ArevaEPRDCPEm Resource

From: BRYAN Martin (EXT) [Martin.Bryan.ext@areva.com]
Sent: Monday, June 14, 2010 4:44 PM
To: Tesfaye, Getachew
Cc: KOWALSKI David J (AREVA NP INC); ROMINE Judy (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Attachments: Blank Bkgrd.gif; RESPONSE RAI 406 Q 09 02 02-110-Draft.pdf; RESPONSE RAI 345 Supp 1 Q 09 02 01-26-Draft.pdf; RESPONSE RAI 345 Supp 1 Q 09 02 01-27-Draft.pdf; RESPONSE RAI 345 Supp 1 Q 09 02 01-30 (f)-Draft.pdf; RESPONSE RAI 345 Supp 1 Q 09 02 01-38 (c)-Draft.pdf; RESPONSE RAI 345 Supp 1 Q 09 02 01-43-Draft.pdf; RESPONSE RAI 406 Q 09 02 02-109-Draft.pdf

Importance: High

Getachew,

Attached are draft responses to support the telecon tomorrow.

Thanks,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: KOWALSKI David J (AREVA NP INC)
Sent: Monday, June 14, 2010 3:59 PM
To: BRYAN Martin (EXT)
Cc: GARDNER George Darrell (AREVA NP INC); BALLARD Robert W (AREVA NP INC); CONNELL Kevin J (AREVA NP INC); HUDDLESTON Stephen C (AREVA NP INC); HARTSELL Jody M (AREVA NP INC); BROUGHTON JR Ronnie T (AREVA NP INC); SLOAN Sandra M (AREVA NP INC); MCINTYRE Brian (AREVA NP INC)
Subject: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Importance: High

Marty:

Please transmit to Getachew Tesfaye the attached partial set of DRAFT responses to RAI 345 and 406 questions. These responses will be discussed at tomorrow's (6/15/10) FSAR Chapter 9 Weekly Telecon/GoToMeeting with the NRC. Some of these responses (e.g., 09.02.01-26, -27 and -38(c), are believed to have been shared with the NRC prior to the implementation of formal GoToMeetings and submittal of DRAFT responses. These revised responses reflect previously-given comments and are considered acceptable for submittal.

Attached DRAFT responses include the following:

- Response to RAI 345 Question 09.02.01-26.
- Response to RAI 345 Question 09.02.01-27.
- Response to RAI 345 Question 09.02.01-30(f).
- Response to RAI 345 Question 09.02.01-38(c).
- Response to RAI 345 Question 09.02.01-43.
- Response to RAI 406 Question 09.02.02-109 [DRAFT response includes Part (3)-Subpart 7 and Part (4)].
- Response to RAI 406 Question 09.02.02-110 [DRAFT response reflects NRC comments received via e-mail on 6-11-10].

Note that none of these DRAFT responses has been through the final Licensing review/approval process; nor do any responses reflect technical editing.

Please call me if you have any questions. Thanks.

David J. Kowalski, P.E.
Principal Engineer
New Plants Regulatory Affairs

AREVA NP Inc.
An AREVA and Siemens company

7207 IBM Drive, Mail Code CLT-2A
Charlotte, NC 28262
Phone: 704-805-2590
Mobile: 704-293-3346

Fax: 704-805-2675
Email: David.Kowalski@areva.com

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1545

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB7106851564)

Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Sent Date: 6/14/2010 4:44:19 PM
Received Date: 6/14/2010 4:44:46 PM
From: BRYAN Martin (EXT)

Created By: Martin.Bryan.ext@areva.com

Recipients:
"KOWALSKI David J (AREVA NP INC)" <David.Kowalski@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA NP INC)" <Judy.Romine@areva.com>
Tracking Status: None
"WILLIFORD Dennis C (AREVA NP INC)" <Dennis.Williford@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	2362	6/14/2010 4:44:46 PM
Blank Bkgrd.gif	210	
RESPONSE RAI 406 Q 09 02 02-110-Draft.pdf	726240	
RESPONSE RAI 345 Supp 1 Q 09 02 01-26-Draft.pdf	971197	
RESPONSE RAI 345 Supp 1 Q 09 02 01-27-Draft.pdf	734208	
RESPONSE RAI 345 Supp 1 Q 09 02 01-30 (f)-Draft.pdf	564488	
RESPONSE RAI 345 Supp 1 Q 09 02 01-38 (c)-Draft.pdf	305977	
RESPONSE RAI 345 Supp 1 Q 09 02 01-43-Draft.pdf	401415	
RESPONSE RAI 406 Q 09 02 02-109-Draft.pdf	1464044	

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

Request for Additional Information No. 406(4683, 4664, 4707), Revision 0

5/14/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
SRP Section: 09.04.01 - Control Room Area Ventilation System
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)
QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)
QUESTIONS for Balance of Plant Branch 1 (SBPA)

DRAFT

09.02.02-110

Follow-up to RAI 334, Question 9.2.2-62 and RAI 174, Question 9.2.2-13

In RAI 9.2.2-62 the applicant was requested to determine CCWS minimum heat transfer and flow requirements for the various plant operating modes and accident conditions. The applicant previously stated this information would not be available until later in the design process. In response to RAI 9.2.2-62 the applicant provided a FSAR markup that included FSAR Tier 2 Table 9.2.2-2, "CCWS User Requirements," with heat load and flow information. The staff's review of this information identified the follow-up questions discussed below:

a. The applicant should provide a summary table in the FSAR to identify the total system flow and heat load requirements for normal and accident conditions as well as an assessment in the RAI response of margin by comparison with the design heat transfer and flow capacities for the CCWS heat exchanger and CCWS pump, respectively.

b. Explain the basis for the CCW LHSI heat exchanger DBA heat load (241 MBTU/Hr) in the markup of Table 9.2.2-2 and explain its difference from the DBA heat load identified elsewhere in the FSAR. For example both Tables 9.2.2-1 and 9.2.5-1 identify a DBA heat load of 291.3 MBTU/Hr. This should be explained in the FSAR.

c. Table 9.2.2-2 states that RCP motor air and bearing oil coolers isolate on a Stage 1 Containment isolation signal. However, FSAR Tier 2 Section 9.2.2 indicates that these loads isolate at Stage 2. This table should also state that the CVCS HP coolers isolate at Stage 2. These discrepancies should be corrected in the FSAR.

d. Describe in the RAI response the differences between the CCW Fuel Pool Cooling heat load for normal refueling (47.8 MBTU/Hr) which is significantly

e. The dedicated heat exchanger capacity is missing from FSAR Tier 2 Table 9.2.2-1. This information should be added to the FSAR.

f. For Table 9.2.2-2, sheet 1 identifies LHSI Hx heat load and flow values for the two cooldown conditions below. Explain in the RAI response the difference for the CCW heat load and flow being significantly less when the CCW train is connected to both the SIS users and the common header and when compared to only being connected to the SIS users (difference of 116 E6 BTU/hr). The applicant should consider adding an explanatory note to the FSAR Table.

Condition	Heat Load (MBTU/Hr)	Flow (10^6 Lb/Hr)
Normal Cooldown when CCW train is only connected to SIS users	152.8	2.984
Normal Cooldown when CCW train is also connected to the common header	36.54	2.1906

DRAFT

Response to Question 09.02.02-110:

a. A review of the CCWS confirmed the system heat load and flow requirements for normal and accident conditions. The following table summarizes flow requirements for various CCWS operating modes.

CCWS Operational Alignment	Required Flow (10^6 lbm/hr) (1)	Required Flow (gpm)
Normal Operation - CCWS Train 1or 2 aligned to Common 1 Header Plus SIS Users	7.359	15043
Normal Operation - CCWS Train 3 or 4 aligned to Common 2 Header Plus SIS Users	7.537	15407
Normal Operation - Plant Cooldown CCWS Trains aligned to SIS users only (No Connection to Common Header)	3.061	6257
DBA - CCWS Train 1 or 2 aligned to Common 1 Header	4.3	8790
DBA - CCWS Train 3 or 4 aligned to Common 2 Header	4.285	8759

Notes: (1) The total required pump flow in each alignment includes recirculation flow to each CCWS surge tank.

The highest total required flow for the CCWS is train 3 aligned to the train SIS users in addition to Common Header 2. This alignment results in a required flow of 7.537E+06 lbm/hr. The expected CCWS pump suction temperatures for the various operational alignments are enveloped by a temperature of 160°F. Using water at 160°F this converts to a required flow of 15407 gpm. Applying the pump margin of 15.33% from the Response to RAI 334, Question 9.2.2-63 results in a total required pump flow of 17768 gpm.

The following table summarizes the heat load requirements and heat exchanger UA calculations for various CCWS operating modes.

CCWS Operational Alignment	Heat Load (10^6 BTU/hr)	CCWS Flow (10^6 lbm/hr) (1)	ESWS Flow (10^6 lbm/hr)	UA (10^6 BTU/hr-°F)
Normal Operation - Plant Heat-up CCWS Train 1or 2 aligned to Common 1 Header (No Connection to SIS Users)	106.9	5.631	7.54	11.37
Normal Operation - Plant Heat-up CCWS Train 3 or 4 aligned to Common 2 Header (No Connection to SIS Users)	123.3	5.809	7.54	13.08
Normal Operation - Plant Cooldown CCWS Train 1or 2 aligned to Common 1 Header Plus SIS Users	114.96	7.078	7.54	11.9
Normal Operation - Plant Cooldown CCWS Train 3 or 4 aligned to Common 2 Header Plus SIS Users	92.36	6.18	7.54	8.8
Normal Operation - Plant Cooldown CCWS Trains aligned to SIS users only (No Connection to Common Header)	153.1	3.061	7.54	7.43
DBA - CCWS Train 1 or 2 aligned to Common 1 Header	291.9	4.3	7.54	10.81
DBA - CCWS Train 3 or 4 aligned to Common 2 Header	291.5	4.285	7.54	10.76

DRAFT

Notes: (1) CCWS flow is the total user required flow. This value does not include the surge tank recirculation line flow as that does not factor in the UA calculation for the CCWS heat exchanger.

Due to the variations in heat load and CCWS flow for each CCWS operational alignment, the UA calculation is used to determine the design case for each CCWS heat exchanger. Calculating the largest required UA for all operational alignments and applying tube plugging margins to that value will envelope the UA requirements for all other operational alignments. The largest UA required for the CCWS heat exchanger of 13.08E+06 BTU/hr-°F results from Normal Operation - Plant Heat-up CCWS Train 3 or 4 aligned to Common 2 Header (No Connection to SIS Users). Considering a 10% margin for tube plugging, the limiting UA becomes 14.39E+06 BTU/hr-°F for each CCWS heat exchanger. The largest UA requirement for a CCWS heat exchanger during a DBA results from Train 1 or 2 aligned to common 1 Header. The design UA of 14.39E+06 BTU/hr-°F for each CCWS heat exchanger provides a 24.8% margin above the required UA of 10.81E+06 BTU/hr-°F for the DBA case.

U.S. EPR FSAR, Tier 2, Table 9.2.2-2 will be revised to update the CCWS flow requirements. Tier 2 Table 9.2.2-6 will be added to summarize CCWS flow and heat loads for various operational alignments.

b. A review of the CCWS confirmed the CCWS LHSI heat exchanger DBA heat load of 241 MBTU/hr. U.S EPR FSAR Tier 2, Table 9.2.2-1 will be revised to update the CCWS LHSI heat exchanger DBA heat load.

   A review of the CCWS design confirmed the CCWS heat exchanger DBA heat load on the Ultimate Heat Sink (UHS) of 291.9 MBTU/hr. This heat load is equal to the LHSI heat exchanger DBA heat load of 241 MBTU/hr from Table 9.2.2-1 plus the additional loads from the CCWS common header users aligned during a DBA. U.S EPR FSAR Tier 2, Table 9.2.5-1 will be revised to update the CCWS heat exchanger DBA heat load.

   The LHSI heat exchanger DBA heat load of 241 MBTU/hr is the decay heat removed by the LHSI system to the CCWS heat exchanger. The MHSI and LHSI pump heat loads are specifically listed as individual values in FSAR Table 9.2.2-2

   The value of 291.9 MBTU/hr in Table 9.2.2-1 is the total DBA heat load that the CCWS is required to reject to the UHS. The design UA of 14.39E+06 BTU/hr-°F for each CCWS heat exchanger provides a 24.8% margin above the required UA of 10.81E+06 BTU/hr-°F for the DBA case. The value of 291.9 MBTU/hr in table 9.2.5-1 is the CCWS DBA heat load that is applied to the UHS. The design of the UHS is required to account for this CCWS heat load plus any additional DBA heat loads that directly impact the UHS. Refer to U.S. EPR FSAR Section 9.2.5 for a discussion on the UHS design.

c. Refer to the Response to part (a) of RAI 406, Question 9.2.2-110 for the update of U.S. EPR FSAR Table 9.2.2-2.

d. Refer to the Response to part (a) of RAI 406, Question 9.2.2-110 for the update of U.S. EPR FSAR Table 9.2.2-2.

e. A review of the CCWS confirmed the Dedicated CCWS Heat Exchanger capacity of 51.2 MBTU/hr. The value of 50.5 MBTU/hr listed in 9.2.2-2 is only the SAHRS heat

DRAFT

f. Refer to the Response to part (a) of RAI 406, Question 9.2.2-110 for the update of U.S. EPR FSAR Table 9.2.2-2.

FSAR Impact:

U.S. EPR FSAR, Tier 2 Table 9.2.2-1, 9.2.2-2 and 9.2.5-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2 Section 9.2.2.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2 Table 9.2.2-6 will be added as described in the response and indicated on the enclosed markup.

DRAFT

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 during all plant operating modes when the RCPs are running. Upon receipt of a containment isolation signal, the CCWS responds to protect the integrity of the containment pressure boundary.

~~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.

DRAFT

FSAR Section 9.2.2.2.1 Insert for RAI 406; 9.2.2-110

During normal operation the temperature at the outlet of the CCWS heat exchanger must be greater than 59°F and lower than 100.4°F. During a DBA, the CCWS heat exchanger outlet temperature must be lower than 113°F.

The expected CCWS pump suction temperatures for the various operational alignments are enveloped by a temperature of 160°F.

