ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Thursday, October 21, 2010 9:56 AM
To: Tesfaye, Getachew
Cc: Hearn, Peter; KOWALSKI David (AREVA)
Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Attachments: Blank Bkgrd.gif; DRAFT RESPONSE RAI 351 Q.09.02.05-32.pdf; DRAFT FSAR Changes RAI 351 Q.09.02.05-31(a+b).pdf; DRAFT FSAR Markup RAI 351 Q.09.02.05-32.pdf; DRAFT RESPONSE RAI 351 Q.09.02.05-31(a+b).pdf

Importance: High

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 (RS/NB)
Sent: Thursday, October 21, 2010 9:19 AM
To: BRYAN Martin (External RS/NB)
Cc: BALLARD Bob (EP/PE); HUDDLESTON Stephen (EP/PE); BRYANT Chad (EP/PE); EDWARDS Harold (EP/PE); HARTSELL Jody (EP/PE); GARDNER Darrell (RS/NB); MCINTYRE Brian (RS/NB); SLOAN Sandra (RS/NB)
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 351 questions. These responses will be discussed at today's (10/21/10) FSAR Chapter 9 Weekly Telecon/GoToMeeting with the NRC.

Attached are the following DRAFT response(s):

- Response to RAI 351 - Question 09.02.05-31 (a+b) and supporting FSAR changes.
- NOTE: Response to Part (b) has been revised to reflect previous NRC comments - Response to Part (a) is also included but has previously been accepted.
- Response to RAI 351 - Question 09.02.05-32 and supporting FSAR changes.

Note that these DRAFT responses have not been through the final Licensing review/approval process; nor do they 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
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Created By: Martin.Bryan.ext@areva.com

Recipients:
"Hearn, Peter" <Peter.Hearn@nrc.gov>
Tracking Status: None
"KOWALSKI David (AREVA)" <David.Kowalski@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

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Response to

Request for Additional Information No. 351(4112, 4163), Revision 1

01/15/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.05 - Ultimate Heat Sink
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

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

DRAFT

Question 09.02.05-32:

Follow-up to RAI 176, Question 14.2.94:

Final Safety Analysis Report (FSAR) Tier 2 Section 14.2.12.5.8 describes initial test for the UHS (Test #049). The NRC staff identified the following issues with test abstract #049:

1. Section 14.2.12.5.8.4.1, “Data Required,” includes “UHS makeup, blowdown air flowrates.” Blowdown air flowrates are not described in the FSAR. Please clarify what is meant by blowdown air flowrates.
2. The following design features and functions identified in Section 9.2.5 of the EPR FSAR are not included in test abstract #049. Please revise the abstract to include the following tests or justify their exclusion:
    a. Confirmation that “normal and emergency” makeup flowrate meets design flow
    b. Confirmation that chemical injection meets design flow
    c. Confirmation that cooling tower fan performance at various speeds (including the reverse direction for cold weather deicing purposes) is satisfactory
    d. Confirmation that the cooling tower flow bypass functions properly (also for cold weather protection)

Based on the staff’s review of the applicant's response to RAI 14.2.94 (ID1833/7333) AREVA #176, the following were determined as unresolved and needed further clarification/resolution by the applicant.

In Item 2.c, the staff requested that the applicant expand FSAR Tier 2 Chapter 14.2, Pre Operational Test 049, Paragraph 3.1, to confirm the capability of the cooling tower fans to operate in all speeds, including the reverse direction. This will demonstrate fan functionality in all operating modes prior to plant operation, and Technical Specification Surveillance 3.7.19.3 will provide continued assurance of fan operability after the initial test program has been completed. In response to this RAI, Paragraph 3.1.2 was added to Test #049 to verify fan operation in reverse, but fan testing to confirm functionality in the forward speeds was not included. The applicant needs to address functionality testing in the forward speeds in Test #049.

Additionally, based upon further review, the staff also determined that confirmation of cooling tower performance during the power ascension test program is necessary. A substantial heat load is needed to adequately confirm that the cooling tower heat removal and water usage rates satisfy design basis considerations. Consequently, UHS cooling tower performance testing should be completed during the power ascension test program. Design-basis conditions should be simulated to the extent possible and the actual cooling tower water usage and heat removal rates should be monitored, extrapolated, and analyzed as necessary to confirm satisfactory performance. This will also serve to establish a benchmark that can be used for periodically assessing performance and determining when actions are needed to address degraded conditions. Therefore, a test procedure needs to be developed and included in FSAR Tier 2, Chapter 14 for testing performance of the UHS cooling towers during the power ascension test program consistent with the guidance provided by Regulatory Guide 1.68, “Initial Test Programs for Water-Cooled Nuclear Power Plants,” Appendix A, Items 1.f and 5.x.

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Response to Question 09.02.05-32:

Item (3)

Tier 2 Section 14.2.12.5.5 will be revised to include performance testing of the UHS during a normal cooldown condition in hot functional testing, as described in Insert 1. The performance test would place one train of RHR into service when the RCS temperature is within the upper RHR operating band. Each train of the cooling chain, including the UHS, would be employed and the thermal-hydraulic performance would be monitored. Cooling chain performance would be determined by extrapolating test data using design data. Conducting the performance test during a cooldown in hot functional testing is recommend because the most significant heat load on the UHS can be provided during this time.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 14.2.12.5.5 will be revised as described in the response and indicated on the enclosed markup.

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Insert 1

1.4 To demonstrate the ability of the CCWS in conjunction with the RHR system, ESW system and the UHS to perform a plant cooldown during hot functional testing. Testing will be performed on each safety related cooling chain trains.

Insert 2

2.5 A thermal hydraulic model of the safety related cooling chain (RHR, CCW, ESW, and UHS) is available to analyze data from the cooldown. The data will have to be extrapolated to design conditions in order to determine system performance.

Insert 3

3.37 [Added in response to RAI 406 Question 114]

3.38 [Added in response to RAI 406 Question 114]

3.39 Ensure that all available loads are placed on the safety related cooling chain train that is to be tested.

3.40 Perform a cooldown test of the safety related cooling chain by placing the RHR system into service at the upper limit of operation.

