

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. The Final Safety Analysis Report (FSAR) states that each of the four SCWS trains circulates chilled water to the user heat exchangers with one of the two chilled water circulating pumps. The other pump remains in standby and starts automatically upon failure of the running pump. However, FSAR Tier 2 Section 9.2.8 does not explain how the automatic start of the standby pump and the protection-off signal based on pump failure are coordinated (note that automatic start of the standby pump is mentioned in FSAR Tier 1 Table 2.7.2-3, Item 4.4 of the inspections, tests, analyses, and acceptance criteria, but this feature is not described in Tier 2 of the system description).. The following information needs to be included in FSAR Tier 2 Section 9.2.8:

a. Explain how the SCWS system automatically starts a standby pump upon failure of the running pump. Provide schematic diagrams showing all inputs (i.e., PS, logic inputs , sensor inputs, all variables, actuation logic, binary limitation signals), with input types (i.e. PS, hardwired, fiber, type of isolation used), SCWS circuit components, and all SCWS control signal outputs of the SCWS control system. The schematic provided should be of the type provided by Figure RAI 19-1, page 5, and Figure RAI 19-2, page 6, in “Response to Second Request for Additional information”, Attachment A, ANP-10284Q2P.

b. Provide a discussion of these pump trips and coordination of signals in FSAR Tier 2 Section 9.2.8. Similarly, a discussion of the heating, ventilation and cooling (HVAC) system backup by the non-safety related 100% capacity maintenance train (cooled by operational chilled water) is discussed in the Technical Specification Bases (B 3.7.9) but is not described in FSAR Tier 2 Section 9.2.8.

Response to Question 09.02.02-47:

A response to this question will be provided by May 20, 2009.

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:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-49:

The safety chilled water system (SCWS) must be designed so that periodic inspections of piping and components can be performed to assure that the integrity and capability of the system will be maintained over time in accordance with general design criteria (GDC 45) requirements. The staff finds the design to be acceptable if the Final Safety Analysis Report (FSAR) describes inspection program requirements that will be implemented and are considered to be adequate for this purpose. While Tier 2 FSAR Section 9.2.8.5 indicates that periodic inspections will be performed, the extent and nature of these inspections and procedural controls that will be implemented to assure that the SCWS is adequately maintained over time were not described. Consequently, the applicant needs to provide additional information in the FSAR to describe the extent and nature of inspections that will be performed and procedural controls that will be implemented commensurate with this requirement.

Response to Question 09.02.02-49:

A response to this question will be provided by March 13, 2009.

Question 09.02.02-50:

The safety chilled water system (SCWS) must be designed so that periodic pressure and functional testing of components can be performed in accordance with general design criteria (GDC) 46 requirements to assure the structural and leak tight integrity of system components, the operability and performance of active components, and the operability of the system as a whole and performance of the full operational sequences that are necessary for accomplishing the SCWS safety functions. The staff finds the design to be acceptable if the Final Safety Analysis Report (FSAR) describes pressure and functional test program requirements that will be implemented and are considered to be adequate for this purpose. While Tier 2 FSAR Section 9.2.8.5 indicates that periodic testing will be performed, the extent and nature of these tests and procedural controls that will be implemented to assure continued SCWS structural and leak tight integrity and system operability over time were not described. Consequently, the applicant needs to provide additional information in the FSAR to describe the extent and nature of testing that will be performed and procedural controls that will be implemented commensurate with this requirement.

Response to Question 09.02.02-50:

A response to this question will be provided by March 13, 2009.

Question 09.02.02-51:

Means must be provided for monitoring effluent discharge paths and the plant environs for radioactivity that may be released in accordance with general design criteria GDC 64 requirements. Also, 10 CFR 52.47(a)(6) and 10 CFR 20.1406 require applicants for standard plant design certifications to describe how facility design and procedures for operation will minimize contamination of the facility and the environment. The staff's review criteria (Standard Review Plan Section 9.2.2, Paragraph III.4.C) specify that provisions should be provided to detect and control leakage of radioactive contamination into and out of the component cooling system (CCWS) which is the heat sink for the safety chilled water system (SCWS). The design is considered to be acceptable by the staff if the SCWS piping and instrumentation diagram (P&IDs) show that radiation monitors are located on the SCWS discharge and at components that are susceptible to leakage, and if the components that are susceptible to leakage can be isolated. However, the staff noted that Tier 2 Final Safety Analysis Report (FSAR) Section 9.2.8 and the SCWS P&ID do not include radiation monitors in the system design and the NRC regulations in this regard have not been addressed. Additional information needs to be provided in FSAR Tier 2 Section 9.2.8 to address the NRC requirements referred to above.