DRAFT

Table 9.2.2-1—CCWS Design Parameters

Description	Technical Data
Component Cooling Water Pump (KAA10/20/30/40 AP001	
Number	4
Type	Centrifugal Pump
Flow rate max.	17,768 gpm
Pump head min (at max flow rate)	199.7 ft
Dedicated Component Cooling Water Pump (KAA80 AP001)	
Number	1
Type	Centrifugal Pump
Flow Rate	2678 gpm
Pump Head	180 ft
Component Cooling Water Surge Tank KAA10/20/30/40 BB001)	
Number	4
Volume	950 ft^3
Dedicated Component Cooling Water Surge Tank (KAA80 BB001)	
Number	1
Volume	75 ft^3
Component Cooling Water HX (KAA10/20/30/40 AC001)	
Number	4
Heat Load (DBA)	291.3×10^6 Btu/hr

DRAFT

Table 9.2.2-2—CCWS User Requirements
Sheet 1 of 4

Component	KKS	Heat Load (10^6 BTU/hr)	Required Flow (10^6 lb/hr)	Comments
Fuel Pool Cooling System				
Fuel Pool Cooling Heat Exchanger	30FAK10/20 AC001	29	0.8818	Normal Operations
		47.8	2.645	Normal Refueling
		33.78	2.645	Refueling (full off-load)
Reactor Coolant System				
RCP Lower Bearing Oil Cooler	JEB10/20/30/40 AC001	0.0819	0.0088	Cooling Isolated with Containment Isolation (CI) Stage 1 Signal
RCP Motor Air Cooler	JEB10/20/30/40 AC002/003	1.075	0.0529	
RCP Upper Bearing Oil Cooler	JEB10/20/30/40 AC004	1.305	0.1323	
RCP Thermal Barrier	N/A	0.3915	0.0198	Not Isolated with CI-1 or CI-2
Safety Injection and Residual Heat Removal System				
MHSI Pump Motor Cooler	JND10/20/30/40 AP001	0.239	0.0265	
LHSI Heat Exchanger	JNG10/20/30/40 AC001	152.8	2.984	Normal cooldown when CCW train is only connected to the train SIS users
		36.54	2.1906	Normal cooldown when CCW train is also connected to the CCW common header
		241	2.1906	DBA
LHSI Pump Motor Cooler	JNG20/30 AP001	0.1262	0.0141	
LHSI Sealing Fluid Cooler	JNG20/30 AP001	0.0341	0.0062	Flow isolated when LHSI pump is out of service for dilution prevention
Severe Accident Heat Removal System				
SAHRS Heat Exchanger	JMQ40 AC001	47.77	1.106	Cooled by dedicated CCWS
SAHRS Pump Seal Watercooler	JMQ40 AC003	0.0593	0.0053	Cooled by dedicated CCWS

DRAFT

Table 9.2.2-2—CCWS User Requirements
Sheet 2 of 4

Component	KKS	Heat Load (10^6 BTU/hr)	Required Flow (10^6 lb/hr)	Comments
SAHRS Pump Motor Cooler	JMQ40 AC002	0.089	0.0079	Cooled by dedicated CCWS
SAHRS Pump Bearing Cooler	JMQ40 AC004	0.0223	0.002	Cooled by Dedicated CCWS
Volume Control System				
CVCS HP Cooler	KBA11/12 AC001	30.71	0.873	Plant Heatup
		14.3	0.2968	Normal Load
		6.9	0.1228	Plant Cooldown
Charging Pump Motor Cooler	KBA31/32 AP001	0.1706	0.0198	
Charging Pump Oil Cooler	KBA31/32 AP001	0.1706	0.0025	
Charging Pump Seal Water Cooler	KBA31/32 AP001	0.1706	0.0033	
Coolant Treatment System				
After Cooler	KBF25 AC001	0.6824	0.0381	Cooling Isolated with Safety Injection (SI) Signal
Condensate Cooler	KBF20 AC006	0.9315	0.0262	
Condenser	KBF20 AC003	0.6824	0.019	
Gas Cooler	KBF20 AC004	0.0358	0.002	
Gas Cooler	KBF40 AC004	0.0481	0.0027	
Reflux Cooler	KBF40 AC003	0.9622	0.0262	
Seal Water Cooler	KBF35 AC001	0.1297	0.0071	
Coolant Degasification System				
CDS Condenser	KBG10 AC002	8.131	0.4524	Cooling Isolated with SI Signal
CDS Gas Cooler	KBG10 AC003	0.6244	0.0349	
Containment Ventilation System				
Containment HVAC Cooler 1/2/3/4	KLA61/63 AC001/003	1.365	0.1437	Cooling Isolated with CI Stage 1 Signal
Solid Waste System				
Condenser	KPC30/40/50 AC001	0.0341	0.0024	Cooling Isolated with SI Signal
Vacuum Unit	KPC60 AC001	0.0239	0.0048	

DRAFT

Table 9.2.2-2—CCWS User Requirements
Sheet 3 of 4

Component	KKS	Heat Load (10^6 BTU/hr)	Required Flow (10^6 lb/hr)	Comments
Liquid Waste Processing System				
Distillate Cooler	KPF11 AC004	0.3583	0.0167	Cooling Isolated with SI Signal
Gas Cooler	KPF11 AC003	1.365	0.0397	
Injection Water Cooler	KPF11 AC006	0.0409	0.0024	
Seal Water Cooler	KPF11 AC007	0.1297	0.0071	
Nuclear Island Drain and Vent System				
Reactor Coolant Drain Cooler	KTA10 AC001	1.996	0.1124	Cooling Isolated with CI Stage 1 Signal
Nuclear Sampling System				
Nuclear Sampling (RCS/HL3)	KUA10 AC001	0.3958	0.0147	
Nuclear Sampling (RCS/HL3)	KUA20 AC001	0.3958	0.0147	
Nuclear Sampling (RCS/PZR)	KUA30 AC001	0.3958	0.0147	
Steam Generator Blowdown System				
SGBS Second Stage Cooler	LCQ51 AC003/004	10.03	0.1932	Cooling Isolated with SI Signal; Heat Exchangers are in series and the heat transfer listed is the combined load.
Safety Chilled Water System				
Safety Chiller	QKA20/30 AC002	4.123	0.373	
Operational Chilled Water System				
OCWS (QNA)	QNA21/22/23/24 AC002	11.84	0.986	Cooling Isolated with SI Signal
OCWS (QNB)	QNB62/63 AC002	1.269	0.119	
Sampling System for Condensate Systems				
SG Secondary Sampling (SG1)	QUC11 AC001	0.2593	0.0097	
SG Secondary Sampling (SG2)	QUC12 AC002	0.2593	0.0097	
SG Secondary Sampling (SG3)	QUC13 AC003	0.2593	0.0097	

DRAFT

Table 9.2.2-2—CCWS User Requirements
Sheet 4 of 4

Component	KKS	Heat Load (10^6 BTU/hr)	Required Flow (10^6 lb/hr)	Comments
SG Secondary Sampling (SG4)	QUC14 AC004	0.2593	0.0097	
~~FPCS Heat Exchanger~~			~~30FAK10/20 AC001~~	~~0.8818~~
~~RCP Thermal Barrier~~			~~N/A~~	~~0.0198~~
~~LHSI Heat Exchanger~~			~~30JNG10/20/30/40 AC001~~	~~2.1906~~
~~SCWS Chiller~~			~~30QKA20/30 AC002~~	~~0.3730~~

DRAFT

Table 9.2.2-2 - CCWS User Requirements Summary

Component	KKS	Heat Load (10^6 BTU/hr)	Required Flow (10^6 lbm/hr)	Comments
CCWS Main Trains 1 and 4				
CCWS Pump Motor Cooler	KAA10/40 AC002	0.0955	0.0302	
LHSI Heat Exchanger	JNG10/40 AC001	152.8	2.984	Normal Cooldown when CCW train is only connected to the train SIS users (1)
		36.54	2.1906	Normal Cooldown when CCW train is also connected to the CCW common header (1)
		241	2.1906	DBA
MHSI Pump Motor Cooler	JND10/40 AP001	0.239	0.0265	
CCWS Main Trains 2 and 3				
CCWS Pump Motor Cooler	KAA20/30 AC002	0.0955	0.0302	
LHSI Heat Exchanger	JNG20/30 AC001	152.8	2.984	Normal Cooldown when CCW train is only connected to the train SIS users (1)
		36.54	2.1906	Normal Cooldown when CCW train is also connected to the CCW common header (1)
		241	2.1906	DBA
MHSI Pump Motor Cooler	JND20/30 AP001	0.239	0.0265	
LHSI Pump Motor Cooler	JNG20/30 AP001	0.1262	0.0141	
LHSI Sealing Fluid Cooler	JNG20/30 AP001	0.0341	0.0062	Flow isolated when LHSI pump is out of service for dilution prevention
Common Header 1				
Fuel Pool Cooling Hx	FAK10 AC001	29	0.8818	Normal Operations
		47.8	2.645	Refueling
Safety Chiller	QKA20 AC002	4.123	0.373	
RCP Thermal Barrier	N/A	1.566	0.0792	Thermal Barriers 1-4 can be cooled by
Additional Operational Users	QNA, QNB, JEB, KBA, KLA, KTA, QUC, KUA	69.86	4.11	
Common Header 2				
Fuel Pool Cooling Hx	FAK20 AC001	29	0.8818	Normal Operations
		47.8	2.645	Refueling
Safety Chiller	QKA30 AC002	4.123	0.373	
RCP Thermal Barrier	N/A	1.566	0.0792	Thermal Barriers 1-4 can be cooled by
Additional Operational Users	QNA, QNB, JEB, KBA, QUC, KUA, LCQ, KBF, KBG, KPC, KPF	86.29	4.29	
Dedicated CCWS Train				
Severe Accident Heat Removal System Heat Exchanger	JMQ40 AC001/004	50.5	1.104	

Notes:

1. A CCWS train aligned only to the train SIS users has a higher heat removal capacity than a CCWS train that is also aligned to the Common header plus the CCWS train SIS users. Flow that would normally go to the common header is used for additional heat removal capacity from the SIS users.

DRAFT

RAI 406, Q 9.2.2-110 FSAR Insert 'B'

Table 9.2.2-6 - CCWS Heat Load and Flow Summary

CCWS Operational Alignment	Heat Load (10^6 BTU/hr)	Total CCWS Flow (10^6 lbm/hr) (2)	Total CCWS Flow (Gpm) (2)
Normal Operation - Plant Heat-up CCWS Train 1or 2 aligned to Common 1 Header (No Connection to SIS Users)	106.9	5.631	11511
Normal Operation - Plant Heat-up CCWS Train 3 or 4 aligned to Common 2 Header (No Connection to SIS Users)	123.3 (1)	5.809	11875
Normal Operation - Plant Cooldown CCWS Train 1or 2 aligned to Common 1 Header Plus SIS Users	114.96	7.359	15043
Normal Operation - Plant Cooldown CCWS Train 3 or 4 aligned to Common 2 Header Plus SIS Users	92.36	7.537	15407
Normal Operation - Plant Cooldown CCWS Trains aligned to SIS users only (No Connection to Common Header)	153.1	3.061	6257
DBA - CCWS Train 1 or 2 aligned to Common 1 Header	291.9	4.3	8790
DBA - CCWS Train 3 or 4 aligned to Common 2 Header	291.5	4.285	8759

Notes:

1. The 123.3 MBTU/hr heat load in this case combined with CCWS and ESWS flow requirements yields the greatest required heat transfer area for the CCWS heat exchanger. All other CCWS heat exchanger load and flow requirement cases are enveloped by this scenario.

2. The total required pump flow in each alignment includes recirculation flow to each CCWS surge tank. The margins in Table 9.2.2-5 are applied to the highest calculated required flow. Applying the margin to the largest calculated total flow requirement envelopes the required flow for all CCWS pumps in any operating mode.

DRAFT

Table 9.2.5-1—Ultimate Heat Sink System Interface

Component	Max Heat Load MBTU/hr	Total Required ESW Flow (10^6 lb_m/hr)	Required ESW Temperature	Comments
CCWS heat exchanger	128.1	7.540 min	≤92°F	Normal Operation
	120.1	7.540 min	≤90°F	Spring/Fall Outage Cooldown
	291.3	7.540 min	≤95°F	DBA
Dedicated CCWS heat exchanger	48.64	1.205 min	≤95°F	Severe Accident
EDG heat exchanger	22.0	1.06	≤95°F	
ESW pump room cooler for 31/32/ 33/34 UQB	0.619	137.6 gpm	≤ 95°F	Normal Operations Shutdown/ Cooldown and DBA
ESW pump room cooler for 34 UQB	0.314	69.8 gpm	≤ 95°F	Severe Accident - ESW flow supplied by dedicated ESW pump

DRAFT

Question 09.02.01-26:

Follow-up to RAI 119, Question 9.2.1-01

The essential service water system (ESWS) must be able to withstand natural phenomena without the loss of function in accordance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 2 requirements. The criteria that are specified in Tier 2 of the Final Safety Analysis Report (FSAR), Section 3.2, indicate that non-safety-related parts of the ESWS should be designated as Seismic Category II if a failure under seismic loading conditions could prevent or reduce the functional capability of a safety-related structure, system, or component (SSC). The staff found that insufficient information was provided to determine if the seismic designation for non-safety-related parts of the ESWS is appropriate. Also, the staff noted that the information on Tier 2 Figure 9.2.1-1, "Essential Service Water System Piping & Instrumentation Diagram," (P&ID) was inconsistent with the information in Tier 2 FSAR Table 3.2.2-1, "Classification Summary," in that the table (Sheet 94) shows that the dedicated ESWS pump is classified as non-safety-related supplemental grade (NS-AQ), Seismic Category II and the P&ID shows the dedicated ESWS pump as simply non-safety-related. The applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to fully explain why the non-safety-related parts of the ESWS are not classified as Seismic Category II (i.e., why the assumed simultaneous failure of all non-safety-related ESWS piping will not adversely affect safety-related parts of the ESWS or any other safety-related SSCs that are in the same general area as the non-safety-related ESWS piping), and to explain the inconsistency noted above with respect to the Seismic Category II designation for the dedicated ESWS pump, and why other parts of the dedicated ESWS are not similarly designated as NS-AQ, Seismic Category II in Table 3.2.2-1 and on the P&ID...

Based on the staff's review response to RAI 119, Question 9.2.1-01 and an audit by the staff conducted on October 27, 2009, the following items remain open and require further resolution and/or clarification by the applicant requiring Tier 1 FSAR changes.

As part of the FSAR markup for this RAI, FSAR Tier 1 Table 2.7.11-2 "ESWS I&C and Electrical Design" has been modified to identify alternate power from the SBO diesel generators for some but not all of the dedicated train powered components. For example;

a. For dedicated train components, such as MOVs 30PEB80 AA015 (pump recirculation) and AA016 (basin blow down), an alternate power source is not identified; therefore, these components will not be functional under conditions when alternate power is necessary.

b. Dedicated train filter is needed to assure operability of the dedicated train; therefore, an alternate power source should be identified for this equipment. However, Table 2.7.11-2 does not include this information.

c. Tier 1 Tables 2.7.11-1 and 2.7.11-2 incorrectly identifies valve 30PEB80 AA003 as the "dedicated train emergency blow down isolation valve," since this valve is actually located at the inlet to the dedicated CCWS heat exchanger as shown in Figure 2.7.11-1 (sheet 5).

DRAFT

d The description of the dedicated train filter blow down valve (30PEB80 AA009) and the basin blow down valve (30PEB80 AA016) shown in Table 2.7.11-1 is inconsistent with the information in Figure 2.7.11-1.

Response to Question 09.02.01-26:

Part a.

U.S. EPR FSAR Table 2.7.11-2 contains the IEEE Class 1E source and, as applicable for certain components, a Class 1E alternate feed source. The indications of SBO in Table 2.7.11-2 for the Dedicated ESW Pump and Dedicated Filter Blowdown Isolation Valve have been appropriately deleted in response to RAI 334, Question 09.02.02-76. SBO is not a Class IE alternate feed source as indicated in Table Note 2. Items identified in Table 2.7.11-2 as "Dedicated" components are capable of being supplied by a standby EDG or a SBODG that is provided as an alternate ac power source. The EDG commitment and ITAAC is already covered by U.S. EPR Tier 1 Section 2.7.11, Subpart 5.1.

The following text will be added to U.S EPR Tier 1, Section 2.7.11, as Subpart 5.4:

"Items identified in Table 2.7.11-2 as "Dedicated" ESWS motor-operated components are capable of being supplied by a SBODG."