3.41 Perform a cooldown test while operating all four RCPs and minimizing steam generator cooling.

3.42 Ensure UHS make-up water flow and blowdown flows are isolated.

3.43 Collect the following cooldown data:

3.43.2 RHR heat exchanger.

- RHR flow through the heat exchanger.
- CCW flow through the heat exchanger.
- Inlet and outlet RHR temperature.
- Inlet and outlet CCW temperature on the RHR heat exchanger.
- RHR pressure
- CCW pressure

3.43.3 CCW heat exchanger.

- CCW flow through the heat exchanger.
- ESW flow through the heat exchanger.
- Inlet and outlet CCW temperature.
- Inlet and outlet ESW temperature on the CCW heat exchanger.
- CCW pressure
- ESW pressure

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3.43.4 UHS performance data

3.44 Analyze the cooldown data using the thermal-hydraulic model at multiple operating points.

3.45 Perform step 3.39 through 3.44 for each cooling chain train.

Insert 4

4.9 RHR, CCW, ESW, and UHS thermal-hydraulic performance data.

Insert 5

5.1.9 Verify the ability of the CCWS in conjunction with the RHRS, ESWS, and UHS to perform a plant cooldown during hot functional testing.

5.1.9.1 Using performance data from the cooldown determine that the RHR heat exchanger meets design requirements or verify by inspection that the RHR heat exchanger is free from blockage and fouling.

5.1.9.2 Using performance data from the cooldown determine that the CCW heat exchanger meets design requirements or verify by inspection that the CCW heat exchanger is free from blockage and fouling.

5.1.9.3 Using performance data from the cooldown determine that the UHS meets design requirements or verify by inspection that the UHS is free from blockage.

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Table 2.7.11-1—Essential Service Water System Equipment Mechanical Design (6 Sheets)

Description	Tag Number [1]	Location	ASME Code Section III	Function	Seismic Category
Isolation Valve Dnstr KAA80AC001	30PEB80AA004	ESW Dedicated Division Safeguard 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

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

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The UHS operates for a nominal 30 days following a loss of coolant accident (LOCA) without requiring any makeup water to the source or demonstrates that replenishment or use of an alternate or additional water supply can be effected to ensure continuous capability of the sink to perform its safety-related functions.

9.2.5.2 System Description

The UHS consists of four separate, redundant, safety-related divisions. Also included is one dedicated non-safety-related division which is located in division 4. Each safety-related UHS division consists of one mechanical draft cooling tower with two fans, piping, valves, controls and instrumentation. System design parameters are listed on Table 9.2.5-2. The system is shown in Figure 9.2.5-1—Ultimate Heat Sink Piping and Instrumentation Diagram.

A COL applicant that references the U.S. EPR design certification will provide site-specific information for the UHS support systems such as makeup water, blowdown and chemical treatment (to control biofouling).

A COL applicant that references the U.S. EPR design certification will provide a description of materials that will be used for the UHS at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.

The UHS contains isolation valves at the cooling towers to isolate the safety related portions of the system from the non-safety-related basin support systems provided by the COL applicant. The site-specific UHS systems are shown in Figure 9.2.5-2—[[Conceptual Site-Specific UHS Systems]].

9.2.5.3 Component Description

9.2.5.3.1 Mechanical Draft Cooling Towers

The cooling towers are rectangular mechanical-induced draft-type towers. Each tower consists of two cells in a back-to-back arrangement. The two cells of the cooling tower in a particular division share a single cooling tower basin and each cell is capable of transferring fifty percent of the design basis heat loads for one division from the ESWS to the environment under worst-case ambient conditions. The division four cooling tower shares use with the dedicated ESW train and can transfer severe accident (SA) heat loads to the environment under worst-case ambient conditions.

The cooling tower fill design and arrangement maximize contact time between water droplets and air inside the tower. The tower fill spacing is chosen to minimize the buildup of biofilm and provide for ease of cleaning, maintenance, and inspection.

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Table 3.2.2-1—Classification Summary
Sheet 96 of 182

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
PEB10/20/30/40	ESW Piping/ Components (Trains PEB10/20/30/40)	S	C	I	Yes	UQB, UZT[22], UJH, UBP	ASME Class 3[3]
30PEB10/20/30/40 AP001	ESW Pumps	S	C	I	Yes	UQB	ASME Class 3[3]
30PEB21/22/23/24	ESW to/from EDG Coolers	S	C	I	Yes	UQB	ASME Class 3[3]
30PEB11/12/13/14	ESW to/from UQB Ventilation System Room Cooler	S	C	I	Yes	UQB	ASME Class 3[3]
30PEB10/20/30/40	ESW Valves (Trains PEB10/20/30/40)	S	C	I	Yes	UQB, UJH, UBP	ASME Class 3[3]
30PED10/20/30/40 AN001/002	UHS Cooling Tower Fans	S	C	I	Yes	URB	
QKA	**Safety Chilled Water System**						
30QKA10/20/30/40 AP107	Running Pumps	S	C	I	Yes	UJK	ASME Class 3[3]
30QKA10/20/30/40 AP108	Standby Pumps	S	C	I	Yes	UJK	ASME Class 3[3]
30QKA10/40 AH112	Air Cooled Chillers	S	C	I	Yes	UJK	ASME Class 3[3]
30QKA20/30 AH112	Water Cooled Chillers	S	C	I	Yes	UJK	ASME Class 3[3]
30QKA10/20/30/40 BB101	Expansion Tanks	S	C	I	Yes	UJK	ASME Class 3[3]

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Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment (Sheet 93 of 195)