Response to Question 09.02.02-51:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-52:

Standard Review Plan (SRP) Section 9.2.2, which is being utilized as guidance for review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS). Technical Specification (TS) Bases (B3.7.9) states that each compressor unit contains three 50 percent compressors. However, the basis does not indicate if the chilled water train is still 100% capable with one of the three compressors inoperable. There is no mention of the three compressors per unit in Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.8.

a. Describe the basis for the three compressors and determine if a safety chilled water train remains operable with one of its three compressors inoperable and provide this description in the FSAR and TS.

b. Describe if the three compressor design is part of the single-failure analysis for safety chilled water and provide this description in the FSAR and TS.

c. Describe how does the compressor control system handles a failed compressor and describe if the three compressor configuration applies to both the water-cooled and air-cooled units and provide this description in the FSAR and TS.

Response to Question 09.02.02-52:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-53:

Standard Review Plan (SRP) Section 9.2.2, which is being utilized as guidance for review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS). Final Safety Analysis Report (FSAR) Tier 2 Section 9.2.8.4 states that the four-train design fulfills the single-failure criteria, with the redundant trains strictly separated into four divisions. The four-train design supports one train unavailable for maintenance and one train unavailable due to single failure under accident conditions, which leaves two 100 percent trains available to mitigate the postulated accident. However, this is not consistent with Technical Specification (TS 3.7.9) which requires the plant to be in hot shutdown 6 hours after a 72-hour period with one train inoperable or not operating. The basis for the 72-hour limiting condition for operation states that in this condition (one train not available), a single-failure in one of the operable emergency service water trains could cause the loss of safety chilled water system function.

a. Describe the basis upon which the chilled water trains are considered to be 100 percent trains. Note: TS Basis 3.7.9 states that the chiller compressor unit for each safety chilled water train contains three 50% compressors. This configuration is not indicated in Section 9.2.8.

In reviewing technical specifications for the chilled water users (like control room or safeguard building ventilation), it appears that the 72-hour limiting-condition-for-operation (LCO) mentioned above is related to the Safeguard Building Ventilation System Electrical Division (3.7.13), which also has a 72-hour LCO for one train inoperable. The basis for TS 3.7.13 states that with one train inoperable, the remaining 3 trains are sufficient to maintain the 3 remaining safeguard buildings within required temperature limits. The basis also states that a non-safety-related maintenance train is available to cool the 4th building. However, a loss of offsite power would result in loss of the maintenance train function since it does not have emergency backup power available.

b. Similar to the above, describe why this results in a 72 hour LCO.

Response to Question 09.02.02-53:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-54:

Standard Review Plan (SRP) 9.2.2, which is being utilized as guidance for the review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS). The staff found that the Tier 1 and Tier 2 information is incomplete, inconsistent, inaccurate, or that clarification is needed and asked the applicant to revise the information in FSAR Tier 1 Section 2.7.7 and applicable Tier 2 Sections (as appropriate) 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 9.2.8 (e.g., equipment locations, valve functional requirements, indication and control information, priority actuation and control system description and functions, automatic actuation and interlock details, power supplies (normal and alternate), valve failure modes, and harsh environment considerations).

b. The specifications do not stipulate that the SCWS is accessible for performing periodic inspections as required by general design criteria (GDC) 45.

c. Specifications are needed to assure that the liquid filters satisfy design and performance requirements. Liquid filter are not listing in Tier 1 Table 2.7.2-1, “SCWS Equipment Mechanical Design.”

d. Tier 1 Figure 2.7.2-1, “Safety Chilled Water System Functional Arrangement,” does not show nominal pipe sizes, which are necessary for design certification.

e. Tier 1 Table 2.7.7.2-1, “Safety Chilled Water System Functional Arrangement’ does not show the safety related class break at the expansion tank relief valve.

f. Tier 1 Table 2.7.7.2-1, “Safety Chilled Water System Functional Arrangement,’’ instruments are missing at the expansion tank (pressure and level).

g. Tier 1 Table 2.7.2-2,”Safety Chilled Water System Equipment I&C (instrumentation and controls) and Electrical Design,” notes alternate and normal power supplied. This alternate power arrangement discussion is missing from FSAR Tier 2 Section 9.2.8 and from the TS basis.

h. The inspections, tests, analyses, and acceptance criteria (ITAAC) in Tier 1 Section 2.7.7 and Tier 2 Section 14.2.12.6.2, “Safety Chilled Water (Test #52),” do not include consideration of the instrumentation requirements listed in Tier 2 Section 9.2.8.6, such as expansion tank low pressure limits and chiller evaporator trips.