A new Note 3 will be added to U.S. EPR FSAR Table 2.7.11-2 that reads:

"3) "Dedicated" components are non-Class 1E components but are powered from the Class 1E Division as shown."

The following text will be added to U.S. EPR FSAR Table 2.7.11-3:

5.4	Items identified in Table 2.7.11-2 as "Dedicated" ESWS motor-operated components are capable of being supplied by a SBODG.	Testing will be performed for motor-operated components designated as "Dedicated" in Table 2.7.11-2 by providing a test signal with the SBODG.	The test signal provided by the SBODG is present at the respective "Dedicated" component identified in Table 2.7.11-2.

The following text will be added to U.S. EPR Tier 2, Section 9.2.1.4.1:

"Dedicated ESWS motor-operated components are capable of being supplied by a standby EDG or a station blackout diesel generator (SBODG) that is provided as an alternate ac power source."

Part b.

The alternate ac power source for the Dedicated train filter is as described in RAI Response 09.02.01-26, Part a. U.S. EPR FSAR Table 2.7.11-2 will be revised to add the Dedicated Train filter 30PEB80AT001.

DRAFT

Part c.

U.S. EPR FSAR Tier 1 Table 2.7.11-1 has been corrected to delete the duplicate and incorrect line item for isolation valve 30PEB80AA003. For clarity and consistency, "Dedicated" has been added to the descriptions of 30PEB80AA003 and 30PEB80AA004. U.S. EPR FSAR Tier 1 Table 2.7.11-2 has been corrected to delete valve 30PEB80AA003 as this is a manual valve. U.S. EPR FSAR Table 3.9.6.2 has also been corrected to delete valve 30PEBAA003.

Part d.

The description of the dedicated train filter blowdown valve (30PEB80AA009) and the basin blowdown valve (30PEB80AA016) shown in U.S. EPR FSAR Table 2.7.11-1 has been corrected to be consistent with the information in U.S. EPR FSAR Figure 2.7.11-1. The valve descriptions had been inadvertently swapped.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.1.4.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 1, Section 2.7.11, Subpart 5 and U.S. EPR FSAR Tables 2.7.11-1, 2.7.11-2, and Tables 2.7.11-3 will be revised as described in the response and indicated on the enclosed markup.

DRAFT

5.0 Electrical Power Design Features

5.1 The components designated as Class 1E in Table 2.7.11-2 are powered from the Class 1E division as listed in Table 2.7.11-2 in a normal or alternate feed condition.

5.2 Valves listed in Table 2.7.11-2 fail as-is on loss of power.

5.3 Deleted.

5.4 INSERT A

RAI 345
09.02.01-26a.

6.0 Environmental Qualifications

6.1 Deleted.

7.0 Equipment and System Performance

7.1 The ESWS UHS as listed in Table 2.7.11-1 has the capacity to remove the design heat load from the CCWS.

7.2 The pumps listed in Table 2.7.11-1 have sufficient net positive suction head absolute.

7.3 Class 1E valves listed in Table 2.7.11-2 can perform the function listed in Table 2.7.11-1 under system operating conditions.

7.4 The ESWS provides for flow testing of the ESWS pumps during plant operation.

7.5 Deleted.~~The non-safety-related dedicated ESWS as listed in Table 2.7.11-1 has the capacity to remove the design heat load from the non-safety-related dedicated CCWS heat exchanger and ESWPBVS division 4 room cooler.~~

7.6 The ESWS delivers water to the CCWS and EDG heat exchangers and the ESWPBVS room coolers.

8.0 Interface Requirements~~Information~~

8.1 The site specific emergency makeup water system provides 300 gpm makeup water to each ESW cooling tower basin ~~in order~~ to maintain the minimum basin water level~~ in the ESW cooling tower basins~~.

9.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.11-3 lists the ESWS ITAAC.

DRAFT

RAI 345
09.02.01-26c.

Table 2.7.11-1—Essential Service Water System Equipment Mechanical Design (8 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME Code Section III	Function	Seismic Category
Makeup Water Check Valve Division 4	30PED40AA220	ESW Pump Structure Division 4	Yes	Close	I
Dedicated → Isolation Valve Upstr KAA80AC001	30PEB80AA003	ESW Dedicated Division Safeguards Building 4	No	Open	N/A
Dedicated → Isolation Valve Dnstr KAA80AC001	30PEB80AA004	ESW Dedicated Division Safeguards Building 4	Yes	Open	I
Dedicated ESW Pump	30PEB80AP001	ESW Pump Structure Division 4	No	Run	N/A
Dedicated Blowdown Isolation Valve	30PEB80AA009	ESW Pump Structure Division 4	No	Close	N/A
Dedicated Filter Blowdown Isolation Valve	30PEB80AA016	ESW Pump Structure Division 4	No	Close	N/A
Dedicated Recirc Isolation Valve	30PEB80AA015	ESW Pump Structure Division 4	No	Close	N/A
Dedicated Filter Blowdown Isolation Check Valve	30PEB80AA211	ESW Pump Structure Division 4	No	Close	N/A
Dedicated Pump Isolation Check Valve	30PEB80AA002	ESW Pump Structure Division 4	No	Open	N/A
~~Dedicated Emergency Blowdown Isolation Valve~~	~~30PEB80AA003~~	~~ESW Pump Structure Division 4~~	~~No~~	~~Close~~	~~N/A~~
Dedicated ESW Debris Filter	30PEB80AT001	ESW Pump Structure Division 4	No	Open	N/A

SWAP

RAI 345
09.02.01-26d.

DELETE — RAI 345 09.02.01-26c. — ADD

DRAFT

Table 2.7.11-2—Essential Service Water System Equipment I&C and Electrical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E (2)	PACS	MCR/RSS Displays	MCR/RSS Controls
Tower Isolation Valve Division 4	30PED40AA010	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Tower Bypass Isolation Valve Division 4	30PED40AA011	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Makeup Water Isolation Valve Division 4	30PED40AA019	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Emer. Makeup Water Isolation Valve Division 4	30PED40AA021	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated ESW Pump	30PEB80AP001	ESW Pump Structure Division 4	Division 4[N] ~~SBO[A]~~	Yes~~No~~	On-Off/ On-Off	Start-Stop/ Start-Stop
Dedicated Filter Blowdown Isolation Valve	30PEB80AA009	ESW Pump Structure Division 4	Division 4[N] ~~SBO[A]~~	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated Blowdown Isolation Valve	30PEB80AA016	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated Recirc Isolation Valve	30PEB80AA015	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated Emergency Blowdown Isolation Valve	30PEB80AA003	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Cooling Tower Fan	30PED10AN001	ESW Cooling Tower, Division 1	Division 1	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Dedicated ESW Debris Filter	30PEB80AT001	ESW Pump Structure Division 4	Division 4	Yes	Pos/N/A	Open-Close/N/A

RAI 345 09.02.01-26d.

SWAP

RAI 345 09.02.01-26b.

ADD

DRAFT

Table 2.7.11-2—Essential Service Water System Equipment I&C and Electrical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E (2)	PACS	MCR/RSS Displays	MCR/RSS Controls
Tower Isolation Valve Division 4	30PED40AA010	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Tower Bypass Isolation Valve Division 4	30PED40AA011	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Makeup Water Isolation Valve Division 4	30PED40AA019	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Emer. Makeup Water Isolation Valve Division 4	30PED40AA021	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated ESW Pump	30PEB80AP001	ESW Pump Structure Division 4	Division 4[N] ~~SBO[A]~~	Yes~~No~~	On-Off/ On-Off	Start-Stop/ Start-Stop
Dedicated Filter Blowdown Isolation Valve	30PEB80AA009	ESW Pump Structure Division 4	Division 4[N] ~~SBO[A]~~	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated Blowdown Isolation Valve	30PEB80AA016	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
Dedicated Recirc Isolation Valve	30PEB80AA015	ESW Pump Structure Division 4	Division 4	Yes~~No~~	Pos/N/A	Open-Close/N/A
~~Dedicated Emergency Blowdown Isolation Valve~~	~~30PEB80AA003~~	~~ESW Pump Structure Division 4~~	~~Division 4~~	~~Yes~~~~No~~	~~Pos/N/A~~	~~Open-Close/N/A~~
Cooling Tower Fan	30PED10AN001	ESW Cooling Tower, Division 1	Division 1	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop

RAI 345 09.02.01-26d.

SWAP

DELETE

RAI 345 09.02.01-26c.

DRAFT

Table 2.7.11-2—Essential Service Water System Equipment I&C and Electrical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E (2) (3)	PACS	MCR/RSS Displays	MCR/RSS Controls
Cooling Tower Fan	30PED10AN002	ESW Cooling Tower, Division 1	Division 1	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED20AN001	ESW Cooling Tower, Division 2	Division 2	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED20AN002	ESW Cooling Tower, Division 2	Division 2	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED30AN001	ESW Cooling Tower, Division 3	Division 3	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED30AN002	ESW Cooling Tower, Division 3	Division 3	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED40AN001	ESW Cooling Tower, Division 4	Division 4	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Cooling Tower Fan	30PED40AN002	ESW Cooling Tower, Division 4	Division 4	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop

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

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

→ INSERT B

RAI 345
09.02-01-26

ADD

DRAFT

Table 2.7.11-3—Essential Service Water System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	The components designated as Class 1E in Table 2.7.11-2 are powered from the Class 1E division as listed in Table 2.7.11-2 in a normal or alternate feed condition.	a. Testing will be performed for components designated as Class 1E in Table 2.7.11-2 by providing a test signal in each normally aligned division.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.7.11-2.
		b. Testing will be performed for components designated as Class 1E in Table 2.7.11-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E component identified in Table 2.7.11-2.
5.2	Valves listed in Table 2.7.11-2 fail as-is on loss of power.	Testing will be performed for the valves listed in Table 2.7.11-2 to fail as-is on loss of power.	Following loss of power, the valves listed in Table 2.7.11-2 fail as-is.
5.3	Deleted.	Deleted.	Deleted.
6.1	Deleted.	Deleted.	Deleted.
7.1	The ESW UHS as listed in Table 2.7.11-1 has the capacity to remove the design heat load from the CCWS.	Tests and analyses will be performed to demonstrate the capability of the ESWS UHS as listed in Table 2.7.11-1 to remove the design heat load from CCWS.	The ESWS UHS has the capacity to remove the design heat load from the CCWS of 2.913 E+08 BTU/hr.
7.2	The pumps listed in Table 2.7.11-1 have sufficient NPSHA.	Testing and analyses will be performed to verify NPSHA for pumps listed in Table 2.7.11-1.	A report exists and concludes that the pumps listed in Table 2.7.11-1 have NPSHA that is greater than net positive suction head required (NPSHR) at system run-out flow with consideration for minimum allowable cooling tower basin water level (as corrected to account for actual temperature and atmospheric conditions).

INSERT C — RAI 345 09.02.01-26a.

DRAFT

RAI 345
09.02.01-26c.

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 81 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
~~30PEB80AA008~~	~~Isolation upstream KAA80 AC001~~	~~BF~~	~~MA~~	~~3~~	~~B~~	~~A~~	~~O~~	~~ET~~ PI	~~5Y~~ 2Y	
30PEB80AA004	Isolation downstream KAA80 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB80AA009	Filter blowdown Isolation PEB80 AP001	GT	MO	3	B	A	O	ET PI	Q 2Y	
30PEB80AA015	Recirculation Isolation PEB80 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB80AA016	Blowdown Isolation PEB80	GB	MO	3	B	A	C	ET PI	Q 2Y	
30PEB80AA190	Air release downstream PEB80 AP001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB80AA192	Thermal relief downstream KAA80 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB80AA211	Blowdown check PEB80	CK	SA	3	C	A	C	ET	Q	
30PEB81AA001	Isolation upstream SAQ40 AC001	PG	MA	3	B	A	O	ET PI	5Y 2Y	

DRAFT

Four ESWS divisions are normally running to achieve cold shutdown in the minimum time. Only two divisions are required to achieve cold shutdown.

During refueling, when the core is almost discharged to the Fuel Building (FB), two or three ESWS divisions are in operation. During this phase, maintenance can be performed on one division. When the core is totally offloaded and in the FB, only two ESWS divisions are required to be in operation.

Non-Safety-Related Division

The dedicated ESW division is not in use during normal plant operation. The ESW side of the dedicated CCWS HX is separated from the rest of the system. The ESW inlet and outlet isolation valves are closed and this section is filled with demineralized water to prevent corrosion. The rest of the system is filled with site specific ESW fluid.

RAI 345
09.02.01-26

The dedicated ESW cooling chain is activated in case of an SA. This requires closing the ESW isolation valve downstream of CCW HX #4, manually opening the dedicated ESW isolation valves upstream and downstream of the dedicated CCW HX, and manually starting the dedicated ESW pump.

INSERT D

9.2.1.4.2 Abnormal Operating Conditions

Non-LOCA Design Basis Event During Power Operation

The ESWS operates as described for normal operating conditions, supplying the operating CCWS divisions as required.

Loss of Offsite Power

In case of loss of offsite power (LOOP), at least three of the safety-related ESWS divisions are available assuming one division is not available due to preventive maintenance. The four ESWS pumps belonging to the four safety-related divisions have power supplied by the EDGs.

In case of LOOP, the dedicated ESWS division is available but in standby condition. Power is supplied by the EDG. The dedicated ESWS division is also capable of being powered by the SBODGs so that the function is available even in case of LOOP with simultaneous loss of all EDGs.

If one safety-related ESWS pump fails during normal operation, a switchover to the other ESWS division is carried out. This switchover is done automatically for the entire cooling chain.

A spurious closure of the isolation valve in a safety-related ESWS division has the same consequences as the failure of the respective pump for that division.

DRAFT

INSERTS for RAI 345 Response 09.02.01-26a.

The following text will be added to U.S EPR Tier 1, Section 2.7.11, as Subpart 5.4.

INSERT A

"Items identified in Table 2.7.11-2 as "Dedicated" ESWS motor-operated components are capable of being supplied by a SBODG."

The following will be added to U.S EPR Tier 1, Table 2.7.11-2, as Note 3:

INSERT B

"3) "Dedicated" ESWS motor-operated components are non-Class 1E components but are powered from the Class 1E Division as shown."

The following table row will be added to U.S EPR Tier 1, Table 2.7.11-3, as Subpart 5.4:

INSERT C

5.4	Items identified in Table 2.7.11-2 as "Dedicated" ESWS motor-operated components are capable of being supplied by a SBODG.	Testing will be performed for motor-operated components designated as "Dedicated" in Table 2.7.11-2 by providing a test signal from the SBODG.	The test signal provided from the SBODG is present at the respective "Dedicated" component identified in Table 2.7.11-2.

The following text will be added to U.S. EPR Tier 2, Section 9.2.1.4.1:

INSERT D

"Dedicated ESWS motor-operated components are capable of being supplied by a standby EDG or a station blackout diesel generator (SBODG) that is provided as an alternate ac power source."

DRAFT

Question 09.02.01-27:

Follow-up to RAI 119, Question 9.2.1-02

The ESWS must be able to withstand natural phenomena without the loss of function in accordance with 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 ESWS integrity and operability during seismic events and other natural phenomena. Consequently, the applicant needs to include additional information in Tier 2 Section 9.2.1 of the FSAR to fully describe: (a) how ESWS integrity and operability is assured by the safety-related boundary isolation valves so that common-cause simultaneous failure of all non-safety-related ESWS piping will not compromise the ESWS safety functions during seismic events, (b) what the maximum allowed combined seat leakage is for the safety-related ESWS boundary isolation valves (including check valve for the non-safety-related dedicated ESWS cooling water supply for the Division 4 ESWS room cooler) and periodic testing that will be performed to ensure that the specified limit will not be exceeded, and (c) a description of any other performance assumptions that pertain to the boundary isolation valves or other parts of the system that are necessary to assure the capability of the ESWS to perform its safety functions during natural phenomena.