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)
CCW HX Tube Side Thermal Relief Vlv	30PEB40AA192	34UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Inlet Side DP Root Vlv	30PEB40AA306	34UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Outlet Side DP Root Vlv	30PEB40AA307	34UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA401	34UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA402	34UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA403	34UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA405	34UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA407	34UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB40AA408	34UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Vent Vlv	30PEB40AA508	34UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX Tube Side Vent Vlv	30PEB40AA509	34UJH10026	M	H	SI	S C/NM	Y (3) Y (5)
Orifice Plate	30PEB40BP002	34UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
CCW HX DP Measurement	30PEB40CP004	34UJH05026	M	H	SI	S	Y (5)
CCW HX Outlet Temp Measurement	30PEB40CT002	34UJH05026	M	H	SI	S	Y (5)
SAQ HX DP Measurement	30PEB41CP001	34UQB02001	M	M	SI	S	Y (5)
SAQ HX Outlet Temp Measurement	30PEB41CT001	34UQB02001	M	M	SI	S	Y (5)
CCW HX Outlet Isolation Vlv	30PEB80AA004	34UJH05026	M	H	SI	S C/NM	Y (3) Y (5)
ESW Drain Isolation Vlv	30PEB80AA405	34UJH01026	M	H	SI	S C/NM	Y (3) Y (5)
Safety Chilled Water System (SCWS)							
QKA Cross-Tie Valve, Div 1	30QKA10AA102	31UJK22028	M	M	SI	S C/NM	Y(5)
QKA Cross-Tie Valve, Div 1	30QKA10AA103	31UJK22028	M	M	SI	S C/NM	Y(5)
QK Tank Isol Valve, Div 1	30QKA10AA001	31UJK26029	M	M	SI	S C/NM	Y (5)
QK Pmp #1 Suct Isol Valve, Div 1	30QKA10AA002	31UJK22028	M	M	SI	S C/NM	Y (5)
QK Pmp #1 Disch Check Valve, Div 1	30QKA10AA003	31UJK22028	M	M	SI	S	Y (5)
QK Pmp #1 Disch Isol Valve, Div 1	30QKA10AA004	31UJK22028	M	M	SI	S C/NM	Y (5)
QK Chiller Dnstrm Flow Reg Valve, Div 1	30QKA10AA005	31UJK22028	M	M	SI	S C/NM	Y (5)
QK Chiller Dnstrm Isol Valve, Div 1	30QKA10AA006	31UJK22028	M	M	SI	S C/NM	Y (5)
QKA10AT001 Upstrm Isol Valve, Div 1	30QKA10AA007	31UJK26029	M	M	SI	S C/NM	Y (5)
QKA10AT001 Dnstrm Flow Reg Valve, Div 1	30QKA10AA008	31UJK26029	M	M	SI	S C/NM	Y (5)
QKA10AT001 Dnstrm Isol Valve, Div 1	30QKA10AA009	31UJK26029	M	M	SI	S C/NM	Y (5)
QK QCB Isol Valve, Div 1	30QKA10AA010	31UJK22028	M	M	SI	S C/NM	Y (5)
QK QCB Check Valve, Div 1	30QKA10AA011	31UJK22028	M	M	SI	S	Y (5)
QK Bypass Control Valve-MOV, Div 1	30QKA10AA101	31UJK26029	M	M	ES SI	S C/NM	Y (5)

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

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 and EDG heat exchangers, and the ESWPBVS room cooler.

7.2 The pumps listed in Table 2.7.11-1 have sufficient net positive suction head available (NPSHA) ~~that is greater than net positive suction head required (NPSHR) at system run-out flow~~.

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.

7.6 The ESWS delivers water to the CCWS and EDG heat exchangers and the ESWPBVS room cooler~~s~~.

8.0 Interface Requirements

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

8.2 The site-specific emergency makeup water system provides water to each ESW cooling tower basin at a temperature below the maximum ESWS supply temperature of 95°F.

8.3 The site-specific emergency makeup water system is designed in accordance with ASME Section III, Class 3 safety-related SSC and Seismic Category I requirements.

8.4 The site-specific emergency makeup water system provides a means to limit corrosion, scaling, and biological contaminants in order to minimize component fouling for a minimum of 30 days post-DBA.

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

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
7.2	The pumps listed in Table 2.7.11-1 have sufficient NPSHA that is greater than NPSHR at system run-out flow.	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 the pumps listed in Table 2.7.11-1 have NPSHA that is greater than NPSHR at the maximum ESWS flow rate system run-out flow with consideration for minimum allowable cooling tower basin water level (as corrected to account for actual temperature and atmospheric conditions).
7.3	Class 1E valves listed in Table 2.7.11-2 perform the function listed in Table 2.7.11-1 under system operating conditions.	Tests and analyses or a combination of tests and analyses will be performed to demonstrate the ability of the valves listed in Table 2.7.11-2 to change position as listed in Table 2.7.11-1 under system operating conditions.	The valve changes position as listed Table 2.7.11-1 under system operating conditions.
7.4	The ESWS has provisions to allow flow testing of the ESWS pumps during plant operation.	Testing for flow of the ESWS pumps back to the ESW cooling tower basin will be performed.	The closed loop allows ESWS pump flow back to the ESW cooling tower basin.
7.5	Deleted.	Deleted.	Deleted.
7.6	The ESWS delivers water to the CCWS and EDG heat exchangers and the ESWPBVS room coolers.	Tests and inspection of a pump data report analyses will be performed to verify the ESWS delivery rate to the CCWS and EDG heat exchangers and the ESWPBVS room coolerunder operating conditions.	A report exists and concludes that the ESWS system delivers a the combined total flowrate of at least 19,340 gpm to the CCWS and EDG heat exchangers and the ESWPBVS room cooler.

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Next File

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 4 of 6

U.S. EPR Site Design Envelope			
Maximum Translational Speed	46 mph		
Maximum Wind Speed	230 mph		
Radius of Maximum Rotational Speed	150 ft		
Missile Spectra	6 in Schedule 40 pipe, 6.625 in diameter x 15 ft long, 287 lb, 34.5 in^2 impact area, impact velocity of 135 fps horizontal and 90 fps vertical.		
	Automobile, 16.4 ft x 6.6 ft x 4.3 ft, 4000 lb, 4086.7 in^2 impact area, impact velocity of 135 fps horizontal and 90 fps vertical. (Automobile missile is considered at elevations up to 30.0 ft above grade elevation.)		
	Solid steel sphere, 1 in diameter, 0.147 lb, 0.79 in^2 impact area, impact velocity of 26 fps horizontal and 17 fps vertical.		
Temperature (Refer to Section 2.3)			
Air	0% Exceedance Values[3]	Maximum	115°F Dry Bulb / 80°F Wet Bulb (mean coincident) 81°F Wet Bulb (non-coincident) UHS Design Only (2)
		Minimum	-40°F
	1% Exceedance Values (seasonal basis)[4]	Maximum	100°F dry bulb/77°F mean coincident wet bulb 80°F wet bulb (noncoincident)
		Minimum	-10°F

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2.2 Potable and sanitary water systems instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support system required for operation of the potable and sanitary water systems are complete and functional.