Response to Question 09.02.02-54:

A response to this question will be provided by May 20, 2009.

Question 09.02.02-55:

Standard Review Plan (SRP) Section 9.2.2, which is being utilized as guidance for the review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS). The staff found that the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) in Final Safety Analysis Report (FSAR) Tier 1 Section 2.7.7, Table 2.7.2-3, are incomplete, inconsistent, inaccurate, or that clarification is needed. Consequently, the Tier 1 information needs to be revised to address the following:

a. An item needs to be added to confirm important design details, such as nominal pipe size.Item 4.3 is misleading since there are no actuators controlled by the priority and actuator control system (PACS).

b. Item 7.2 needs to specify that SCWS pump testing to demonstrate adequate net positive suction head will be completed at the minimum expansion tank level. The acceptance criteria for an acceptable test need to be specified.

c. Item 7.5, the system should be tested with both divisional 100% pumps running to demonstrate dual system flow capacity (strong pump vs. weak pump). Running of both pumps normally occurs for short periods of time during pump swaps.

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

e. No test item is provided to demonstrate that water hammer will not occur in the as built system upon manual or automatic start of a previously idle train, and during loss-of-power scenarios.

Response to Question 09.02.02-55:

A response to this question will be provided by May 20, 2009.

U.S. EPR Final Safety Analysis Report Markups

09.02.02-10(b)

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (9 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Valve							
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA10 AA027	Safeguards Building	~~NA~~1	No	No	~~NA / NA~~Pos	~~NA / NA~~Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA20 AA027	Safeguards Building	~~NA~~2	No	No	~~NA / NA~~Pos	~~NA / NA~~Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA30 AA027	Safeguards Building	~~NA~~3	No	No	~~NA / NA~~Pos	~~NA / NA~~Open-Close
Surge Tank Demin. Water Makeup Supply Isolation Valve	KAA40 AA027	Safeguards Building	~~NA~~4	No	No	~~NA / NA~~Pos	~~NA / NA~~Open-Close
Common Header 1a Fuel Pool Cooling Heat Exchanger 1 Downstream Control Valve	~~KAA10~~ KAB10 AA134	Safeguards Building	1	No	No	NA / NA	NA / NA
Common Header 1a Fuel Pool Cooling Heat Exchanger 2 Downstream Control Valve	~~KAA20~~ KAB20 AA134	Safeguards Building	2	No	No	NA / NA	NA / NA
Common Header 1b Safety Related Loads CVCS HP Cooler 1	KAB60 AA116	Reactor Building	1	No	No	Pos	Open-Close