Based on the staff's review of response RAI 119, Question 9.2.1-02 and an audit by the staff conducted on October 27, 2009, the following item remains open and requires further resolution and/or clarification by the applicant.

In regard to part (b), valve seat leakage, the staff found the applicant's explanation that valve leakage was accounted for in determination of the volume required to support the first 72 hours of post accident UHS cooling tower operation as partially acceptable, including the referenced criteria used to determine valve leakage. The provided markup of FSAR Section 9.2.1.3.5 was acceptable to the staff and confirmed to have been incorporated in Revision 1 of the application. Additionally, Tier 2 FSAR Table 3.9.6-2, "In-service Valve Testing Program Requirements," was reviewed by the staff and found to include all the boundary valves relevant to the cooling tower basin. However, the applicant should address valve seat leak testing (LT) which is not specified for these ESWS boundary isolation valves by the In-service Valve Testing Program per FSAR Tier 2 Table 3.9.6-2.

Response to Question 09.02.01-27:

Valve seat leak testing (LT) has been specified for the ESWS boundary isolation valves 30PEB10/20/30/40 AA003, 30PEB10/20/30/40 AA015, and 30PEB10/20/30/40 AA016 in the In-service Valve Testing Program in FSAR Tier 2 Table 3.9.6-2. LT has been added as a Required Test for these boundary isolation valves and the ASME OM Code Category has been changed from B to A. For the dedicated system check valve upstream of the Division 4 pump room cooler, valve 30PEB41 AA011, LT has been added as a Required Test and the ASME OM Code Category has been changed from C to A/C. The safety position was changed from open to close.

FSAR Impact:

DRAFT

U.S. EPR FSAR Tier 2, Table 3.9.6-2 will be revised as described in the response and indicated on the enclosed markup.

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 72 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30LBA43AA101	Main Steam Relief Control Valve	GB	MO	2	A	A	O/C	ET ST LT PI	Q Q 2Y 2Y	
30LBA11AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA21AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA31AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA41AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA12AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA22AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA32AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA42AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30PEB10AA002	Recirc isolation PEB10 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB10AA003	Emer. blowdown isolation PEB10	BF	MO	3	~~B~~ A	A	C	ET PI	Q 2Y	2Y

LT

RAI 345
09.02.01-27

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 73 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30PEB10AA005	Pump discharge isolation PEB10 AP001	BF	MO	3	B	A	O	ET PI	Q 2Y	
30PEB10AA007	Isolation upstreamKAA10 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB10AA009	Isolation downstream KAA10 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB10AA015	Filter blowdown isolation PEB10 AP001	GT	MO	3	~~B~~ A	A	C	ET PI LT	Q 2Y 2Y	
30PEB10AA016	Blowdown isolation PEB10	GB	MO	3	~~B~~ A	A	C	ET PI LT	Q 2Y	2Y
30PEB10AA190	Air release downstream PEB10 AP001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB11AA191	Vacuum breaker downstream SAQ10 AC001	RV	SA	3	C	A	O/C	ET LT PI	2Y 10Y 2Y	
30PEB10AA192	Thermal relief downstream KAA10 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB10AA204	Pump discharge check PEB10 AP001	CK	SA	3	C	A	O	ET	Q	

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 74 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
~~30PEB10AA205~~	~~Blowdown check PEB10~~	~~CK~~	~~SA~~	~~3~~	~~C~~	~~A~~	~~C~~	~~ET~~	~~Q~~	-
30PEB11AA001	Isolation upstream SAQ10 AC001	GB	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB11AA002	Isolation downstream SAQ10 AC001	GB	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB21AA001	Isolation upstream XJG10 AC002	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB21AA002	Isolation downstream XJG10 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB21AA195	Air release 30XJG10 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB21AA196	Thermal relief downstream 30XJG10 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB20AA002	Recirculation Isolation PEB20 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB20AA003	Emergency blowdown Isolation PEB20	BF	MO	3	~~B~~ A	A	C	ET PI LT	Q 2Y 2Y	

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 75 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30PEB20AA005	Pump discharge Isolation PEB20 AP001	BF	MO	3	B	A	O	ET PI	Q 2Y	
30PEB20AA007	Isolation upstream KAA20 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB20AA009	Isolation downstream KAA20 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB20AA015	Filter blowdown Isolation PEB20 AP001	GT	MO	3	~~B~~ A	A	C	ET PI LT	Q 2Y 2Y	
30PEB20AA016	Blowdown Isolation PEB20	GB	MO	3	~~B~~ A	A	C	ET PI LT	Q 2Y	2Y
30PEB20AA190	Air release downstream PEB20 AP001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB21AA191	Vacuum breaker downstream SAQ20 AC001	RV	SA	3	C	A	O/C	ET LT PI	2Y 10Y 2Y	
30PEB20AA192	Thermal relief downstream KAA20 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB20AA204	Pump Discharge Check PEB20 AP001	CK	SA	3	C	A	O	ET	Q	

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 77 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30PEB23AA195	Air release 30XJG30 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB23AA196	Thermal relief downstream 30XJG30 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB30AA002	Recirculation Isolation PEB30 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB30AA003	Emergency Blowdown Isolation PEB30	BF	MO	3	~~B~~ A	A	C	ET PI LT	Q ~~2Y~~ 2Y	
30PEB30AA005	Pump Discharge Isolation PEB30 AP001	BF	MO	3	B	A	O	ET PI	Q 2Y	
30PEB30AA007	Isolation upstream KAA30 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB30AA009	Isolation downstream KAA30 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB30AA015	Filter blowdown Isolation PEB30 AP001	GT	MO	3	B A	A	C	ET PI LT	Q ~~2Y~~ 2Y	
30PEB30AA016	Blowdown Isolation PEB30	GB	MO	3	B A	A	C	ET PI LT	Q 2Y	2Y

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 79 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30PEB24AA195	Air release 30XJG40 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB24AA196	Thermal relief downstream 30XJG40 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB40AA002	Recirculation Isolation PEB40 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB40AA003	Emergency Blowdown Isolation PEB40	BF	MO	3	B A	A	C	ET PI LT	Q 2Y 2Y	
30PEB40AA005	Pump Discharge Isolation PEB40 AP001	BF	MO	3	B	A	O	ET PI	Q 2Y	
30PEB40AA007	Isolation upstream KAA40 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB40AA009	Isolation downstream KAA40 AC001	BF	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB40AA015	Filter blowdown Isolation PEB40 AP001	GT	MO	3	B A	A	C	ET PI LT	Q 2Y 2Y	
30PEB40AA016	Blowdown Isolation PEB40	GB	MO	3	B A	A	C	ET PI LT	Q 2Y	2Y

DRAFT

Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 80 of 92

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30PEB40AA190	Air release downstream PEB40 AP001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB41AA191	Vacuum breaker downstream SAQ40 AC001	RV	SA	3	C	A	O/C	ET LT PI	2Y 10Y 2Y	
30PEB40AA192	Thermal relief downstream KAA40 AC001	RV	SA	3	C	A	O/C	ET LT PI	10Y 10Y 2Y	
30PEB40AA204	Pump Discharge Check PEB40 AP001	CK	SA	3	C	A	O	ET	Q	
~~30PEB40AA205~~	~~Blowdown check PEB40~~	~~CK~~	~~SA~~	~~3~~	~~C~~	~~A~~	~~C~~	~~ET~~	~~Q~~	-
30PEB41AA001	Isolation upstream SAQ40 AC001	GB	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB41AA002	Isolation downstream SAQ40 AC001	GB	MA	3	B	A	O	ET PI	5Y 2Y	
30PEB41AA011	DED SYSTEM Check upstream SAQ40 AC001	CK	SA	3	~~C~~ A/C	A	~~O~~ C	ET ~~PI~~ LT	Q ~~2Y~~ 2Y	
30PEB80AA002	Pump Discharge Check PEB80 AP001	CK	SA	3	C	A	O	ET	Q	

DRAFT

Question 09.02.01-30:

Follow-up to RAI 119, Question 9.2.1-04 (f)

The ESWS 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 GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS 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 FSAR to address the following considerations in this regard:

> Part (f)- The P&ID does not show a flow indicator for the ESWS pump room coolers and additional discussion is needed to explain how the ESWS flow rate through the pump room coolers will be periodically verified and confirmed to be adequate.

Based on the staff's review of response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Part (f) remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

> The staff reviewed the applicant's response to part (f) of RAI-response 9.2.1-04 above relative to means of periodic confirmation of the adequacy of ESW pump room cooler flow. In this response, the applicant stated that temporary flow instrumentation will be installed for the performance of periodic cooler surveillance testing and testing after repairs. The staff found this response to be unacceptable since plant operators will not have valuable information related to ESWS possible degraded flow rates or degraded heat exchanger performance. This instrumentation should be described in the FSAR.

Response to Question 09.02.01-30:

The following information is provided in addition to the information previously provided in RAI Response 09.02.01-04 (f):

Indication of the ESW pump building room temperature is provided in the MCR as listed in Tier 1, Table 2.6.13-2. ESW temperature measurement is provided at the discharge of the ESWS pump and will be added downstream of the pump building ventilation system room cooler. Differential pressure across the cooler and temperature indications are available in the control room; therefore, plant operators will have information related to possible ESW degraded flow rates or degraded heat exchanger performance. The differential pressure is also available locally.

Indication of temperature measurement downstream of the pump building ventilation system room cooler will be added to U.S. EPR FSAR Tier 2, Figure 9.2.1-1. New instrumentation will be added to U.S. EPR FSAR Tier 2 Tables 3.10-1 and 3.11-1.

U.S. EPR Sections 9.2.1.7.2, and Table 9.2.1-3 were evaluated as part of this response and no changes are required for these sections and table.

DRAFT

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.1.7.1, Figure 9.2.1-1 and Tables 3.10-1 and 3.11-1 will be revised as described in the response and indicated on the enclosed markup.

DRAFT

- Fluid flow from the CCWS and EDG HXs.
- Temperature of the ESWS and the dedicated ESWS pump discharge.
- Temperature at the outlet of the HXs. and pump room coolers.

9.2.1.7.2 System Alarms

- High temperature ESW and dedicated ESW.
- ESW and dedicated ESW pump abnormal.
- Low flow across the CCWS and dedicated CCWS HX.
- High ΔP across the CCWS, dedicated CCWS HX, and SAQ room cooler.
- Low temperature ESW.
- Table 9.2.1-3—Alarm Summary provides additional information.

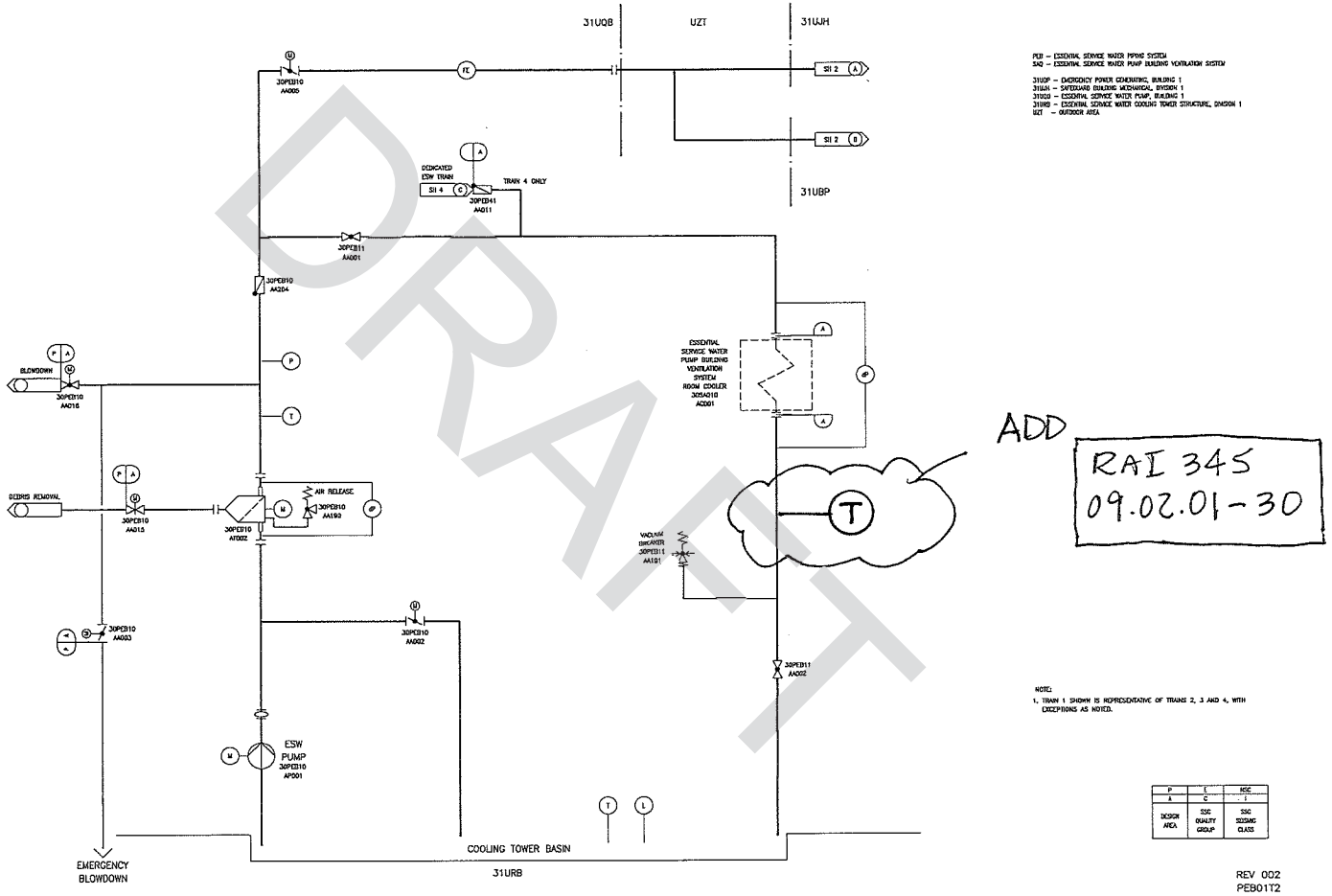
9.2.1.8 References

1. ASME Boiler and Pressure Vessel Code, Section III: "Rules for Construction of Nuclear Facility Components," Class 3 Components, The American Society of Mechanical Engineers, 2004.
2. Generic Letter 89-13, NRC Letter to All Holders of Operating Licenses or Construction Permits for Nuclear Power Plants, "Service Water System Problems Affecting Safety-Related Equipment," U.S. Nuclear Regulatory Commission, July 18, 1989.

