ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Wednesday, June 13, 2012 9:15 AM
To: Tesfaye, Getachew
Cc: Miernicki, Michael; BENNETT Kathy (AREVA); DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); WILLIFORD Dennis (AREVA); KOWALSKI David (AREVA); RYAN Tom (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9, Question 09.02.05-38
Attachments: RAI 518 Question 09.02.05 38 Response US EPR DC - DRAFT.pdf

Getachew,

Attached is a DRAFT response to Question 09.02.05-38 in RAI No. 518 (FSAR Ch. 9) in advance of the July 13, 2012 final date.

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

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Monday, February 27, 2012 7:36 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the two questions in RAI No. 518 on November 14, 2011. Supplement 1 and Supplement 2 responses to RAI No. 518 were sent on December 14, 2011, and January 19, 2012, respectively, to provide a revised schedule.

The attached file, “RAI 518 Supplement 3 Response US EPR DC.pdf” provides a technically correct and complete final response to Question 09.05.01-87.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 518 Question 09.05.01-87.

The following table indicates the respective pages in the response document, "RAI 518 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 518 — 09.05.01-87	2	2

The schedule for a technically correct and complete response to the remaining question is unchanged as provided below:

Question #	Response Date
RAI 518 — 09.02.05-38	July 13, 2012

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, January 19, 2012 8:55 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the two questions in RAI No. 518 on November 14, 2011. Supplement 1 response to RAI No. 518 was sent on December 14, 2011 to provide a preliminary revised schedule.

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

Question #	Response Date
RAI 518 — 09.02.05-38	**July 13, 2012**
RAI 518 — 09.05.01-87	**March 28, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, December 14, 2011 10:40 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for a technically correct and complete response to the two questions in RAI No. 518 on November 14, 2011.

A preliminary revised schedule for technically correct and complete responses to the two questions is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Response Date
RAI 518 — 09.02.05-38	**January 25, 2012**
RAI 518 — 09.05.01-87	**January 25, 2012**

Sincerely,

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

From: WILLIFORD Dennis (RS/NB)
Sent: Monday, November 14, 2011 8:27 AM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 518 Response US EPR DC.pdf," provides a schedule since technically correct and complete responses to the two questions cannot be provided at this time.

The following table indicates the respective pages in the response document, “RAI 518 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 518 — 09.02.05-38	2	3
RAI 518 — 09.05.01-87	4	4

A preliminary schedule for a technically correct and complete response to this question is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by December 14, 2011.

Question #	Response Date
RAI 518 — 09.02.05-38	December 14, 2011
RAI 518 — 09.05.01-87	December 14, 2011

Sincerely,

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

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, October 13, 2011 4:09 PM
To: ZZ-DL-A-USEPR-DL
Cc: Wheeler, Larry; McCann, Edward; Dreisbach, Jason; Segala, John; Clark, Phyllis; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 13, 2011, and discussed with your staff the same day on October 13, 2011. No change is made to the draft RAI as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

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

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3947

Mail Envelope Properties (68A588D0DDE96547855C97AF83A8CAFDA0AD1C)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 518 (6122, 6125), FSAR Ch. 9, Question 09.02.05-38
Sent Date: 6/13/2012 9:15:02 AM
Received Date: 6/13/2012 9:15:46 AM
From: RYAN Tom (AREVA)

Created By: Tom.Ryan@areva.com

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Files	**Size**	**Date & Time**
MESSAGE	7406	6/13/2012 9:15:46 AM
RAI 518 Question 09.02.05 38 Response US EPR DC - DRAFT.pdf	1030034	

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

Response to

Request for Additional Information No. 518(6122, 6125), Question 09.02.05-38

Question 09.02.05-38

10/13/2011

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.05 - Ultimate Heat Sink
Application Section: 9.2.5

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

Question 09.02.05-38:

OPEN ITEM

NRC regulations 10 CFR 50.36(c)(2)(ii) states that a technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of the following criteria … (C) Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The US EPR standard plant uses a mechanical draft cooling tower (MDCT) for its ultimate heat sink (UHS). Regulatory Position 4 from Regulatory Guide (RG) 1.27 (1976), “Ultimate Heat Sink for Nuclear Power Plants,” states, in part, that the technical specifications for the plant should include provisions for actions to be taken in the event that conditions threaten partial loss of the capability of the UHS. Thus, the staff needs assurance that the assumptions used to calculate the UHS cooling capability bound actual conditions.

There are already surveillance requirements in TS 3.7.19 for the UHS cooling tower basin water temperature and level. For a MDCT, wet bulb (WB) temperature dictates the cooling tower’s heat removal capacity. The higher the ambient WB temperature the worse the cooling performance of the tower. A higher WB temperature than previously analyzed would threaten the cooling capability of the MDCT UHS. Thus, if RG 1.27 is followed, plants that use MDCTs for their UHS should incorporate an ambient WB temperature surveillance requirement in their TS.