2.4 Test instrumentation available and calibrated.

2.5 The potable and sanitary water systems suction supplies are being maintained at the water level (pressure) specified in the design documents.

3.0 TEST METHOD

3.1 Verify potable and sanitary water systems measured pump and system flow meet design specifications.

3.2 Verify that potable and sanitary water systems interlocks and protective features perform as designed.

4.0 DATA REQUIRED

4.1 Pump operating data.

4.2 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The potable and sanitary water systems meet design requirements (refer to Section 9.2.4):

5.1.1 System flow is within design limits.

5.1.2 Supplied water meets design requirements.

14.2.12.5.5 Component Cooling Water System (Test #046)

1.0 OBJECTIVE

1.1 To demonstrate the capability of the CCWS to provide treated cooling water under the following conditions:

1.1.1 Normal unit operation.

1.1.2 During unit cooldown.

1.1.3 During refueling.

1.1.4 During an emergency situation.

1.2 To demonstrate that system response to a simulated ESF actuation signal is as designed.

1.3 To demonstrate electrical independence and redundancy of safety-related power supplies.

1.4 To demonstrate the CCWS is adequately designed and constructed to prevent water hammer.

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2.0 PREREQUISITES

2.1 Construction activities on the CCWS have been completed.

2.2 CCWS instrumentation has been calibrated and is functional for performance of the following test.

2.3 Test instrumentation is available and calibrated.

2.4 Plant systems required to support testing are functional, or temporary systems are installed and functional.

3.0 TEST METHOD

3.1 Demonstrate that operation of the surge tanks and their controls is within design limits.

3.2 Demonstrate that system and component flow paths, flow rates, and pressure drops including head versus flow verification for the CCW pumps is within design limits.

3.2.1 Verify that pump starts/stops, valve realignments resulting from automatic switchover, RCP thermal barrier transfer, automatic valve closures and pump trips occur without introducingObserve the system during operation for the following water hammer indications:

- Noise.
- Pipe movement.
- Pipe support or restraint damage.
- Leakage.
- Damaged valves or equipment.
- Pressure spikes or waves.

3.3 Perform a pump head versus flow verification for CCW pumps.

3.3.1 $NPSH_a \geq NPSH_R$.

3.3.2 Starting time (motor start time and time to reach rated flow).

3.4 Verify the stroke closure time of the CCWS switchover valves.

3.5 Verify that the start of a CCWS pump generates a starting of the corresponding ESWS train.

3.6 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.7 Observe response of power-operated valves upon loss of motive power (refer to Section 9.2.2 for anticipated response).

3.8 Verify alarms, interlocks, indicating instruments, and status lights are functional.

3.9 Verify pump control from the PICS.

3.10 Demonstrate the ability of the CCWS in conjunction with the RHRS and essential service water system to perform a plant cooldown during HFT.

3.11 Verify that the RCP thermal barriers can be supplied by either the 1.b or 2.b common header. Demonstrate that the supply can be realigned with the RCPs operating during HFT.

3.12 Verify that the fire protection makeup to the CCW surge tank meets design flow rates.

3.13 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.14 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS common 1.b ~~Emergency~~Automatic Backup Switchover function.

3.14.1 Initiate a failure of CCWS Train 1 by simulating a signal for CCWS Train 1 discharge pressure less than or equal to MIN1. Verify the following actions occur:

- CCWS Train 1 common 1.b supply and return switchover valves close.
- CCWS Train 1 LHSI heat exchanger isolation valve opens.
- CCWS Train 2 common 1.b supply and return switchover valves open.
- CCWS Train 2 pump starts.
- RCP thermal barrier flow returns to normal.

3.14.2 Initiate a failure of CCWS Train 1 by simulating a signal for loss of ESWS Train 1. Verify the following actions occur:

- CCWS Train 1 common 1.b supply and return switchover valves close.
- CCWS Train 1 LHSI heat exchanger isolation valve opens.
- CCWS Train 2 common 1.b supply and return switchover valves open.
- CCWS Train 2 pump starts.
- RCP thermal barrier flow returns to normal.

3.14.3 Initiate a failure of CCWS Train 1 by simulating a signal for main train (flow through CCW pump and heat exchanger, with or without flow through common headers) flow rate less than or equal to MIN1. Verify the following actions occur:

- CCWS Train 1 common 1.b supply and return switchover valves close.
- CCWS Train 1 LHSI heat exchanger isolation valve opens.

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- CCWS Train 2 common 1.b supply and return switchover valves open.
- CCWS Train 2 pump starts.
- RCP thermal barrier flow returns to normal.

3.15 Perform step 3.14 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

3.16 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Emergency Temperature Control function by simulating two out of three Train 1 temperature sensors greater than MAX1. Verify the following action occurs:

- CCWS Train 1 heat exchanger bypass valve closes until MAX1 is cleared (or the valve is fully closed).

3.17 Perform step 3.16 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

3.18 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Emergency Leak Detection function.

3.18.1 Simulate a CCWS Train 1 surge tank level signal less than or equal to MIN2 and simulate a flow mismatch between the inlet and outlet of the common 1.b header (~~main common user group~~non-safety related branches). Verify the following actions occur:

- KAB80 AA015/016/019~~CCWS common 1.b non-safety users isolation~~ valves close.
- Normal and Automatic Switchover functions are inhibited~~CCWS common 1.b supply outer RB isolation valve closes~~.

3.18.2 Simulate a CCWS Train 1 surge tank level signal less than or equal to MIN3. Verify the following actions occur:

- CCWS Train 1 common 1.a supply and return switchover valves close.
- CCWS Train 1 common 1.b supply and return switchover valves close.