RAI 345
09.02.01-30

DRAFT

Figure 9.2.1-1—Essential Service Water System Piping & Instrumentation Diagram
Sheet 1 of 4



ADD

RAI 345
09.02.01-30

DRAFT

RAI 345
09.02.01-30

ADD AS INDIVIDUAL COMPONENTS (& TOTAL) ROOM NUMBERS CHANGE 31/32/33/34

Table 3.10-1 List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
V 2 UPSTR *QN* USERS	30KAB80AA016	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V DNSTR *QN* USERS	30KAB80AA019	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
CK-V RTEN COM 1B NC	30KAB80AA020	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V F KAB80 CF060	30KAB80AA314	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V F KAB80 CF060	30KAB80AA315	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V F KAB80 CF061	30KAB80AA316	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V F KAB80 CF061	30KAB80AA317	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
D-V SUP COM1B NC	30KAB80AA403	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
D-V RETN COM1B NC	30KAB80AA406	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
D-V RETN COM1B NC	30KAB80AA407	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V-V SUP COM1B NC	30KAB80AA501	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
V-V RETN COM1B NC	30KAB80AA504	31UJH10004	M	H	ES SI	S C/NM	Y (3) Y (5)
F UPSTR QNA21 AC002	30KAB80CF060	31UJH10004	M	H	SI	S C/NM	Y (3) Y (5)
F DNSTR KAB80 CHIL	30KAB80CF061	31UJH10004	M	H	SI	S C/NM	Y (3) Y (5)
Essential Service Water System (ESWS)							
CCW HX Inlet Isolation Vlv	30PEB10AA007	31UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Outlet Isolation Vlv	30PEB10AA009	31UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Thermal Relief Vlv	30PEB10AA192	31UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Inlet Side DP Root Vlv	30PEB10AA306	31UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Outlet Side DP Root Vlv	30PEB10AA307	31UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA401	31UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA402	31UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA403	31UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA405	31UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA407	31UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB10AA408	31UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Vent Vlv	30PEB10AA508	31UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Vent Vlv	30PEB10AA509	31UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
Orifice Plate	30PEB10BP002	31UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX DP Measurement	30PEB10CP004	31UJH05026	M	H	SI	S	Y (5)
CCW HX Outlet Temp Measurement	30PEB10CT002	31UJH05026	M	H	SI	S	Y (5)
CCW HX Inlet Isolation Vlv	30PEB20AA007	32UJH05020	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Outlet Isolation Vlv	30PEB20AA009	32UJH05020	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Thermal Relief Vlv	30PEB20AA192	32UJH05020	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Inlet Side DP Root Vlv	30PEB20AA306	32UJH10020	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Outlet Side DP Root Vlv	30PEB20AA307	32UJH10020	M	H	SI	S C/NM	Y (3) Y (5)
SAQ HX Outlet Temp Measurement	30PEB 11/21/31/41 CT001	31UQB02001	M	M	SI	S	Y(5)
SAQ HX DP Measurement	30PEB 11/21/31/41 CP001	31UQB02001	M	M	SI	S	Y(5)

DRAFT

RAI 345
09.02.01-30

Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment
Sheet 38 of 103

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
ESW Pump Motor Heater, Train 2	30PEB20AH500	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor, Train 2	30PEB20AP001	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB20 AT002 Filter Motor Actuator	30PEB20AT002	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Flow Indicator	30PEB20CF001	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
UHS Tower Basin Level Indicator	30PEB20CL001	32URB01003	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Pressure Indicator	30PEB20CP002	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Filter Diff Pressure Indicator	30PEB20CP003	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Thermocouple	30PEB20CT001	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SW Pump Bldg Cooler Pressure Indicator	30PEB21CP501	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AA002 Valve Motor Actuator	30PEB30AA002	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AA003 Valve Motor Actuator	30PEB30AA003	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AA005 Valve Motor Actuator	30PEB30AA005	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AA015 Valve Motor Actuator	30PEB30AA015	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AA016 Valve Motor Actuator	30PEB30AA016	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor Heater, Train 3	30PEB30AH500	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor, Train 3	30PEB30AP001	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB30 AT002 Filter Motor Actuator	30PEB30AT002	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Flow Indicator	30PEB30CF001	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
UHS Tower Basin Level Indicator	30PEB30CL001	33URB01003	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Pressure Indicator	30PEB30CP002	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Filter Diff Pressure Indicator	30PEB30CP003	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Thermocouple	30PEB30CT001	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SW Pump Bldg Cooler Pressure Indicator	30PEB31CP501	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA002 Valve Motor Actuator	30PEB40AA002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA003 Valve Motor Actuator	30PEB40AA003	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA005 Valve Motor Actuator	30PEB40AA005	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA015 Valve Motor Actuator	30PEB40AA015	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA016 Valve Motor Actuator	30PEB40AA016	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor Heater, Train 4	30PEB40AH500	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor, Train 4	30PEB40AP001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AT002 Filter Motor Actuator	30PEB40AT002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Flow Indicator	30PEB40CF001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
UHS Tower Basin Level Indicator	30PEB40CL001	34URB01003	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Pressure Indicator	30PEB40CP002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Filter Diff Pressure Indicator	30PEB40CP003	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Thermocouple	30PEB40CT001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SW Pump Bldg Cooler Pressure Indicator	30PEB41CP501	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
~~ESW Pump Motor, Dedicated Train~~	~~30PEB80AP001~~	~~34UQB02001~~	~~M~~	~~M~~	~~SII~~	~~NS-AQ~~ ~~EMC~~	~~Y (5)~~ ~~Y (6)~~
30PED10 AA010 Valve Motor Actuator	30PED10AA010	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA011 Valve Motor Actuator	30PED10AA011	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA019 Valve Motor Actuator	30PED10AA019	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA021 Valve Motor Actuator	30PED10AA021	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AN001 Fan Motor	30PED10AN001	31URB03001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AN002 Fan Motor	30PED10AN002	31URB03002	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA010 Valve Motor Actuator	30PED20AA010	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA011 Valve Motor Actuator	30PED20AA011	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SAQ HX Outlet Temp Measurement	30PEB11/21/31/41 CT001	31UQB02001	M	M	ES SI	S 1E EMC	Y(5) Y(6)
SAQ HX DP Measurement	30PEB11/21/31/41 CP001	31UQB02001	M	M	ES SI	S 1E EMC	Y(5) Y(6)

ADD AS INDIVIDUAL COMPONENTS (& TOTAL)
ROOM LOCATIONS CHANGE 31/32/33/34

DRAFT

Question 09.02.01-38:

Follow-up to RAI 119, Question 9.2.1-12

The ESWS 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 GDC 45 requirements. The staff finds the design to be acceptable if the FSAR describes inspection program requirements that will be implemented and are considered to be adequate for this purpose. While Tier 2 FSAR Section 9.2.1.6 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 ESWS is adequately maintained over time were not described. Furthermore, the accessibility and periodic inspection of buried ESWS piping is of particular interest and needs to be addressed. 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.

Based on the staff's review of response to RAI 119, Question 9.2.1-12 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

a. Testing in accordance with ASME XI, IWA-5244, "Buried Components," needs to be addressed by the COL.

b. Based on past operating experiences, the applicant should consider implementing periodic inspections under maintenance programs for larger diameter buried pipe to ensure ongoing material condition. EPRI has a recommended program for buried piping which should be considered as a COL information item. This program is considered good practice to inspect the buried piping system in addition to the requirements of IWA-5244.

c. FSAR Tier 2 Section 9.2.1.6 "Testing and Inspections" for ESWS does NOT include pointers to the appropriate FSAR Sections for ISI, IST and Surveillance Testing that are present in 9.2.2.5. Section 9.2.1.5 only states "after the plant is brought into operation periodic inspections and tests of the ESWS components and subsystems are performed.

Response to Question 09.02.01-38:

Part (c):

U.S. EPR FSAR Tier 2 Section 9.2.1.6 "Testing and Inspections" for ESWS was revised in response to RAI 119, Question 9.2.1-13 to include pointers to the appropriate FSAR Sections for ISI, IST and Surveillance Testing. The following text was included:

"U.S. EPR FSAR Tier 2, Section 3.9 and Section 6.6 outline the inservice testing and inspection requirements. Refer to U.S. EPR FSAR Tier 2, Section 16.0, Surveillance Requirement (SR) 3.7.8 for surveillance requirements that verify continued operability of the ESWS."

DRAFT

FSAR Impact:

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

DRAFT

Question 09.02.01-43:

Follow-up to RAI 119, Question 9.2.1-19

The Bases for TS 3.7.8 (Page B 3.7.8-1) states that for an accident: "The pumps aligned to the critical loops are automatically started upon receipt of a safety injection signal, and all essential valves are aligned to their post accident position." However, no description of what the critical loops are or what valves must be realigned is provided in Tier 2 FSAR Section 9.2.1 or in the TS Bases. Therefore, the applicant needs to provide additional information in Tier 2 FSAR Section 9.2.1 to fully describe these design features and operating considerations.

Based on the staff's review of response to RAI 119, Question 9.2.1-19 and an audit by the staff conducted on October 27, 2009, this item remains open and requires further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the item remaining open.

> No response or FSAR markup was provided by the applicant with regard to identification of "essential valves that must be realigned to their post accident position." As previously identified, FSAR Tier 2 Section 9.2.1 does not presently include sufficient functional descriptions for several key system valves that automatically re-align in response to an accident or a pump start/ stop (e.g. AA005, AA010 etc.).

Response to Question 09.02.01-43:

The following valves receive a signal to automatically align to their post accident position (closed) upon receipt of a safety injection signal:

- ESWS normal blowdown isolation valves 30PEB10/20/30/40 AA016
- Cooling tower emergency blowdown system isolation valves 30PEB10/20/30/40 AA003
- Debris filter blowdown isolation valves 30PEB10/20/30/40 AA015
- ESWS cooling tower bypass isolation valves 30PED10/20/30/40 AA011
- ESWS normal makeup water isolation valves 30PED10/20/30/40 AA019
- ESWS pump recirculation isolation valves 30PEB10/20/30/40 AA002

The following valves receive a signal to automatically align to their post accident position (open) upon receipt of a safety injection signal:

- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005
- ESWS cooling tower return isolation valves 30PED10/20/30/40 AA010
- ESWS emergency makeup water isolation valves 30PED10/20/30/40 AA021

The following valves are automatically re-aligned in response to a pump start/stop:

- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 (open/closed)
- ESWS cooling tower return isolation valves, 30PED10/20/30/40 AA010 (open/closed)

Per Item 7.3 of U.S. EPR Tier 1, Table 2.7.11-3, these valves can perform the function listed in U.S. EPR Tier 1, Table 2.7.11-1 under system operating conditions, which includes safety injection.

DRAFT

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.1.7 will be revised as described in the response and indicated on the enclosed markup.

DRAFT

U.S. EPR FSAR Tier 2, Section 3.9 and Section 6.6 outline the inservice testing and inspection requirements. Refer to U.S. EPR FSAR Tier 2, Section 16.0, Surveillance Requirement (SR) 3.7.8 for surveillance requirements that verify continued operability of the ESWS.

Pursuant to the recommendations included in Generic Letter 89-13 (Reference 2), the design of safety-related portions of the ESWS considers the potential for capability and performance degradation and subsequent system failure due to siltation, erosion, corrosion, protective coating failure, and the presence of organisms that subject the system to microbiological influenced corrosion, as well as macro-fouling. A combination of design means, such as chemical treatment to reduce biological challenges; provisions to permit regular, periodic inspections, preventative maintenance, testing and performance trending; the use of best design practices for piping material selection and layout to minimize erosion and corrosion; and administrative controls in the form of operating, maintenance and emergency procedures, provide a level of assurance that the ESWS is able to perform its safety function when required.

Consistent with GL 89-13, design provisions of the ESWS accommodate performing the following:

- Identify and reduce the incidence of flow blockage problems caused from biofouling.
- Verify the heat transfer capability of safety-related heat exchangers connected to or cooled by the ESWS.
- Conduct routine inspection and maintenance activities of ESWS piping and components to provide assurance that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of safety-related systems supplied by ESW.

9.2.1.7 Instrumentation Requirements

Instrumentation is provided in order to control, monitor and maintain the safety-related and non-safety-related functions of the ESWS.

INSERT

9.2.1.7.1 System Monitoring

RAI 345
09.02.01-43

The ESWS system is monitored for the following parameters:

- Fluid flow rate and pressure downstream of the ESWS pumps and the dedicated ESWS pump.
- Differential pressure at the ESWS and the dedicated ESWS debris filters, CCWS HXs, and Essential Service Water Pump Building Ventilation System (SAQ) room cooler.

DRAFT

INSERT for RAI 345, Response 09.02.01-43

INSERT for Section 9.2.1.7

Upon receipt of a safety injection signal, the following valves will receive a signal to automatically align to their post accident position as indicated:

- ESWS normal blowdown isolation valves 30PEB10/20/30/40 AA016 (closed)
- Cooling tower emergency blowdown system isolation valves 30PEB10/20/30/40 AA003 (closed)
- Debris filter blowdown isolation valves 30PEB10/20/30/40 AA015 (closed)
- ESWS cooling tower bypass isolation valves 30PED10/20/30/40 AA011 (closed)
- ESWS normal makeup water isolation valves 30PED10/20/30/40 AA019 (closed)
- ESWS pump recirculation isolation valves 30PEB10/20/30/40 AA002 (closed)
- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 (open)
- ESWS return header tower isolation valves 30PED10/20/30/40 AA010 (open)
- ESWS emergency makeup water isolation valves 30PED10/20/30/40 AA021 (open)

The following valves are automatically re-aligned in response to a pump start/stop:

- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 (open/closed)
- ESWS return header isolation valves, 30PED10/20/30/40 AA010 (open/closed)

DRAFT

Request for Additional Information No. 406(4683, 4664, 4707), Revision 0

5/14/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
SRP Section: 09.04.01 - Control Room Area Ventilation System
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)
QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)
QUESTIONS for Balance of Plant Branch 1 (SBPA)

DRAFT

09.02.02-109

Follow-up to RAI 334, Question 9.2.2-61 and RAI 174, Question 9.2.2-12

In RAI 9.2.2-61 the staff identified a group of follow-up items in regard to CCWS design information that was found to be missing, inconsistent or inaccurate. Staff review of the applicant's response to 9.2.2-61 provided in RAI 334, Supplement 1, identified the follow-up Questions listed below.

Part (1): In the response to RAI 9.2.2-61 Part 1, the applicant noted that pipe sizes were identified on FSAR Tier 2, P&IDs Figures 9.2.2-1, 2, 3 and 4. While this response is acceptable, the staff noted that some pipe sizes were still missing from Figure 9.2.2-1 for: (1) normal surge tank makeup demineralized water and (2) emergency surge tank makeup water.

Part (3): In follow-up RAI 9.2.2-61 Part (3) the applicant was asked to provide detail design for I&C. In response the applicant stated that the CCWS control logic has been identified and referenced information provided in Section 9.2.2.6.1 "Control Features and Interlocks," which has been totally revised and reorganized in the FSAR markup provided with RAI 334, Supplement 1.

The staff's review of the markup of Section 9.2.2.6.1 identified the follow-up items listed below:

1. Page 9.2-43 of the markup proposes to add a new section entitled "CCWS Automatic I&C Safety-Related Functions." "Emergency Backup Switchover Sequence" addresses the case where "automatic" CCWS train switchover has failed this sequence implies that remote manual actions (from the control room) are needed to complete the switchover. The sequence should be revised in the FSAR to clearly state automatic actions and manual actions since it is confusing.

2. The FSAR should clearly explain the differences between the various types of common header switchovers that are described; (1) automatic, (2) emergency backup, (3) emergency, (4) normal and (5) semi-automatic. Similarly, on FSAR mark-up page 9.2-47 under "Normal Switchover Sequence" make it clear where the description "semi-automatic" applies.