09.02.02-33

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
Sheet 1 of 24

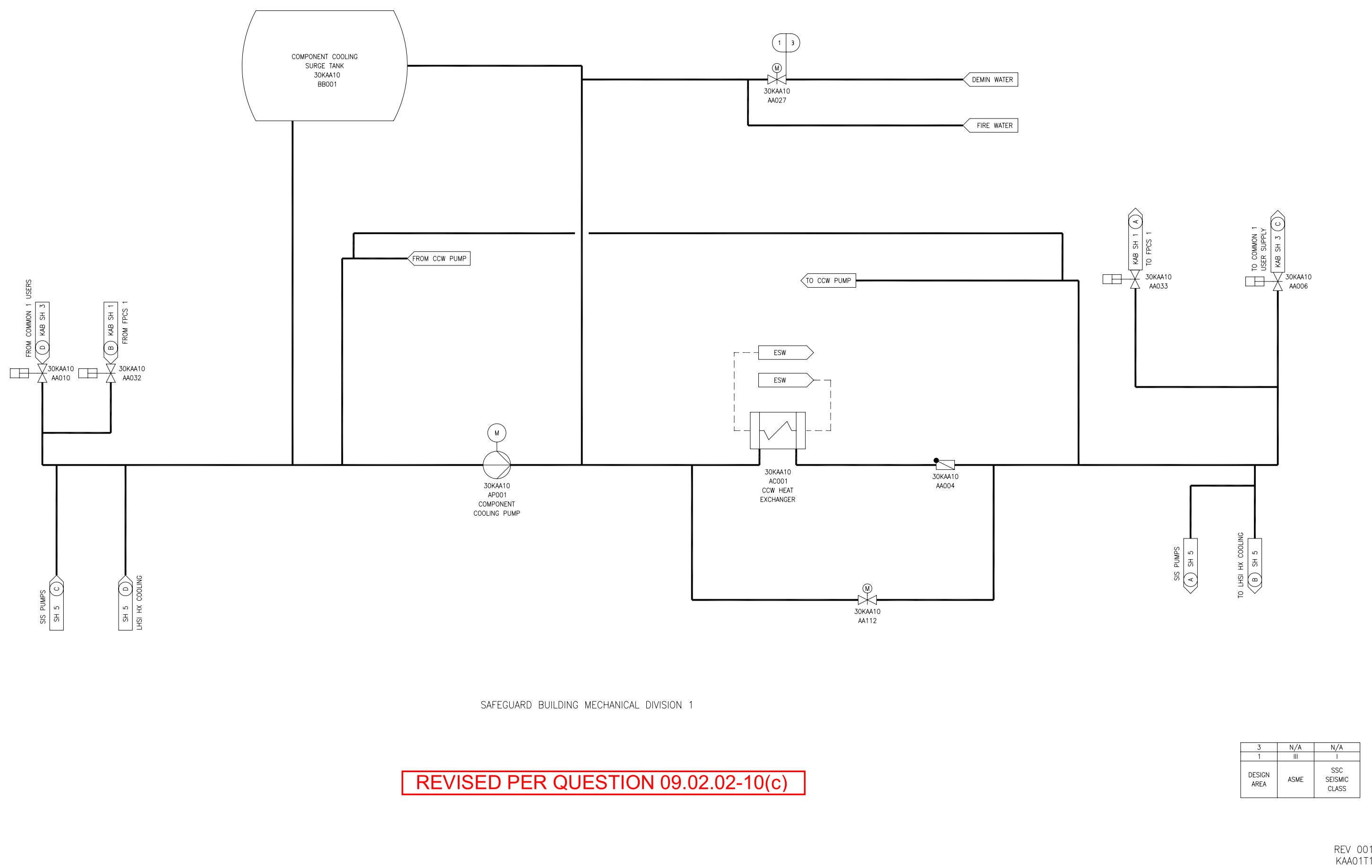
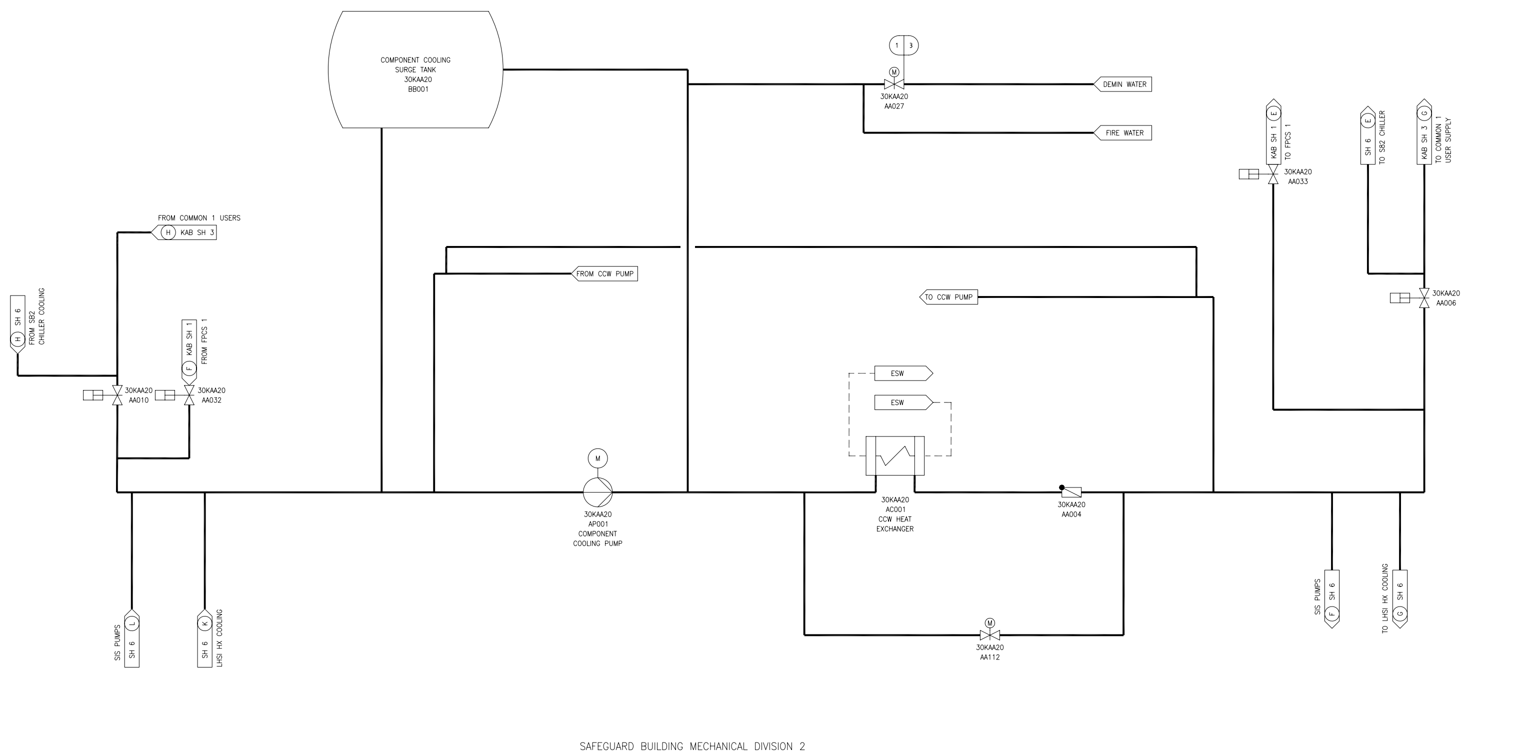


**Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
Sheet 2 of 24**

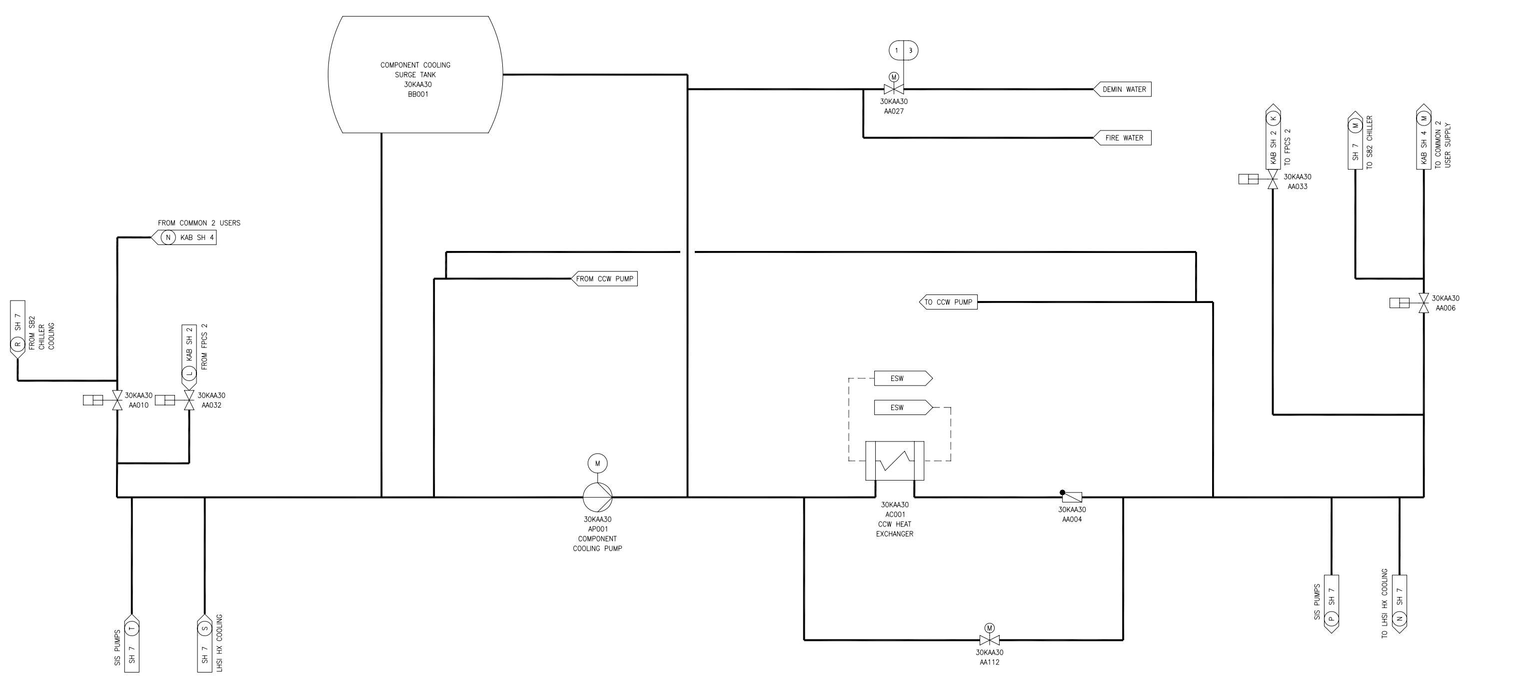


REVISED PER QUESTION 09.02.02-10(c)