3.18.3 Simulate a CCWS Train 1 surge tank level signal less than or equal to MIN4. Verify the following actions occur:

- DWDS supply isolation valve closes.
- CCWS common 1.b Automatic~~Emergency~~ Backup Switchover function is enabled.
- CCWS Train 1 pump trips and CCWS Train 2 pump automatically starts~~CCWS Emergency Temperature Control function is enabled~~.

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3.19 Perform step 3.18 for CCWS Trains 2, 3, and 4 to verify appropriate responses. For common 2.b testing with Trains 3 and 4 valves KAB50 AA001/004/006 close.

3.20 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Actuation from Safety Injection function by simulating a safety injection signal to CCWS. Verify the following actions occur:

- CCWS Train 1/2/3/4 pumps start automatically (if not previously running).
- CCWS Train 1/2/3/4 LHSI heat exchanger isolation valves KAA12/22/32/42 AA005 open.
- Isolation valves for non-safety-related users outside the Reactor Building (KAB50 AA001/004/006 and KAB80 AA015/016/019) closeCCWS common 2 non-safety users supply isolation valve closes.
- LHSI pump seal cooler isolation valves (KAA22/32 AA013) openCCWS common 2 non-safety users upstream and downstream isolation valves close.
- CCWS common 1.b NAB non-safety users isolation valves close.

3.21 Perform step 3.20 for CCWS Trains 2, 3 and 4 to verify appropriate responses.

3.22 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Operation from Stage 1 Containment Isolation signal and CCWS Operation from Stage 2 Containment Isolation signal functions.

3.22.1 Simulate a containment stage 1 isolation signal to CCWS. Verify the following actions occur:

- CCWS containment isolation valves KAB40 AA001/006/012 closeCCWS common 1 supply outer containment isolation valve closes.
- CCWS common 1 return inner and outer containment isolation valves close.

3.22.2 Simulate a containment stage 2 isolation signal to CCWS. Verify the following actions occur:

- CCWS containment isolation valves KAB60/70 AA013/018/019 closeCCWS common 1 safety users supply outer containment isolation valve closes.
- CCWS common 1 safety users return inner and outer containment isolation valves close.
- CCWS common 2 safety users supply outer containment isolation valve closes.
- CCWS common 2 safety users return inner and outer containment isolation valves close.

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3.23 Perform step 3.22 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

3.24 Verify that CCWS Train 1 is supplying the common 1.a header (fuel pool cooling and safety injection loads) and the common 1.b header (main common user group) then perform test of CCWS Response to a LOOP function by simulating a loss of offsite power to CCWS. Verify the following actions occur:

- ~~CCWS common 2 safety users return inner and outer containment isolation valves close.~~
- CCWS Train 1 starts upon receipt of a Protection System signal.

3.25 Perform step 3.24 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

3.26 Verify that CCWS Train 1 is supplying the common 1.a header (fuel pool cooling and safety injection loads) and the common 1.b header (main common user group) then perform test of CCWS Switchover Valve Interlock function. Verify the following groupings of valves cannot be simultaneously opened to prohibit more than one train from being connected to a common header:

- KAA10 AA033/032 with KAA20 AA033/32.~~CCWS Train 1 common 1.a switchover valves with Train 2 common 1.a switchover valves~~
- KAA30 AA033/032 with KAA40 AA033/32.~~CCWS Train 3 common 2.a switchover valves with Train 4 common 2.a switchover valves~~
- KAA10 AA006/010 with KAA20 AA006/010.~~CCWS Train 1 common 1.b switchover valves with Train 2 common 1.b switchover valves~~
- KAA30 AA006/010 with KAA40 AA006/010.~~CCWS Train 3 common 2.b switchover valves with Train 4 common 2.b switchover valves~~

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3.27 Verify that CCWS Train 1 or 2 is supplying the common 1.b header (main common user group), then perform test of CCWS RCP Thermal Barrier Containment Isolation Valve Interlock function. Verify the following action occurs:

- KAB30 AA049/051/052 must be closed prior to opening KAB30 AA053/055/056 and vice versa~~CCWS common Train 1.b and 2.b can not be placed into service at the same time~~.

3.28 Perform step 3.27 for CCWS Train 3 or 4 supplying common 2.b header to verify appropriate responses.

3.29 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Switchover Valve Leakage or Failure function by simulating CCWS Train 1 surge tank level less than MIN3 and CCWS surge tank 2 level greater than MAX2. Verify the following actions occur:

- CCWS Train 1 common 1.a supply and return switchover valves close.
- CCWS Train 1 common 1.b supply and return switchover valves close.

3.30 Perform step 3.29 for CCWS Train 2 supplying common 2.b header to verify appropriate responses.

3.31 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Surge Tank Makeup function. Verify the following action occurs:

- DWDS supply isolation valve responds to CCWS surge tank level changes.

3.32 Perform step 3.31 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

3.33 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Temperature Control function.

3.33.1 Simulate two of three CCWS Train 1 temperature sensors less than MIN1. Verify that the Train 1 heat exchanger bypass valve opens by 10 percent of its 0-100 percent range at 1 minute intervals until 2 of 3 temperature measurements are greater than MIN1, or the valve is fully open.

3.33.2 Simulate two out of three CCWS Train 1 temperature sensors greater than MAX1. Verify that the Train 1 heat exchanger bypass valve closes by 10 percent of its 0-100 percent range at 1 minute intervals until 2 of 3 temperature measurements are less than MAX1, or the valve is fully closed.

3.34 Perform step 3.33 for CCWS Trains 2, 3, and 4 to verify appropriate responses~~Perform Steps 3.14 through 3.24 for CCWS Trains 2, 3, and 4 to verify appropriate responses~~.

3.35 Verify that CCWS common 1.b header is supplying RCP thermal barrier cooling, then perform test of RCP thermal barrier isolation function.

3.35.1 Simulate high flow above threshold value on the return of RCP1 thermal barrier. Verify that RCP1 thermal barrier isolation valves close.

3.35.2 Simulate high pressure above threshold value on the return of RCP1 thermal barrier. Verify that RCP1 thermal barrier isolation valves close.