3. Page 9.2-43 includes a description under "Emergency CCWS Temperature Control," that the bypass control valve closes when at a high temperature threshold of MAX 1. Describe if the valve goes fully closed at MAX1 or is stepped closed until MAX1 is cleared. This statement is confusing based on the staff's review of "CCWS Temperature Controls" on FSAR markup page 9.2-48. Also the last sentence states "this temperature control function is required during all plant modes of operation, except for SBO, when the CCWS (KAA10/20/30/40) is energized." Provide clarification of the SBO exception in the FSAR.

4. Page 9.2-44, "Emergency Leak Detection Sequence," third bullet from top states that if surge tank level continues to drop to less than MIN4 then the switchover sequence function is unlocked to allow supplying the common users by the "associated train". Clarify in the FSAR the basis for the restoration of flow to the common users, which were isolated at MIN3.

5. Page 9.2-45, "Thermal Barrier Isolation," the following clarifications are needed:

    a. Since both bullets list indications; the heading, "the following actions indicate" should be corrected.
    b. The statement about high radiation not performing an isolation conflicts with Section 9.2.2.6.1.5, "Additional Controls Features and Interlocks," (page 9.2-50) which states "only the RCP thermal barrier and CVCS HP cooler leaks results in automatic isolation of the failed user". This quote is described under "detection of increased radiation" bullet and should be clarified in the FSAR. Thermal barrier isolation is based on pressure or high flow only.
    c. Operating experiences with thermal barrier cracks indicate that among the various parameters utilized for early detection of cracks on the thermal barrier housing, the variation in exit temperature from the component cooling system water coil was the only one to be considered sufficiently representative and reliable. Describe in your FSAR the utilization of the CCWS temperature monitoring for the determination of degraded thermal barrier conditions and include any trip functions based on temperature rise in CCWS from the thermal barrier.

6. Page 9.2-46, fourth bullet lists valve AA015 twice and should be corrected in the FSAR.

7. Page 9.2-48, "CCWS Temperature Control," described the CCW Hx bypass valve control that during normal operation the CCW Hx bypass valve is stepped 'closed' when the heat exchanger outlet temperature reaches MAX1. Clarify in the FSAR the step increments of the valve (for example 10% increments) and what is the end position of the valve (full closed or is this a temperature setpoint).

DRAFT

Also describe in the FSAR if the bypass control valve is “manually positioned” in the field or manually positioned by the main control room operator in the control room on the control room display. While in “remote manual” describe in the FSAR if the automatic controls still function to control valve position based on control signals.

8. Page 9.2-49, “Dedicated CCWS Circuit Pressurization,” describe in the FSAR the means for preventing the nitrogen gas from entering the dedicated train piping system.

Part (4): In Part 4 of RAI 9.2.2-61 the applicant was asked to provide the detail design for valve positions. The applicant’s response included a list of CCWS valve responses to a safety injection. The staff noted the list of CCWS CCSs automatic system realignments that result from a safety injection signal (FSAR markup Page 9.2-44) needs to be considered for addition to the Tier 1 design description and ITAAC. This is references in SRP 14.3, Appendix C, page 14.3-26, paragraph V.I.

Part 6: In Part 6 the applicant was asked to simplify the 24 page CCWS functional arrangement drawing in Tier 1 (Figure 2.7.1-1). Accordingly the applicant provided a simplified version (11 pages) of Figure 2.7.1-1. The staff found the revised drawings were acceptable but noted that pipe transitions between ASME Class 2 and Class 3 need to be added as appropriate for the CCWS containment penetrations. This is based on SRP 14.3, Appendix C, page 14.3-35, “Figure Check List”. The applicant needs to correct the Tier 1 FSAR markup accordingly.

Part 7b: In Part 7(b) of RAI 9.2.2-12 the staff asked the applicant if the non-safety load hydraulic isolation valves operated in the same manner as the common header switchover valves described in FSAR Tier 2 Section 9.2.2.2. In response the applicant explained that the difference between the switchover valves and non-safety load isolation valves was in the actuation of the pilot valves. The switchover valve pilots are energized to open and bleed off the hydraulic fluid while the non-safety load isolation valve pilots are de-energized to open. The applicant also provided a markup of FSAR Tier 2 Section 9.2.2.2 consistent with this explanation. In follow-up RAI 9.2.2-61 Part 7b the staff asked the applicant to explain the reason for the difference. However, in response the applicant stated that details of the pilot valve operation are part of vendor supplied information and that the vendor will be provided with details of system operation along with I&C logic requirements for all hydraulic valves. The vendor is required to develop an appropriate pilot operating system. The applicant also provided a markup to remove the description previously added to FSAR Tier 2 Section 9.2.2.2 and stated that information would be added when available from the vendor.

Since the details of the pilot valve will be added to the FSAR at a later date all inaccurate information presently in the FSAR related to these pilot valves should be removed (FSAR markup page 9.2-27 to 28 presently describes pilot valve operation). Once this new information is available, Tier 1 ITAACs should be considered for proper valve performance and the pilot valves should be added to the Tier 2 failure mode and effects analyses table related to single failure. The staff will consider this an open item until this information is added to the FSAR and has been evaluated by the staff.

DRAFT

Response to Question 09.02.02-109:

Part (1): Normal surge tank makeup from Demineralized Water is through a 2" line. Refer to the Response to RAI 406, 9.2.2-112 for the discussion related to the removal of the emergency post-seismic makeup line.

Part (3):

1. The "Emergency Backup Switchover Sequence" is an Automatic Safety-Related Function as defined by 9.2.2.6.1.1 "CCWS Automatic I&C Safety-Related Functions". There are no manual operator actions from the MCR associated with this function.

   The statement in FSAR Section 9.2.2.6.1 on page 9.2-43 "Train backup switchover is performed if common 1.b (2.b) header is not isolated coincident with" means if a train is aligned to the common 1.b (2.b) header for common user cooling (common 1.b (2.b) switchover valves open) and any of the three indications listed are realized an automatic switchover is performed to provide cooling to the common header from the opposite train associated with the common header.

2. The following common header switchover sequences are defined for the CCWS:

   - Normal Switchover

     During normal plant and system operation, switchover of the common headers is periodically done by the plant operators to verify the Operability of the CCWS trains (system surveillances) and to equalize the run time of each CCWS pump. The normal switchover is a remote manual actuation from the MCR.

   - Automatic Backup Switchover

     The Automatic Backup Switchover Sequence functions to limit the loss of flow to Common 1.b (2.b) users in case of failure of a CCWS train supplying the Common 1.b (2.b) or Common 1.a and 1.b (2.a and 2.b) headers. This function confirms the supply of safety related loads (e.g. RCP Thermal Barrier) connected to the Common 1.b (2.b) header. This switchover function is an automatic function.

   - Semi-Automatic Switchover

     This is a sub-function of the Automatic Backup Switchover Sequence. During the Automatic Backup Switchover Sequence, the common header isolation valves for the "a" and "b" portions of the common header are automatically closed for the off-going CCWS train. The thermal inertia of the Spent Fuel Pool offers time to allow manual actuation. To re-establish cooling to the Fuel Pool Cooling System, the opening of the a header switchover valves is manually done from the MCR.

3. The CCWS heat exchanger bypass valve steps closed in 10% increments until MAX1 is cleared in "Normal" and "Emergency" CCWS temperature control.

   CCWS is not credited in SBO mitigation and is not backed by the SBO diesels; therefore the temperature control function is not required in SBO.

DRAFT

4. Associated train in this discussion relates to the opposite train that is capable of supplying the common header. Once MIN4 is reached, it is determined that the leak is in the main train portion of the system. Cooling of the common header from the other train can be restored.

5. a. FSAR page 9.2-45 will be revised to state: “A fault of an RCP Thermal Barrier is recognized by the following indications”

   b. Increased radiation in the CCWS does not actuate automatic isolation of the RCP thermal barriers. FSAR Section 9.2.2, page 9.2-45 states that RCP thermal barrier automatic isolation is based on high flow or high pressure indication. FSAR section 9.2.2.6.1.5 “Additional Control Features and Interlocks”, fourth bullet states that increasing radiation in the CCWS from the CVCS HP Coolers indicates leakage and triggers automatic isolation of the affected CVCS HP Cooler. The last sentence of the fourth bullet only states RCP thermal barrier and CVCS HP cooler leaks result in automatic isolation of the failed users. This sentence will be deleted from Section 9.2.2.6.1.5 for clarity.

   c. The return temperature from each RCP thermal barrier is continuously monitored in the MCR by temperature elements in the CCWS piping at the outlet of each thermal barrier. There are no automatic trip functions associated with high temperature readings on the outlet of the RCP thermal barriers. A high outlet temperature on a RCP thermal barrier will initiate an alarm in the MCR.

6. The correct valves for the fourth bullet are KAB50 AA001/004/006, KAB80 AA015/016/019.

7. The CCWS HX bypass valve is stepped closed in approximate 10% increments. The valve is stepped closed until MAX1 is cleared.

   The CCWS Hx bypass valve will be manually positioned by the operator in the main control room. The non-safety automatic controls will not be enabled while the valve is in the remote manual mode. Remote manual control can only occur if there is no automatic class-1E function operating on the valve. The automatic class 1E functions will override all other manual or automatic non-safety control functions.

8. The Dedicated CCWS tank is a diaphragm tank with a nitrogen fill connection for the nitrogen side of the diaphragm. A relief valve protects the expansion tank. A humidity sensor is installed in the nitrogen region of the diaphragm expansion tank. The DCS issues an alarm indicating a leaking diaphragm if humidity exceeds a pre-determined limit.

Part (4): A review of the CCWS confirmed the system response to a Safety Injection Signal. The system response will be added to FSAR Section 2.7.1 and Table 2.7.1-3.

Part (6): Pipe transitions between ASME Class 2 and Class 3 for the CCWS have been confirmed.

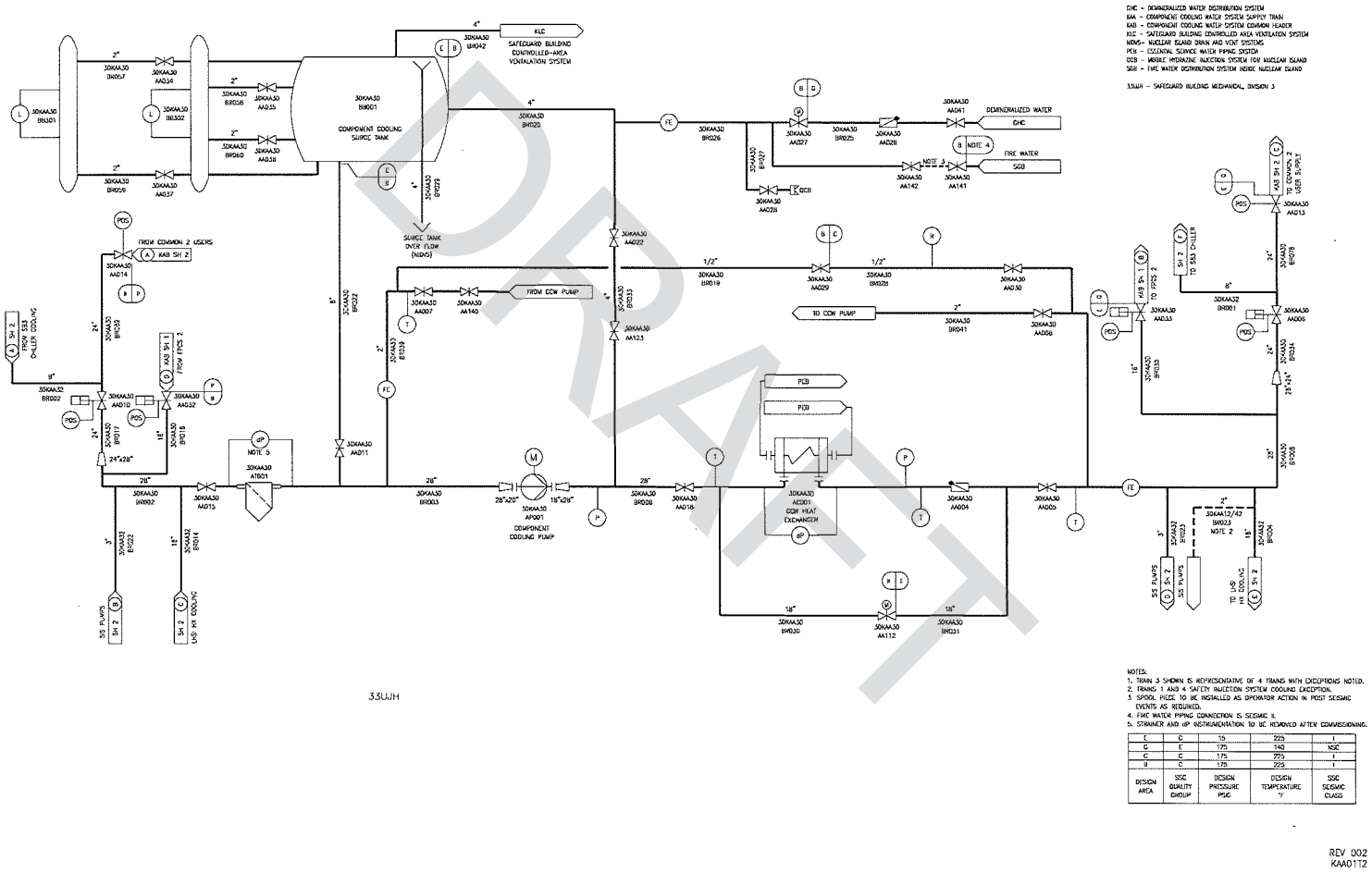
Part (7b): Refer to the Response to RAI 397, Question 9.2.2-107 for FSAR Tier 1 and Tier 2 markups related to hydraulic valve operation and pilot valve Class 1E redundant power supply.

FSAR Impact:

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

DRAFT

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



DRAFT

the LHSI HX. The CCWS trains 2 and 3 also provide cooling to the LHSI pump motor and seal water coolers.

During normal operations, one or two trains can be in operation in each pair of associated trains (trains 1 and 2 or trains 3 and 4) to cool the two common sets of users (common 1.b (2.b), with or without common 1.a (2.a)). Each of the common headers may be split so that one of the two associated trains is supplying the common 1.a (2.a) header and the other is supplying the common 1.b (2.b) header to enhance cooling efficacy of the cooling chain.

The common 1.a header provides cooling to the first FPCS train and the common 2.a header provides cooling to the second FPCS train. These are separated from the other operational loads (1.b and 2.b) that the CCWS supplies to maintain FPCS cooling capacity during maintenance or plant outages.

Each train in operation:

- Cools the fluid in a closed loop through the CCWS exchanger.
- Provides recirculation in the surge tank for CCW mixing.
- Cools the main auxiliary pumps coolers (SIS and CCWS pumps).
- Is continuously sampled for radioactivity leakage into the CCWS using the permanently installed radiation monitor.

For each of common headers (1 and 2), the associated safety-related trains are isolated from each other by the four switchover isolation valves located on the supply and return side of each common header sub-loop (a and b).