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

REV 001
KAA02T1

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement Sheet 3 of 24

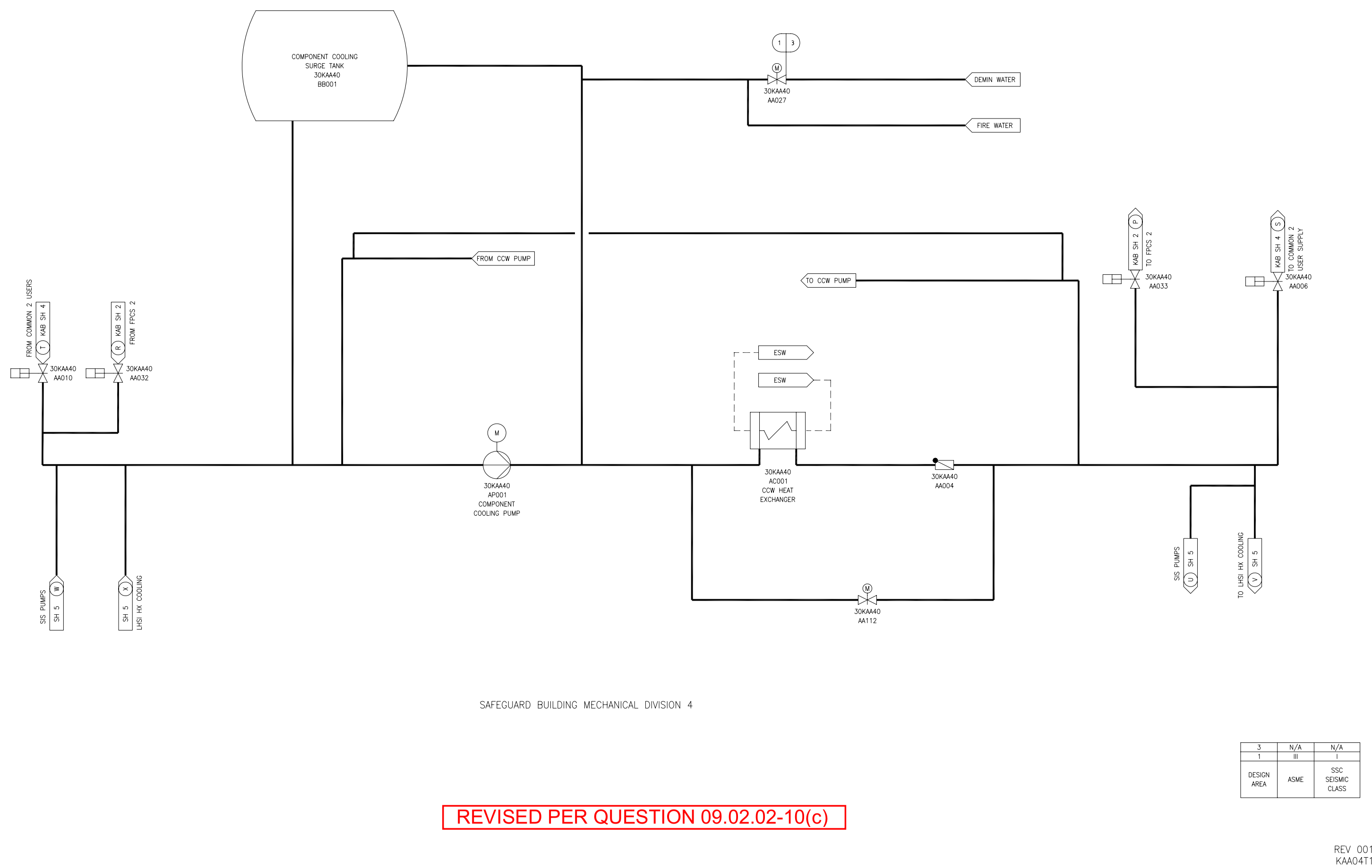


3	N/A	N/A
1	III	I
DESIGN AREA	ASME	SSC SEISMIC CLASS

REVISED PER QUESTION 09.02.02-10(c)

REV 001
KAA03T1

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
Sheet 4 of 24



REVISED PER QUESTION 09.02.02-10(c)

- Environmental qualification as specified in 10 CFR 50.49.

The CCWS is a four train system configured to allow sharing of operational and safety-related users among the trains during normal operation, while always maintaining train separation with rapid isolation capability of the non-safety-related users in the event of an accident. The trains form pairs; trains 1 and 2 form one pair, and trains 3 and 4 the other pair. During normal operation, one or both trains in each associated pair can be in operation to cool the two common sets of users. Depending on the system user requirements, heat loads, and flow rates, and depending on the existing plant operating condition, the CCWS may have two, three, or all four trains in operation. System design parameters and flow requirements are listed in Table 9.2.2-1—CCWS Design Parameters and Table 9.2.2-2—CCWS User Flow Requirements.