For the US EPR FSAR – Revision 3, the variable “wet bulb” is found in several locations as shown below:

- Tier 2 FSAR Table 9.2.5-2, “Ultimate Heat Sink Design Parameters,” states that the design inlet wet bulb temperature is 81° F (non-coincident, 0% exceedance value).
- Tier 2 FSAR Table 9.2.5-3, “Design Valves for Maximum Evaporation and Drift Loss of Water from the UHS,” shows a wet bulb value of 78.72°F at hour 42.
- Tier 2 FSAR Table 9.2.5-4, “Design Values for Minimum Water Cooling in the UHS,” shows a maximum wet bulb temperature of 85.3° F with a concurrent dry bulb temperature of 99° F (hour 8 & 9).

For the US EPR FSAR – Revision 3, references to RG 1.27 is found in several locations as shown below:

- Tier 2 FSAR, Section 9.2.5, “Ultimate Heat Sink,” states that the UHS for the US EPR is sized to provide adequate cooling capacity as required by RG 1.27.
- Tier 2 FSAR, Table 1.9-2, “US EPR Conformance with Regulatory Guides,” states that the US EPR assessment is “yes” for RG 1.27; that is; there is no exception to RG 1.27.

Other related FSAR section influenced by WB:

- Tier 2 FSAR Technical Specification (TS) SR 3.7.19.2 states that the water temperature of each UHS cooling tower basin is ≤ 90° F.

Since the ambient WB temperature greatly influences the heat removal capacity and efficiency of the MDCT and may simultaneously affects all four trains of the UHS, which is used to protect fission product barriers:

a. Describe in the US EPR FSAR the condition of the UHS that would exist if the ambient WB temperature exceeds the UHS design basis 81° F WB temperature.

b. Describe in the RAI response the UHS WB temperature margins.

c. Describe if the existing US EPR basin water temperature TS surveillance requirements (SR) of <90° F is bounding and if the limited conditions of operations (LCO), would be entered if the ambient WB temperature exceeds 81° F (Table 9.2.5-2), exceeds 78.72° F (Table 9.2.5-3), or exceeds 85.3° F (Table 9.2.5-4).

d. Describe the US EPR TS surveillance (and TS Bases) for ambient WB temperature as it relates to cooling tower performance. Also describe in the US EPR TS how ambient WB is to be measured and on what frequency.

e. Describe applicable combined license (COL) information items that are required to address ambient WB temperature.

Response to Question 09.02.05-38:

Item a:

As shown in U.S. EPR FSAR Tier 2, Table 9.2.5-2 – Ultimate Heat Sink Design Parameters, the U.S. EPR ultimate heat sink (UHS) design 0% exceedance non-coincident wet bulb temperature is 81°F. The UHS mechanical draft cooling tower is designed for a wet bulb temperature of 81°F. Using the values provided in U.S. EPR FSAR Tier 2, Table 9.2.5-4 – Design Values for Minimum Water Cooling in the UHS, the performance of the UHS is analyzed for accident conditions that result in the limiting ambient mechanical draft cooling tower cooling performance.

If the ambient wet bulb temperature increases to above the design inlet wet bulb temperature (81°F) specified in U.S. EPR FSAR Tier 2, Table 9.2.5-2, due to diurnal variations shown in U.S. EPR FSAR Tier 2, Table 9.2.5-4, the UHS basin water temperature increases. However, the analyses summarized bullet items that follow demonstrate that the maximum basin water temperature does not exceed the maximum design cold water (outlet) temperature (95°F) given in U.S. EPR FSAR Tier 2, Table 9.2.5-2 during a design basis accident (DBA) condition.

U.S. EPR FSAR Tier 2, Section 9.2.5.4 will be revised to include this updated information.

Analyses show that the maximum UHS basin water temperature of 93.5°F corresponds to the following inputs:

- Postulated initial basin temperature of 92°F (Technical Specification Surveillance Requirement (SR)) 3.7.19.2 temperature limit of 90°F for normal plant operation, plus 2°F margin for instrument uncertainty.
- U.S. EPR bounding DBA heat loads of a large break loss of coolant accident (LBLOCA).

- Limiting 24-hour meteorological ambient conditions in U.S. EPR FSAR Tier 2, Table 9.2.5-4, which result in minimum cooling from the mechanical draft cooling tower, where the wet bulb temperature exceeds the 0% exceedance wet bulb design temperature of 81°F and reaches a temperature of 85.3°F for a period of two hours during the DBA.

Therefore, the UHS is capable of removing normal plant operation and DBA heat loads of the emergency core cooling system (ECCS), emergency diesel generators (EDG) and essential service water (ESW) pump room coolers, without exceeding the U.S. EPR maximum design basis UHS basin water temperature limit of 95°F for the duration of a DBA, when considering the limiting 24-hour meteorological ambient conditions resulting in minimum mechanical draft cooling tower cooling with a wet bulb temperature exceeding 81°F.