The permissive for the switchover valve of the on-coming CCWS train is by limit switch of the switchover valve of the off-going CCWS train. The switchover valve of the off-going train must signal "Closed" prior to the switchover valve of the on-coming train being allowed to open. Train separation of the redundant CCWS divisions is provided to confirm that a fault affects no more than one train. To achieve this, the switchover valves are interlocked. The following valve groupings cannot be simultaneously opened to prohibit more than one train from being connected to a common header:

- Common 1.A – 30KAA10AA032/033 with 30KAA20AA032/033.
- Common 2.A – 30KAA30AA032/033 with 30KAA40AA032/033.
- Common 1.B – 30KAA10AA006/010 with 30KAA20AA006/010.
- Common 2.B – 30KAA30AA006/010 with 30KAA40AA006/010.

DRAFT

FSAR Section 9.2.2.3.1 Insert for RAI 406; 9.2.2-109

The following common header switchover sequences are defined for the CCWS:

- Normal Switchover

  During normal plant and system operation, switchover of the common headers is periodically done by the plant operators to verify the Operability of the CCWS trains (system surveillances) and to equalize the run time of each CCWS pump. The normal switchover is a remote manual actuation from the MCR.

- Automatic Backup Switchover

  The Automatic Backup Switchover Sequence functions to limit the loss of flow to Common 1.b (2.b) users in case of failure of a CCWS train supplying the Common 1.b (2.b) or Common 1.a and 1.b (2.a and 2.b) headers. This function confirms the supply of safety related loads (e.g. RCP Thermal Barrier) connected to the Common 1.b (2.b) header. This switchover function is an automatic function.

DRAFT

During the normal switchover sequence and emergency backup switchover sequence, flow to all CCWS users on the common headers is momentarily degraded. The quick-closing hydraulically operated switchover valves are designed to close and open within 10 seconds. During the maximum allowed time for the closing and opening sequence (20 seconds), there is a potential for increased temperatures in the systems supplied with CCWS via the common headers. Systems that depend on CCWS cooling from the common headers are designed for transients caused by the switchover sequences.

Depending on the system user requirements, heat loads and flow rates, and depending upon the current plant operation, the CCWS can be configured with two, three or four trains in operation.

The following criterion drives CCWS operation with two, three or four trains:

- CCW temperature at the outlet of CCWS HX must be above the minimum required and below the maximum allowed.
- CCWS pump steady state operating flow must be between the minimum required and the maximum allowable.

For some users, the CCWS flow rate will be controlled automatically, while the others stay at fixed flow resistance during all operating conditions. Flow rates through CCWS users are adjusted once during plant commissioning with the most penalizing configuration (system flow balancing). After this, the minimum required user flow rate is always maintained whatever the plant operating condition. The system flow balance is reaffirmed regularly throughout the plant life during periodic surveillances. The expected cooling flow rate through system users, with fixed flow resistance, can reach approximately 140 percent of the required flow. Manual adjustments of flow balancing devices generally are not required during the normal plant operating cycle.

To make sure that the CCWS pump operates within the allowable range, system operation is limited. The allowed system configurations for a train are as follows:

- One train supplies only its associated SIS users (train-related LHSI HX and LHSI/ MHSI pumps).
- 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.

DRAFT

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.

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.

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

Hot Shutdown

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

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

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

Cool Down Procedure

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

Two LHSI trains are operating in the residual heat removal (RHR) mode and are removing residual heat from the RCS to the heat sink. The associated CCWS trains

DRAFT

Loss of one ESWS Train

CCWS Safety-Related Trains

In case of loss of one ESWS or CCWS train, an automatic switchover is performed to allow the cooling of the common headers using the available train. In case of a loss of an ESWS train, the corresponding CCWS train can be kept in operation supplying its safety users (SIS users) so long as the CCWS operating temperature is lower than 100.4°F, the maximum operating temperature for safety users.

Dedicated Train

The dedicated CCWS train is cooled by the dedicated ESWS train. In case of a loss of the dedicated ESWS train, the associated dedicated CCWS train is also lost.

Loss of a CCWS train

CCWS Safety-Related Trains

In case of loss of one CCWS train, a switchover is done to allow the cooling of the common a or b headers (or both) with the available train.

Dedicated Train

In case of a loss of the dedicated CCWS train, the entire SAHRS cooling chain is lost.

Active Failure

CCWS Safety-Related Trains

In case of loss of a CCWS pump, a switchover is done to allow for cooling of the common a or b headers (or both) with the available train.

Dedicated Train

In the event of the loss of the dedicated CCWS pump, the train is lost. If the makeup pump is lost, water makeup from the DWDS is also lost. With a water leak within the dedicated CCWS train, a low level will eventually be reached in the tank and the tank will be automatically isolated. The main dedicated CCWS pump is then tripped, leaving the train unavailable.

CCWS Protection Against RCS Dilution

Tube Rupture Inside RHR Heat Exchanger

When the LHSI is not operating in the RHR mode, an HX failure causes a leak from the CCWS to the SIS. The following protections have been designed to avoid RCS dilution:

DRAFT

9.2.2.6.1.1 CCWS Automatic I&C Safety-Related Functions

Emergency Backup Switchover Sequence

Train backup switchover is performed if common 1.b (2.b) header is not isolated coincident with:

- Loss of CCWS pump (KAA10/20/30/40 AP001).
- Loss of one ESWS train (PEB10/20/30/40 AP001).
- Low flow rate to system users.

Train backup switchover limits loss of flow to common 1.b (2.b) users in case of failure of a train supplying the common 1.b (2.b) or common 1.a and 1.b (2.a and 2.b) headers.

Train backup switchover consists of:

- Close switchover valves (KAA10/20/30/40 AA006/010) on the initial train and open LHSI heat exchanger isolation valve (KAA12/22/32/42 AA005).
- Open common 1.b (2.b) switchover valves (KAA10/20/30/40 AA006/010) on the on-coming train.
- Start CCWS pump (KAA10/20/30/40 AP001) on the on-coming train.

The on-coming train common .a sub-header switchover valve may then be manually opened.

Emergency CCWS Temperature Control

An open CCWS heat exchanger bypass line can cause CCWS temperature to be greater than 100.4°F.

To prevent this condition, the bypass control valve of the CCWS heat exchanger (KAA10 AA112) is automatically closed when the heat exchanger outlet is near the high temperature threshold (MAX1).

This temperature control function is required during all plant modes of operation, except for SBO, when the CCWS (KAA10/20/30/40) is energized.

Emergency Leak Detection Sequence

Leakage can occur in a CCWS train, which leads to a loss of system fluid and consequently in a drop in the CCWS level in the corresponding surge tank.

The following leakage detection sequence is initiated when the surge tank level is less than the MIN2 set point:

DRAFT

- The common user emergency and normal switchover sequence is inhibited to avoid the transfer of the faulted piping on the associated train. The non-safety-related branches are isolated by fast closing valves if there is a flow mismatch between the inlet and outlet of the users supply and return lines.

- If the surge tank level continues to decrease to less than the MIN3 setpoint, the common headers are isolated by closure of the switchover valves (KAA10/20/30/40 AA006/010/032/033) and the switchover sequence is prohibited.

- If the surge tank level continues to decrease to less than MIN4 set point, the common user sets switchover sequence function is unlocked to allow supplying of the common users by the associated train. The DWDS supply isolation valve (KAA10/20/30/40 AA027) is also closed in order to avoid DW water supply to a train with a leak.

The surge tank level is detected by two redundant analog level measurements.

CCWS Actuation from Safety Injection Signal

Upon receipt of a safety injection signal, the four CCWS trains are started, supplying all SIS pump coolers and the four LHSI heat exchangers. The non-safety-related users outside of the RB are also isolated.

The system response optimizes the CCWS to cool the SIS pumps and LHSI heat exchangers. The following CCWS actuations are automatically initiated:

- Start CCWS pumps (KAA10/20/30/40 AP001), if not previously running.

- Open LHSI HX isolation valves (KAA12/22/32/42 AA005).

- Open LHSI pump seal cooler isolation valves (KAA22/32 AA013).

- Close isolation valves for non-safety related users outside of RB (KAB50 AA001/004/006 & KAB80 AA015/016/019).

Simultaneous operation of LHSI heat exchanger isolation valves (opening) and non-safety-related user isolation valves (closing) maintains pump operation in a safe range.

CCWS Operation from Containment Isolation Stage 1

Upon receipt of a containment isolation stage 1 signal, CONT HVAC and NI DVS users in the RB are isolated via closure of KAB40 AA001/006/012.

This system response isolates these users, confirms the containment isolation function is met, and allows a maximum cooling flow rate through the LHSI heat exchanger in the event of a coincident safety injection signal.

DRAFT

CCWS Operation from Containment Isolation Stage 2

Upon receipt of a containment isolation stage 2 signal, the RCP and CVCS loads inside the RB are isolated (not including the RCP thermal barriers) via closure of KAB60/70 AA013/018/019.

CCWS Response to a LOOP

In case of LOOP, operating CCWS trains are de-energized. Previously operating CCWS trains return to operation according to the EDG load sequencing and standby trains remain idle, unless other start signals are received during EDG load sequencing.

CCWS Switchover Valve Interlock

Train separation of redundant CCWS divisions confirms that a fault affects no more than one train via a switchover valve interlock. To prohibit more than one train from being connected to a common header, the following groupings of valves cannot be simultaneously opened:

- Common 1.a – KAA10AA032/033 with KAA20AA032/033.
- Common 2.a – KAA30AA032/033 with KAA40AA032/033.
- Common 1.b – KAA10AA006/010 and KAA20AA006/010.
- Common 2.b – KAA30AA006/010 and KAA40AA006/010.

Thermal Barrier Isolation

The following actions indicate a fault of a RCP thermal barrier:

- A high flow above a threshold value measured with a flow element in the CCWS piping on the return from each RCP thermal barrier.
- A high pressure above a threshold value measured with a pressure sensor in the RCS piping on the return from each RCP thermal barrier.

Isolation valves at inlet (JEB10/20/30/40 AA021) and outlet (JEB10/20/30/40 AA003) of each RCP thermal barrier (as shown in Figure 5.1-4) are used to automatically isolate the faulted thermal barrier from the CCWS. High radiation in the CCWS does not initiate automatic isolation of CCWS cooling to the RCP thermal barriers. Isolation of faulted RCP thermal barrier only affects that RCP; it does not affect the CCWS cooling of the other three RCP thermal barriers or thermal barrier cross tie.

CCWS Containment Isolation Valve Interlock

Either the common 1.b or 2.b headers can provide cooling to the RCP thermal barriers. To maintain strict train separation of the redundant CCWS division supplying either

DRAFT

common header to confirm that a fault affects no more than one train, the CIVs (KAB30 AA049/051/052/053/055/056) are interlocked. The CCWS CIVs from the common 1.b header (KAB30 AA049/051/052) must be closed prior to opening the CIVs from the common 2.b header (KAB30 AA053/055/056), and vice versa.

Switchover Valves Leakage or Failure

In the event of a switchover valve seat leakage or failure and depending upon the difference in pressure between the two CCWS trains, a water transfer can occur. If the water transfer leads to a MAX2 in one of the two associated trains and MIN3 on the other, the common users are automatically isolated from the safety trains.

9.2.2.6.1.2 CCWS Manual I&C Safety-Related Functions

CCWS Manual Control

Safety-related manual controls are provided for the operators in the MCR as a backup to the SR system automation. Manual control capabilities are provided in the MCR for the following CCWS components:

- CCWS pump (30KAA10/20/30/40 AP001).
- CCWS switchover valves (30KAA10/20/30/40 AA006/010/032/033).
- CCWS heat exchanger bypass valve (KAA10/20/30/40 AA112).
- Non-safety-related branch Isolation valves (KAB50 AA001/004/006, KAB80 AA015/015/019).
- CIVs.

CCWS Common 1.a (2.a) Manual Supply

When the common 1.b (2.b) header supply is automatically transferred to the common header associated CCWS train via the emergency switchover sequence, the common 1.a (2.a) header is also isolated and no automation is foreseen to switchover the common 1.a (2.a) header. To re-establish cooling of the FPCS, the opening of switchover valves (KAA10/20/30/40 AA032/033) is performed in the MCR.

9.2.2.6.1.3 CCWS Non-Safety-Related Functions

Normal Switchover Sequence

During normal plant operation, switchover of the common headers is periodically done by the plant operators to confirm operability of CCWS trains (system surveillances) and equalize run time of each CCWS pump.

DRAFT

This action is normally done when only one train is in operation on a pair of two associated trains. In the semi-automatic normal switchover sequence, all the parameters which can be checked before the actuation of the valves are done to increase the reliability of the sequence.

This switchover consists of the following sequential actions:

- Start ESWS pump (PEB10/20/30/40 AP001).
- Start CCWS pump (KAA10/20/30/40 AP001).
- Open LHSI heat exchanger isolation valve on the on-coming train as mini flow line (KAA12/22/32/42 AA005).
- Close switchover valves (KAA10/20/30/40 AA006/010/032/033) on the off-going train and open of the train associated LHSI heat exchanger isolation valve (KAA12/22/32/42 AA005).
- Open switchover valves (KAA10/20/30/40 AA006/010/032/033) on the on-coming train.

Unavailability of a CCWS train (low level on the surge tank, loss of pump) inhibits the common user switchover to this train.

In case of a failure to close of a switchover valve on the initial train or lack of opening of a switchover valves on the final train, another switchover is automatically done to the initial configuration. Refer to Section 7.6.1.2.3 for a more detailed description.

CCWS Surge Tank Makeup

A CCWS train can operate as long as the water level in the CCWS surge tank is maintained between the MIN1 and MAX1 levels. This non-safety-related function maintains the CCWS surge tank level within design limits during normal plant operation.

Small CCWS leakage is compensated for with demineralized water via operation of the DWDS supply isolation valve (KAA10/20/30/40 AA027):

- When the surge tank water level lowers to the MIN1 level, the DWDS supply isolation valve (KAA10/20/30/40 AA027) is automatically opened.
- When the surge tank water level reaches the MAX1 level, the DWDS supply isolation valve is automatically closed.

RCP Thermal Barrier Cooling Transfer

Either the common 1.b or 2.b headers can provide cooling to the RCP thermal barriers. Because of the valve interlock associated with the supply of cooling to these loads and

DRAFT

the short duration desired to have cooling flow isolated, a group command is provided. The RCP thermal barrier cooling transfer consists of closing the open group of CIVs (KAB30 AA049/051/052, common 1.b or KAB30 AA053/055/056, common 2.b) and as soon as all valves indicate closure, the other group of CIVs (KAB30 AA049/051/052, common 1.b or KAB30 AA053/055/056, common 2.b) are opened.

In case a CIV fails to close on the initial common header or lack of valve opening of a CIV on the final header, another transfer is automatically performed back to the initial configuration.

In the event that one CCWS train is inoperable, RCP thermal barrier cooling is aligned to the CCWS common header that is supported by two operable CCWS trains within 72 hours per Chapter 16, Technical Specification 3.7.7.

CCWS Temperature Control

Normally, the CCWS heat exchanger bypass control valve (KAA10/20/30/40 AA112) is manually positioned in order to maintain a CCWS normal temperature greater than 59°F and less than 100.4°F. An alarm is relayed to the operator in the MCR when the temperature is near the MIN2 or MAX2 temperature limit.

To avoid a CCWS temperature less than 59°F, the bypass control valve of the CCWS heat exchanger (KAA10 AA112) is automatically stepped opened when the heat exchanger outlet is near the low temperature threshold (MIN1). The valve is stepped open in 10 percent increments every one minute until the temperature measured at the heat exchanger outlet is above the threshold value or the bypass valve is fully open.