Trains may be added or dropped as necessary to maintain the CCWS HX outlet temperature above the minimum required and below the maximum allowed and maintain the individual CCWS pump steady-state operating flow between the minimum required and the maximum allowed values. Idle CCWS trains are available and isolated from the common headers to provide safety injection system (SIS) availability if necessary. Maintenance on a CCWS train during power operation is possible.

During normal operation and design basis events, the CCWS provides the cooling function for the safety injection system/residual heat removal system (SIS/RHRS) and the safety chilled water system (SCWS) of divisions 2 and 3. The CCWS also transfers decay heat from the fuel pool cooling system (FPCS) whenever fuel is stored in the spent fuel pool. The CCWS additionally cools the thermal barriers of the RCP seals when seal injection is not available. Upon receipt of a containment isolation signal, the CCWS responds to protect the integrity of the containment pressure boundary.

09.02.02-17

To meet single-failure criteria for the RCP thermal barrier cooling function, the load is required to be cooled by a common header which is capable of being connected to two operable CCW trains A single failure of a train initiates an automatic system response to transfer the common header to the remaining train.

The CCWS flow rate is automatically controlled for those users which have been determined to have a limited operating temperature range for support of stable operation, while less temperature-sensitive users remain at a fixed flow resistance during all operating conditions. These fixed flow rates are adjusted once during plant commissioning with the system in its most demanding flow configuration (system flow balancing), and is reaffirmed regularly throughout the plant life by periodic surveillance, to make sure there is adequate required user flow for all operating conditions. It is not expected that the CCWS flow balance will require adjustment after the initial flow balance has been established.

CCWS Surge Tanks

The CCWS surge tanks are concrete structures with a steel liner. Each tank is connected to the suction side of its respective train CCWS pump.

09.02.02-10(d)

Each surge tank has sufficient storage capacity to compensate for normal system leaks or component draining. Makeup water is supplied from the DWDS.

An additional makeup source of water to each surge tank originates from ~~a~~the seismically qualified (Seismic II) portion of the fire water distribution system ~~(FWDS)~~inside the Nuclear Island. This makeup source provides sufficient post seismic event surge tank capacity to accommodate system leakage for seven days. Emergency makeup to the surge tanks is a manual operation performed by inserting a spool piece between valves AA141 and AA142. The manual valves AA141 and AA142 are then opened to provide the emergency makeup.

Dedicated CCWS Surge Tank

The dedicated CCWS surge tank is connected to the dedicated CCWS pump suction line.

The surge tank makeup is provided from the DWDS and nitrogen overpressure is provided to prevent a leak of radioactive fluids into the dedicated CCWS from the SAHRS.

The surge tank is provided with overpressure protection.

Common Header Switchover Valves

The common header switchover valves are fast-acting, hydraulically operated valves. Actuation of the valves is provided by a hydraulic circuit. A normally closed pilot valve blocks the hydraulic fluid path to the reservoir and the associated hydraulic pump generates the motive force to compress the valve actuator spring to open the 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

- One train supplies the common 1.a (2.a) header (common FPCS and FBVS loads) and associated LHSI users.
- One train supplies only the common 1.b (2.b) header (main common user group).
- One train supplies the common 1.b (2.b) header and associated LHIS users.
- One train supplies the common 1.a and 1.b (2.a and 2.b) headers.
- One train supplies the common 1.a and 1.b (2.a and 2.b) headers and its LHSI users without the maximum flow rate through the CVCS and FPCS HXs.

For pump protection, the following configurations for an operating train are not permitted:

- One train cannot be isolated from the common headers and also from the LHSI/ RHR HX.
- One train cannot supply only the common 1.a (2.a) header.
- One train cannot supply the common 1.a and 1.b (2.a and 2.b) header and its LHSI users with the maximum flow rate through the CVCS and FPCS HXs.

Forbidden configurations lead to operations with abnormal flow rate and are subject to automatic system protection.

09.02.02-10(a)

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.