3.35.3 Perform steps 3.35.1 and 3.35.2 for RCP 2, 3, and 4 thermal barriers.

3.36 Perform step 3.35 for common 2.b header supplying RCP thermal barrier cooling to verify appropriate responses.

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4.0 DATA REQUIRED

4.1 Record pump head versus flow and operating data for each pump.

4.2 Flow balancing data including flow to each component and throttle valve positions.

4.3 Setpoints of alarms interlocks and controls.

4.4 Valve performance data, where required.

4.5 Valve position indication.

4.6 Position response of valves to loss of motive power.

4.7 Temperature data during cooldown.

4.8 Response of CCW System to SIAS, CIAS, surge tank level signal, and CCW header differential flow signal.

5.0 ACCEPTANCE CRITERIA

5.1 The CCWS meets design requirements (refer to Section 9.2.2):

5.1.1 Operation of the surge tanks and their controls is within design limits.

5.1.2 System and component flow paths, flow rates, and pressure drops including head versus flow verification for the CCW pumps is within design limits.

5.1.3 Pump head versus flow verification for CCW pumps is within design limits.

5.1.4 Response to safety-related simulated signals meets design requirements.

5.1.5 Non-safety-related headers and RCP headers are isolated on simulated signals.

5.1.6 System valves meet design requirements.

5.1.7 Alarms, interlocks, indicating instruments, and status lights meet design requirements.

5.1.8 Verify pump control from the PICS.

5.1.9 Verify the ability of the CCWS in conjunction with the RHRS and essential service water system (ESWS) to perform a plant cooldown during HFT.

5.1.10 Verify none of the following water hammer indications are present for all operational tests (3.14 through 3.36):

- Noise.
- Pipe movement.
- Pipe support or restraint damage.
- Leakage.
- Damaged valves or equipment.
- Pressure spikes or waves.

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Response to

Request for Additional Information No. 351(4112, 4163), Revision 1

01/15/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.05 - Ultimate Heat Sink
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

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

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Question 09.02.05-31:

Follow-up to RAI 175, Question 9.2.5-18:

Standard Review Plan (SRP) 9.2.5 Section III, paragraph 1 requires confirmation of the overall arrangement of the ultimate heat sink (UHS). The staff reviewed the information provided in Tier 1, Table 2.7.11-3, “Essential Service Water System Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC),” to confirm that the proposed ITAAC are adequate for EPR design certification. However, the staff found that the proposed ITAAC are incomplete, inconsistent, inaccurate, or that clarification is needed as follows:

1. Item 2.1 only refers to functional arrangement, but it should refer to functional arrangement and design details since nominal pipe size is an important consideration that needs to be verified, as it pertains to the ultimate heat sink (UHS).
2. Item 2.3 is incomplete in that it does not address physical separation criteria for outdoor piping and components such as for the UHS fans.
3. Provide an ITAAC for the UHS/ESW fans are (proper accident response, operating capability in various speeds including reverse).
4. Need to include under several existing item, such as 7.1, the performance of the UHS fans since neither the UHS fans are listed under Tables 2.7.11-2 or 2.7.11-3. Quantitative acceptance criteria need to be established for all ITAAC as applicable (flow rates, heat transfer rates, completion times, etc.).

Based on the staff’s review of the applicant's response to RAI 9.2.5-18 (ID1817/6816) AREVA #175, Supplement 2, the following were determined as unresolved and needed further clarification/resolution by the applicant.

With regard to Item 3, the staff does not agree with the assertion that fan performance is not safety significant. In fact, fan performance is critical for establishing the cooling tower heat removal capability that is necessary to satisfy accident analysis assumptions. Therefore, an ITAAC is necessary to confirm that fan performance in high speed (with one fan operating separately and with both fans operating simultaneously) satisfies the manufacturer’s specifications for the cooling tower design. An ITAAC is also needed to confirm that both cooling tower fans operating simultaneously through all speed combinations (including reverse) will not result in unacceptable vibrations or other deleterious conditions. Additionally, Standard Review Plan Section 14.3, Appendix C, Paragraph II.B.vii, entitled, “Initiation Logic,” states: “If a system/component has a direct safety function it typically receives automatic signals to perform some action. This includes start, isolation, etc. The system ITAAC capture these aspects related to the direct safety function…” Therefore, an ITAAC is also needed to confirm proper fan response to an accident.

Also, based on further review of the ITAAC that are proposed in FSAR Tier 1 Section 2.7.11, Table 2.7.11-3, “Essential Service Water System ITAAC,” the staff identified the following additional items that need to be addressed:

a. An ITAAC is needed to confirm the seismic adequacy of the cooling towers and their component parts (fill material, nozzles, wind drift eliminators).
b. With regard to the ITAAC that are specified by Item 7.1, the commitment refers to the “ESW UHS as listed in Table 2.7.11-1.” Table 2.7.11-1 includes all of the mechanical

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equipment that is included in the essential service water system (ESWS), but does not include the cooling towers, components that are included in the cooling tower design, and the cooling tower basins. Therefore, the UHS part of the ESWS is not really listed in Table 2.7.11-1 and it is not clear what this commitment means and what is actually being accomplished by this ITAAC. Consequently, additional thought is required to establish ITAAC that are meaningful and appropriate for the ESWS and UHS designs. Along these lines, ITAAC need to be established to confirm that important design specifications and features have been properly implemented (to the extent that they have not been established elsewhere). For example, inspections should be conducted to confirm that the cooling towers have been constructed in accordance with manufacturer drawings and specifications (e.g., elevations, dimensions, materials, piping, fill, wind drift eliminators, spray nozzles). Likewise, ITAAC are needed to confirm that the cooling tower basins have been constructed in accordance with design specifications (e.g., elevations, dimensions, materials, screens, penetrations). Also, ITAAC should be established for the ESWS (e.g., elevations, materials, height of pump impeller above the bottom of the basin, valve and pipe sizes, pump specifications, heat exchanger specifications, filter size and specifications).

c. The ITAAC specified by Item 7.2 should be revised to also recognize vortex effects since this is more limiting than net positive suction head considerations.