During normal plant operation, an open CCWS heat exchanger bypass line can cause CCWS temperature to be greater than 100.4°F. To prevent this condition, the bypass control valve of the CCWS heat exchanger (KAA10 AA112) is automatically stepped closed when the heat exchanger outlet is near the high temperature threshold (MAX1).

Manual Start and Trip of a Train

During normal operation, the CCWS trains are started to align the CCWS configuration to meet the operational needs of the plant.

When the pump is shutdown, the LHSI heat exchanger isolation valve (KAA12/22/32/42 AA005) is closed after a time delay to avoid risks of leakage from a CCWS train through the corresponding SIS train.

Dedicated CCWS Control

The dedicated CCWS train is manually actuated from the MCR when needed during severe accident conditions. Control is provided for the follow components:

DRAFT

FSAR Section 9.2.2.6.1.3 Insert for RAI 406; 9.2.2-109

The non-safety automatic controls will not be enabled while the valve is in the remote manual mode. Remote manual control can only occur if there is no automatic class-1E function operating on the valve. The automatic class 1E functions will override all other manual or automatic non-safety control functions.

DRAFT

9.2.2.6.1.4 CCWS Pump Control, Protection and Monitoring

High Bearings Temperatures

An alarm is relayed to the operator in the MCR when the pump bearing temperature or the motor bearing temperature is near the first threshold value. The second threshold value trips the pump.

High Windings Temperatures

An alarm is relayed to the operator in the MCR when the motor stator windings temperature is near the first threshold value. The second threshold value trips the pump.

9.2.2.6.1.5 Additional Control Features and Interlocks

- Each CCWS pump is interlocked with its associated LHSI/RHR HX supply valve so that when the pump is stopped the supply valve closes, following a delay to allow for pump coast down. This action prevents potential leakage of the CCWS into the SIS train.

- In the event of a pump low flow condition, the associated LHSI HX isolation valve automatically opens to provide a minimum flow path for CCWS pump protection. In the event of a pump high flow condition, the FPCS HX outlet flow control valve is closed to its minimum opening mechanical stop position to reduce the CCWS flow rate and to maintain normal pump operation.

- The CCWS surge tanks are instrumented with level indication and graduated level control and equipment protection set points designated from lowest to highest level (MIN4, MIN3, MIN2, MIN1, MAX1, MAX2, MAX3 and MAX4). A CCWS train can operate continuously so long as the water level in its surge tank is maintained between MIN1 and MAX1.

- Detection of increasing radiation in the CCWS from the CVCS HP coolers indicates leakage and triggers automatic isolation of the affected CVCS HP cooler via motor-operated valves (KBA11/12 AA001/003) in the CVCS. Leakage of reactor coolant into the CCWS from such users as the LHSI HXs is also indicated by increasing radiation in the CCWS and prompts isolation of the user. Only the RCP thermal barrier and CVCS HP cooler leaks result in automatic isolation of the failed users.

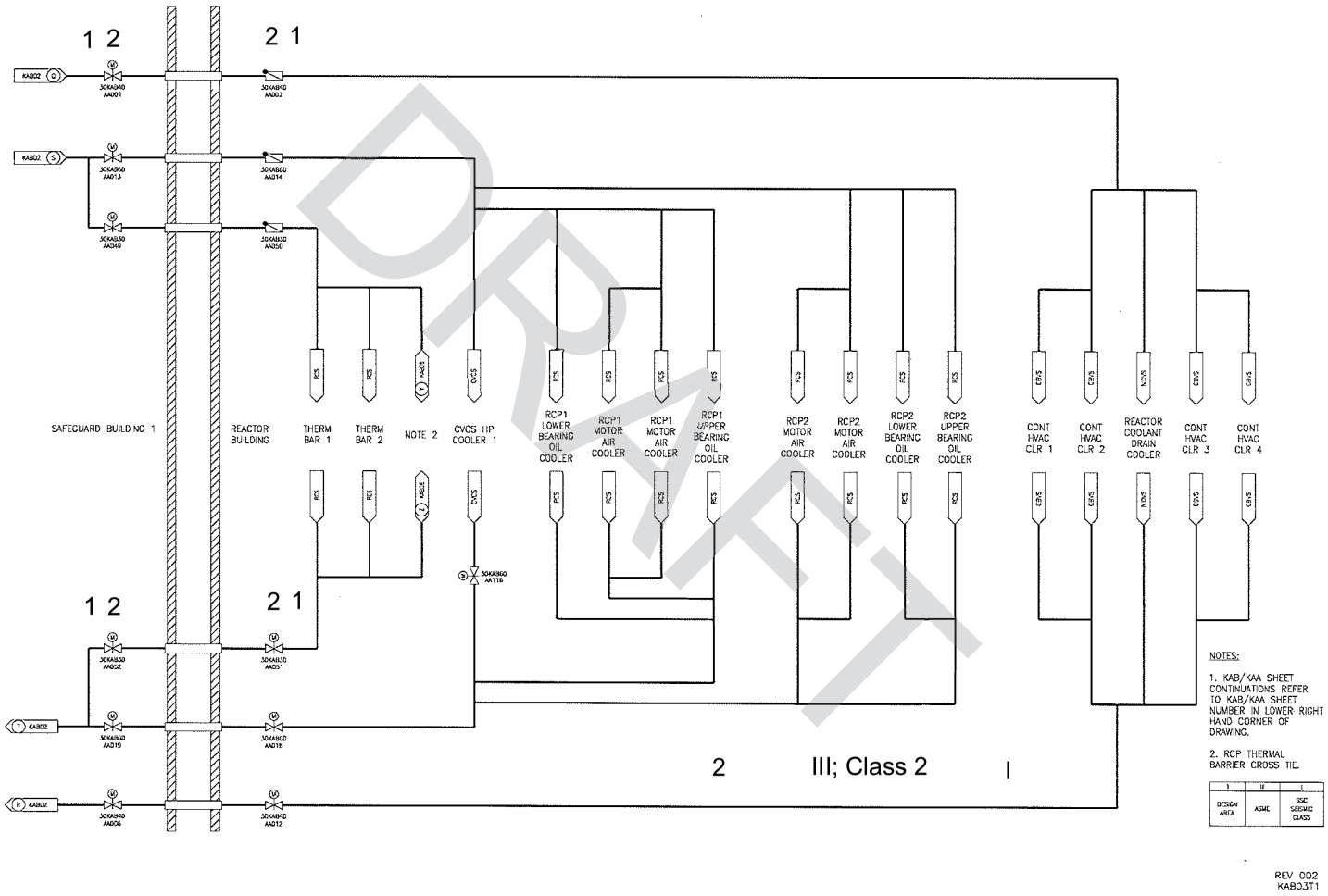
9.2.2.7 References

1. ASME Boiler and Pressure Vessel Code, Section III: "Rules for Construction of Nuclear Facility Components," Class 2 and 3 Components, The American Society of Mechanical Engineers, 2004.

2. ANSI/ASME B31.1-2004, "Power Piping," The American Society of Mechanical Engineers, 2004.

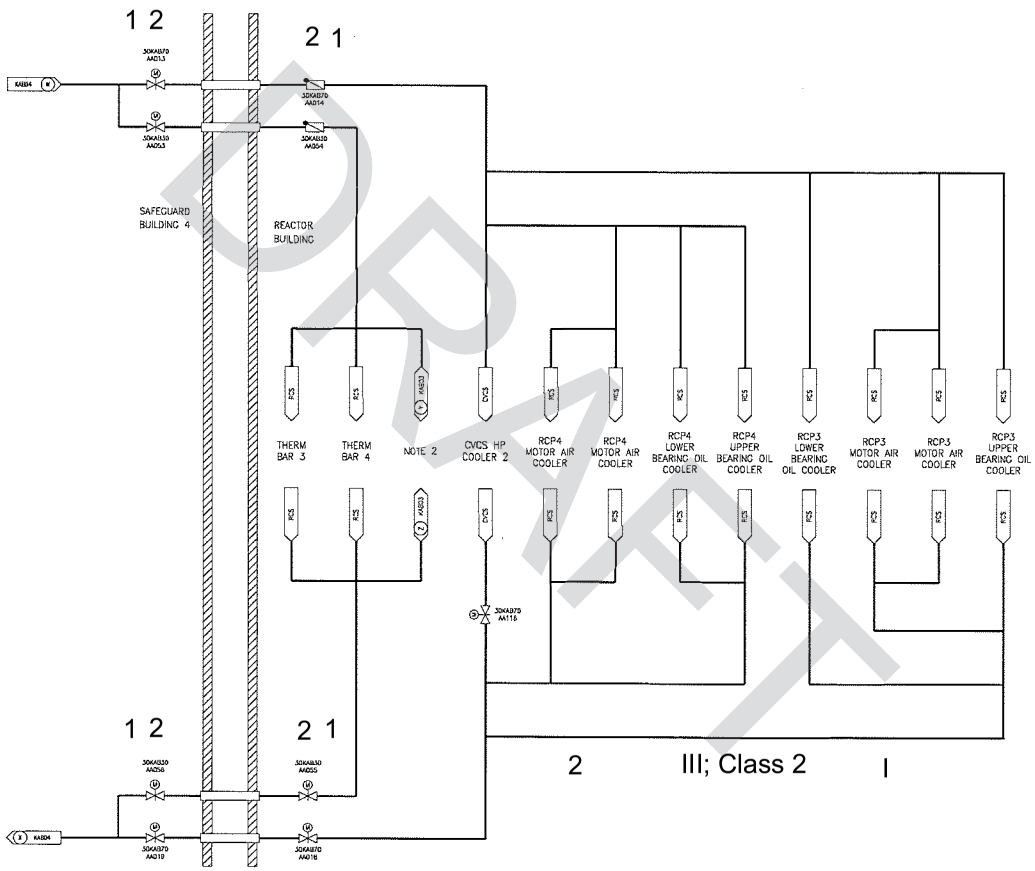
DRAFT

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
Sheet 7 of 11



DRAFT

Figure 2.7.1-1—Component Cooling Water System Functional Arrangement
Sheet 10 of 11



NOTES:

1. KAB/KAA SHEET CONTINUATIONS REFER TO KAB/KAA SHEET NUMBER IN LOWER RIGHT HAND CORNER OF DRAWING.

2. RCP THERMAL BARRIER CROSS TIE.

I	II	I
DESIGN AREA	ASME	SSE SEISMIC CLASS

REV 002
KAB06T1

DRAFT

4.0 I&C Design Features, Displays and Controls

4.1 Displays listed in Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.7.1-2.

4.2 The CCWS equipment controls are provided in the MCR and the RSS as listed in Table 2.7.1-2.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.7.1-2 responds to the state requested by a test signal.

4.4 A CCWS low flow condition automatically opens the low head safety injection (LHSI)/residual heat removal (RHR) heat exchanger (HX) inlet valve.

4.5 A surge tank level of MIN3 automatically isolates the associated train common header switchover valves.

4.6 ~~A surge tank level of MIN4 automatically trips the associated CCWS pump~~Deleted.

4.7 A flowrate difference between the supply and return from the Nuclear Auxiliary Building (NAB) and the Radioactive Waste Building (RWB) automatically isolates the non-safety-related branch.

4.8 Loss of one CCWS train initiates an automatic switchover to allow cooling of the common 'a' and/or 'b' headers.

4.9 Deleted.

4.10 CCWS train separation to RCP thermal barriers is maintained by interlocks provided on the supply and return thermal barrier containment isolation valves. The interlocks require that CIVs associated with one common header be closed before the other common header CIVs can be opened.

5.0 Electrical Power Design Features

5.1 The components designated as Class 1E in Table 2.7.1-2 are powered from the Class 1E division as listed in Table 2.7.1-2 in a normal or alternate feed condition.

5.2 Valves listed in Table 2.7.1-2 fail as-is on loss of power.

6.0 Environmental Qualifications

6.1 Components in Table 2.7.1-2, that are designated as harsh environment, will perform the function listed in Table 2.7.1-1 in the environments that exist during and following design basis events.~~Electrical drivers for equipment listed in Table 2.7.1-2 for harsh environment can perform the safety function in Table 2.7.1-1 following exposure to the design basis environments for the time required.~~

DRAFT

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

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.6	Deleted.~~A surge tank level of MIN4 automatically trips the associated CCWS pump.~~	~~Tests will be performed using test signals to verify the interlock.~~Deleted.	Deleted.~~The following interlock responds as specified below when activated by a test signal:~~ ~~Surge tank level of MIN4 automatically trips the associated CCWS pump.~~
4.7	A flow rate difference between the supply and return from NAB and RWB automatically isolates the non-safety related branch.	Tests will be performed using test signals to verify the interlock.	The following interlock responds as specified below when activated by a test signal: Flow rate difference between the supply and return from NAB and RWB automatically isolates the non-safety related branch.
4.8	Loss of one CCWS train initiates an automatic switchover to allow cooling of the common "a" and/or "b" headers.	Tests will be performed using test signals to verify the interlock.	The following interlock responds as specified below when activated by a test signal: Loss of one CCWS train automatically initiates a switchover to allow cooling of the common "a" and/or "b" headers.
4.9	Deleted.	Deleted.	Deleted.
4.10	CCWS train separation to RCP thermal barriers is maintained by interlocks provided on the supply and return thermal barrier containment isolation valves. The interlocks require that CIVs associated with one common header be closed before the other common header CIVs can be opened.	Tests will be performed using test signals to verify the interlocks.	The following interlock responds as specified below when activated by a test signal: Thermal barrier CIVs associated with common header 1 fail to open while CIVs associated with common header 2 are opened and vice versa. Thermal barrier CIVs associated with common header 1 open when CIVs associated with common header 2 are closed and vice versa.

DRAFT

FSAR Section 2.7.1 Insert A for RAI 406; 9.2.2-109 Part (4)

4.12 Upon receipt of a Safety Injection Signal, the four CCWS trains are started, supplying all SIS pump coolers and the four LHSI heat exchangers. The Non-Safety related users outside of the reactor building are also isolated. The following CCWS actuations are automatically initiated:

- Start CCWS pumps (KAA10/20/30/40 AP001), if not previously running
- Open LHSI HX isolation valves (KAA12/22/32/43 AA005)
- Open LHSI pump seal cooler isolation valves (KAA22/32 AA013)
- Close isolation valves for Non-Safety related users outside of reactor building (KAB50 AA001/004/0006 and KAB80 AA015/016/019)

FSAR Table 2.7.1-3 Insert B for RAI 406; 9.2.2-109 Part (4)

Commitment Wording	Inspections, Tests, Analysis	Acceptance Criteria
Upon receipt of a Safety Injection Signal the following CCWS actuations are automatically initiated: • Start CCWS pumps (KAA10/20/30/40 AP001), if not previously running • Open LHSI HX isolation valves (KAA12/22/32/43 AA005) • Open LHSI pump seal cooler isolation valves (KAA22/32 AA013) • Close isolation valves for Non-Safety related users outside of reactor building (KAB50 AA001/004/0006 and KAB80 AA015/016/019)	A test will be performed using test signals.	The following components respond as specified below when activated by a Safety Injection test signal: • CCWS pumps (KAA10/20/30/40 AP001) start (if not previously running) • LHSI HX isolation valves (KAA12/22/32/43 AA005) open • LHSI pump seal cooler isolation valves (KAA22/32 AA013) open • Isolation valves for Non-Safety related users outside of reactor building (KAB50 AA001/004/0006 and KAB80 AA015/016/019) close

DRAFT