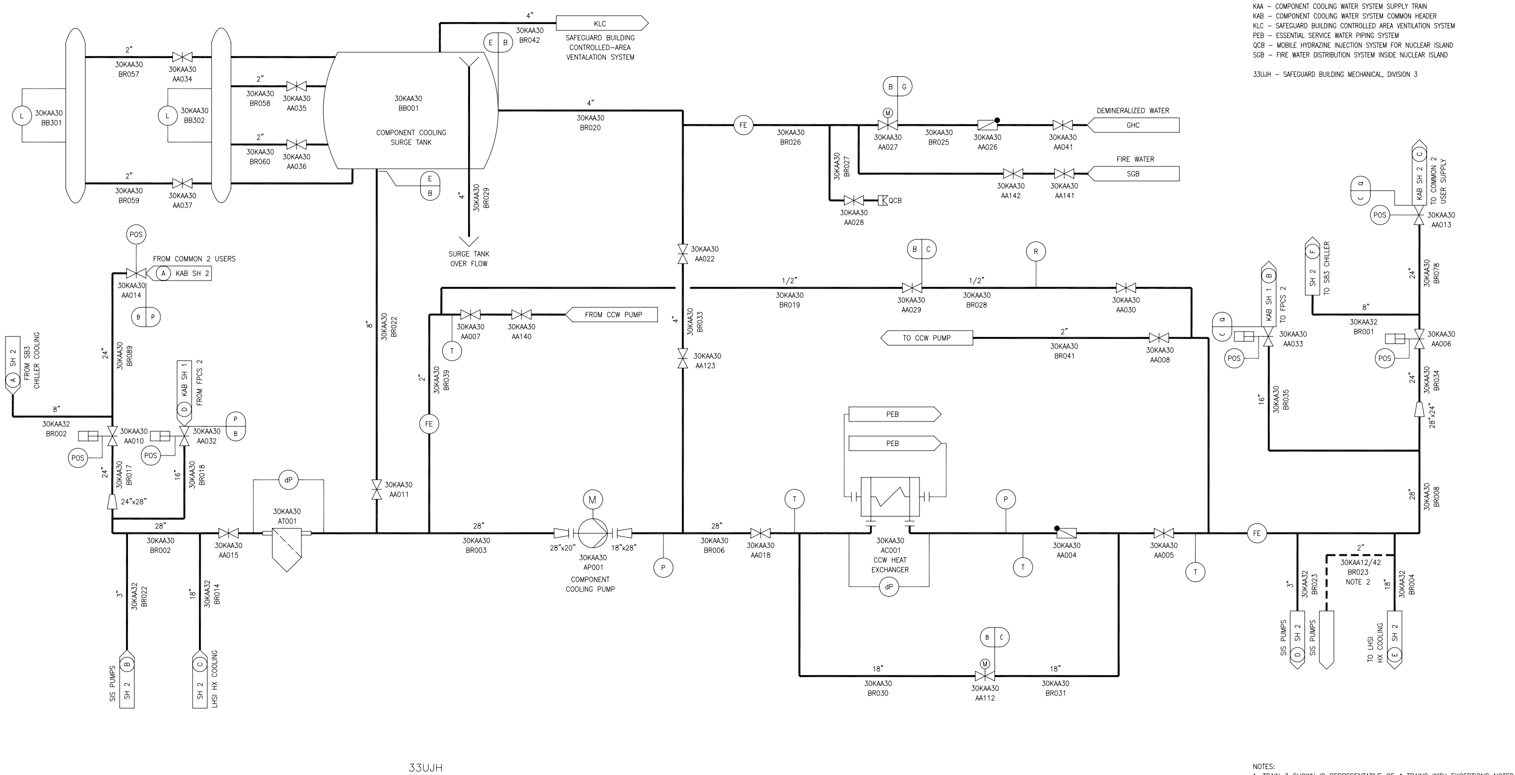
Hot Shutdown

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.

Figure 9.2.2-1—Component Cooling Water System Trains 1 through 4
Sheet 1 of 2



GHC – DEMINERALIZED WATER DISTRIBUTION SYSTEM
KAA – COMPONENT COOLING WATER SYSTEM SUPPLY TRAIN
KAB – COMPONENT COOLING WATER SYSTEM COMMON HEADER
KLC – SAFEGUARD BUILDING CONTROLLED AREA VENTILATION SYSTEM
PEB – ESSENTIAL SERVICE WATER PIPING SYSTEM
QCB – MOBILE HYDRAZINE INJECTION SYSTEM FOR NUCLEAR ISLAND
SGB – FIRE WATER DISTRIBUTION SYSTEM INSIDE NUCLEAR ISLAND

33UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 3

NOTES:
1. TRAIN 3 SHOWN IS REPRESENTATIVE OF 4 TRAINS WITH EXCEPTIONS NOTED.
2. TRAINS 1 AND 4 SAFETY INJECTION SYSTEM COOLING EXCEPTION.

DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS
E	C	15	225	I
G	E	175	140	NSC
C	C	175	225	I
B	C	175	225	I

REV 001
KAA01T2

REVISED PER QUESTION 09.02.02-10(c)