d. The acceptance criteria for the ITAAC specified by Item 7.6 should be revised to indicate that the required flow rate is “greater than or equal to” the value specified.

e. An ITAAC needs to be established to confirm that the cooling towers, with the minimum specified water inventory available and for the most limiting conditions that are assumed for heat removal, are capable of removing the design-basis heat load without exceeding the maximum specified temperature limit for ESWS. A transient analysis should be completed by qualified individuals with the results documented in a report that includes performance curves for the cooling towers being used for the specific conditions of interest, such as limiting meteorology, initial water volume and quality, no filter backwash and blowdown, and no makeup or blowdown flow for the initial 72 hours. After 72 hours, makeup water of specified flow rate and water quality is provided for the remainder of the 30 day period, but no blowdown or filter backwash is provided consistent with design basis assumptions. The report should show how the water temperature in the cooling tower basin will trend over time; and the effect of concentrated impurities in the cooling tower basin on ESWS flow rate and cooling tower performance, and how the water quality at the end of the 30 day period compares with manufacturer’s specifications, should be assessed. The report should include a listing of the limiting assumptions and inputs that were used, as well as an uncertainty analysis that demonstrates conservative results. The qualifications of the individuals performing the analysis and independent verification, and their certification of the accuracy of the information in the report should also be included, as well as a discussion of the analytical methods and modeling that were used, and a listing of references that are pertinent to the analysis that was performed.

f. An ITAAC needs to be established to confirm that the cooling towers, with the minimum specified water inventory available and for the most limiting conditions that are assumed for water usage, are capable of removing the design basis heat load without the water inventory dropping below the minimum required level in the cooling tower basin. A report similar to the one referred to in (e) above should be prepared demonstrating

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acceptable performance. Note that because water usage is higher in this case, impurities in the water will be more concentrated at the end of the 30 day period and may have a more severe impact on ESWS flow rate and cooling tower performance.

Response to Question 09.02.05-31:

Item (a)

Each of the four mechanical draft cooling towers, which include the tower fill, wind drift eliminators, spray piping and nozzles, will be added to Tier 1 Table 2.7.11-1 for mechanical equipment as shown in Insert 1. Also, Tier 2 Section 9.2.5.3.1 will be revised to clarify that the tower fill, wind drift eliminators, spray piping and nozzles are part of the mechanical draft cooling tower.

As stated in SRP 14.3 Appendix C, Subsection I.A.iii, the internal workings of the mechanical draft cooling towers do not need to be discussed in Tier 1. Thus, the mechanical draft cooling towers are mechanical equipment included within the scope of ITAAC 3.4 in Tier 1 Table 2.7.11-3 which verifies the seismic adequacy of ESWS and UHS mechanical equipment.

In addition, the component description of the mechanical draft cooling tower (Tier 2 section 9.2.5.3.1) states "UHS cooling tower internals are seismically designed and supported to withstand a safe shutdown earthquake."

Tier 2 Table 3.2.2-1 and Tier 2 Table 3.10-1 will be revised to include the four mechanical draft cooling towers.

Item (b)

Tier 1 section 2.7.11-3 ITAAC 7.1 verifies the equipment listed in Table 2.7.11-1 has the capacity to remove the design heat load from the CCWS, EDG heat exchangers, the ESWPBVS room cooler and the ESW pump mechanical work. As stated in the previously accepted response to RAI 345 9.2.1-44(b), the UHS cooling tower fans were added to Tier 1 table 2.7.11-1. In response to Item (a), the mechanical draft cooling towers were added to Table 2.7.11-1; therefore, it is a component included in the scope of ITAAC 7.1 Tier 1 Table 2.7.11-3.

As stated in Tier 2 Table 1.8-2 Item 2.0-1, the COL applicant is responsible for determining the wet bulb temperature correction factor to account for interference and recirculation effects of a UHS cooling tower on another UHS cooling tower. Similarly, the interference effects of a UHS cooling tower on other nearby air intakes will be evaluated by the COL applicant and ensured the inlet conditions of intake do not exceed the site design envelope ambient air conditions listed in Tier 2 Table 2.1-1. The following note will be added to Table 2.1-1: COL applicant will ensure potential UHS cooling tower interference effects on the safety related air intakes does not result in air intake inlet conditions that exceed the site design envelope ambient air conditions (Refer to COL Item 2.0-1 in Table 1.8-2—U.S. EPR Combined License Information Items).

The cooling tower basin is considered a portion of the structure and ITAAC in Tier 1 Table 2.5.1-3 are used to confirm the adequacy of its design, including important dimensions and elevations. In addition, Tier 2 Table 9.2.5-2 states the minimum basin water volume. Tier 3

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Table 2.7.11-3 will be revised (as indicated in Insert 5) to include an ITAAC to confirm the cooling tower basin is adequately sized for the minimum basin water volume.

In response to the other items not specifically described above that were requested to be included in ITAAC, COL applicants have to address everything contained in the FSAR Tier 2 material independent of whether or not there is ITAAC on a specific feature. Inspections of ITAAC related activities are addressed by IMC 2503 while those for non-ITAAC activities are covered by IMC 2504.

The US EPR Tier 1 material and ITAAC was generated based on the guidance provided in SRP 14.3 (March 2007) using the process described in US EPR Tier 2 section 14.3. The process selected was based on the guidance provided in SRP 14.3 and consisted of two parallel paths, one based on the safety related function of the equipment and the other based on whether it is credited in a specific list of analyses. Page 14.3-19 of SRP 14.3 section 6.0 provides a summary of the guidance on selection of material from Tier 2 for inclusion in Tier 1 and defines the specific list analyses to be addressed. Additional specific topics are addressed in other sections of SRP 14.3 as discussed below.

- SRP 14.3 page 14.3-5 item 3, "If applicable, review the DCD for a certified design similar to the design for which certification is sought, specifically the Tier 1 information, for the purpose of using a similar approach, format, and language and for familiarity with the treatment of SSCs, the appropriate level of design detail, and other certification issues."

- SRP 14.3 page 14.3-6 item 3, "Review the Tier 1 design descriptions to ensure that the key performance characteristics and safety functions of SSCs are appropriately treated at a level of detail commensurate with their safety significance.

- SRP 14.3 page 14.3-6 item 4, "Review Tier 1 for whether all information is clear and consistent with the Tier 2 information. If any new items are added to ITAAC, then ensure that they are added, including appropriate supporting analyses, to the applicable sections of Tier 2. Figures and diagrams should be reviewed to ensure that they accurately depict the functional arrangement and requirements of the systems. Reviewers should use the detailed review guidance in Appendix C to this SRP section as an aid in treating issues consistently and comprehensively."

- SRP 14.3 (March 2007) Appendix C pages 14.3-24 through 14.3-32 provides the guidance specified for determining which Tier 2 (FSAR) material should be included in Tier 1 and have ITAAC. Examples of the guidance provided by this SRP are:

    - Unique features such as special features for flow testing.

    - Interlocks required for accomplishment of a direct safety function should be addressed; those provided for equipment protection do not need to be addressed.

    - Part B on figures specifies the use of simplified figures and diagrams and that only valves that accomplish an active safety function need to be addressed.

In the RAI question it was requested that ITAAC be provided for the following items listed in the table.

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SSC	Requested ITAAC subject	Response
Cooling tower	Elevations Dimensions Materials Piping Fill Wind drift eliminators Spray nozzles	Elevations and dimensions are included in the basic inputs for determining the potential for interference effects. This evaluation is the responsibility of the COL applicant as stated in COL Item 2.0-1 in Tier 2 Table 1.8-2. Materials are the responsibility of the COL applicant as stated in COL Items 9.2-4 and 9.2-5 in Tier 2 Table 1.8-2. Piping is covered in a level commensurate with its safety significance. Tower fill, wind drift eliminators, and spray nozzles are not unique features, rather they are internal parts of the mechanical draft cooling towers, and are not credited in any of the listed safety analyses.
Cooling tower basin	Elevations Dimensions Materials Screens Penetrations	Regarding elevations and dimensions for the cooling tower basin, an ITAAC for the minimum cooling tower basin volume has been added as a part of this response. See above response materials. ITAAC are provided for the coarse and fine debris screens as stated in response to RAI 351 question 9.2.5-30(d). There are no specific penetration features to be verified by ITAAC.
ESWS	Elevations Materials Height of pump impeller above bottom of basin Valve and pipe sizes Pump specifications Heat exchanger	See above response for elevations, dimensions, and materials. The height of the pump impeller with respect to the cooling tower basin was stated in the response to RAI 345 Question 9.2.1-34(e) regarding available NPSH. Tier 1 Table 2.7.11-3 ITAAC 7.2 verifies available NPSH. Valves and pipe sizes are not unique features.

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	specifications Filter size and specifications	Pump performance is enveloped by confirming the necessary NPSH is available in Tier 1 Table 2.7.11-3 ITAAC 7.2 and through the system heat removal test in Tier 1 Table 2.7.11-3 ITAAC 7.6. The only heat exchanger within the scope of the ESWS-UHS is the UHS, which is enveloped by Tier 1 Table 2.7.11-3 ITAAC 7.1. ITAAC are provided for the coarse and fine debris screens as stated in response to RAI 351 question 9.2.5-30(d).

FSAR Impact:

U.S. EPR FSAR, Tier 1, Table 2.7.11-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2, Section 3.2.2, 3.10, and 9.2.5.3.1 will be revised as described in the response and indicated on the enclosed markup.

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Insert 1

Description	Tag Number [(1)]	Location	ASME Code Section III	Function	Seismic Category
Mechanical Draft Cooling Tower Train 1 (excluding fans)	30PED10AC001	ESW Cooling Tower Structure 1	Yes	Heat Transfer Device	I
Mechanical Draft Cooling Tower Train 2 (excluding fans)	30PED20AC001	ESW Cooling Tower Structure 2	Yes	Heat Transfer Device	I
Mechanical Draft Cooling Tower Train 3 (excluding fans)	30PED30AC001	ESW Cooling Tower Structure 3	Yes	Heat Transfer Device	I
Mechanical Draft Cooling Tower Train 4 (excluding fans)	30PED40AC001	ESW Cooling Tower Structure 4	Yes	Heat Transfer Device	I

Insert 2

"spray nozzles, tower fill, wind drift eliminator"

Insert 3

KKS System or Component Code	SSC Description	Safety Classification	Quality Group Classification	Seismic Category	10 CFR 50 Appendix B Program	Location	Comments/ Commercial Code
30PED10/20/30/40 AC001	Mechanical Draft Cooling Towers (excluding fans)	S	C	I	Yes	URB	ASME Class 3[3]

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Insert 4

Name Tag	Tag Number	Local Area	EQ Environment	Radiation Environment	EQ Designated Function	Safety Class	EQ Program Designation
Mechanical Draft Cooling Tower Train 1 (excluding fans)	30PED10AC001	31URB	M	M	SI	S	Y(5)
Mechanical Draft Cooling Tower Train 2 (excluding fans)	30PED20AC001	32URB	M	M	SI	S	Y(5)
Mechanical Draft Cooling Tower Train 3 (excluding fans)	30PED30AC001	33URB	M	M	SI	S	Y(5)
Mechanical Draft Cooling Tower Train 4 (excluding fans)	30PED40AC001	34URB	M	M	SI	S	Y(5)

Insert 5

7.X The cooling tower basin is sized for the minimum basin water volume.

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Insert 6

Commitment Wording		Inspection, Tests, Analyses	Acceptance Criteria
7.X	The cooling tower basin is sized to for the minimum basin water volume.	An inspection and analysis will be performed to demonstrate the size of the cooling tower basin is capable of holding the minimum basin water volume.	A report exists and concludes that the cooling tower basin size is capable to hold the minimum basin water volume.

Insert 7

COL applicant will ensure potential UHS cooling tower interference effects on the safety related air intakes does not result in air intake inlet conditions that exceed the site design envelope ambient air conditions (Refer to COL Item 2.0-1 in Table 1.8-2—U.S. EPR Combined License Information Items).

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