Item b:

U.S. EPR SR 3.7.19.2 verifies once every 24 hours that the UHS cooling tower basin temperature is less than or equal to 90°F. Under the limiting combination of environmental conditions and bounding DBA heat loads, a 90°F temperature (plus 2°F margin for instrument uncertainty) provides reasonable assurance that the maximum UHS cooling tower basin temperature does not exceed the DBA temperature limit of 95°F given in U.S. EPR FSAR Tier 2, Table 9.2.5-2. As described in U.S. EPR FSAR Tier 2, Section 9.2.5, the UHS is sized to provide adequate cooling capacity as required by RG 1.27, which states that the meteorological conditions resulting in minimum water cooling should be the limiting combination of controlling parameters, including diurnal variations where appropriate, for the critical time period(s) unique to the specific design of the UHS.

As shown in U.S. EPR FSAR Tier 2, Table 9.2.5-2, the U.S. EPR UHS design inlet wet bulb temperature is 81°F, which is the non-coincident, 0% exceedance value. The U.S. EPR UHS is designed to operate for a nominal 30 days following a DBA, and the UHS cooling tower basin is sized to maintain UHS operation for 72 hours without makeup. The meteorological conditions given in U.S. EPR FSAR Tier 2, Table 9.2.5-4 that result in minimum mechanical draft cooling tower performance, are the limiting combination of the controlling parameters (wet bulb and dry bulb temperatures), including diurnal variations for the first 24 hours of a DBA LOCA, and are used in the analysis of the maximum UHS basin water temperature. This analysis shows that considering a maximum initial basin temperature of 92°F (Technical Specification limit of 90°F, plus 2°F for instrument uncertainty) during normal operation with the meteorological conditions in U.S. EPR FSAR Tier 2, Table 9.2.5-4 and U.S. EPR bounding DBA heat loads of an LBLOCA, the UHS basin maximum water temperature only reach 93.5°F during the duration of a DBA, which is less than the U.S. EPR maximum design basis UHS basin water temperature limit of 95°F.

Item c:

The U.S. EPR UHS consists of four safety-related divisions. Four UHS divisions are required to be operable to provide the required redundancy to provide reasonable assurance that the system functions with the ability to remove post-accident heat loads. During normal operation, only two of the four ESW and UHS divisions operate with the remaining two divisions in standby. During a plant shutdown, four ESW and UHS divisions normally operate to achieve cold shutdown in a minimum length of time. Upon receiving a safety injection (SI) signal, four ESW and UHS divisions are actuated, but only two divisions are needed to achieve a safe shutdown under DBA conditions.

The non-coincident, 0% exceedance wet bulb temperature of 81°F in U.S. EPR FSAR Tier 2, Table 9.2.5-2 is the design inlet wet bulb temperature for the UHS cooling towers. U.S. EPR SR 3.7.19.2 verifies once every 24 hours that the UHS cooling tower basin temperature is ≤ 90°F. As described in U.S. EPR FSAR Tier 2, Section 9.2.5, each UHS division is sized to provide adequate cooling capacity as required by RG 1.27.

U.S. EPR FSAR Tier 2, Table 9.2.5-4 provides the limiting 24-hour meteorological conditions, with the highest running average wet bulb and coincident dry bulb temperatures that result in minimum mechanical draft cooling tower cooling, where the maximum hourly wet bulb temperature is 85.3°F. The data in this table are considered when determining the maximum UHS basin water temperature. The bounding DBA heat load corresponds to a LBLOCA. Analyses confirm that considering a bounding DBA heat load during the limiting 24-hour meteorological conditions (resulting in the minimum MDCT cooling performance for the first 24 hours of a DBA LBLOCA), the maximum UHS basin temperature only reaches 93.5°F and does not exceed the U.S. EPR maximum design basis UHS basin water temperature limit of 95°F for the duration of a DBA. After 24 hours, the UHS basin temperature decreases below 90°F. The analyses considered an initial UHS basin temperature of 92°F (Technical Specification limit of 90°F, plus 2°F for instrument uncertainty).

U.S. EPR FSAR Tier 2, Table 9.2.5-3—Design Values for Maximum Evaporation and Drift Losses of Water from the UHS, provides the 72-hour meteorological conditions with the highest running 72-hour average wet bulb and coincident dry-bulb temperatures, which result in the maximum evaporative loss of water from the UHS. The maximum hourly wet bulb temperature is 78.72°F. The data in this table are considered when determining the maximum UHS evaporative losses for UHS volume requirements for basin sizing. Analyses confirm that the UHS inventory evaporative losses are maximized when considering these meteorological conditions with an initial basin water temperature of 92°F (Technical Specification limit of 90°F, plus 2°F for instrument uncertainty) and the bounding DBA LBLOCA heat loads. Therefore, when considering both the UHS basin sizing and cooling tower performance, a UHS basin temperature of 90°F is bounding for the U.S. EPR meteorological conditions that are described in the U.S. EPR FSAR.

If an ambient wet bulb temperature is assumed to exceed 81°F, 78.72°F or 85.3°F for long periods of time during normal plant operation, it is possible that the UHS basin water temperature of the operating division may exceed the SR temperature of 90°F, depending upon the heat loads on the cooling tower and the postulated wet bulb temperature and its duration. In that case, the plant enters a Limiting Condition of Operation (LCO) requiring remedial actions in accordance with the applicable Technical Specification action statements. Therefore, an additional UHS LCO condition, related to ambient wet bulb temperature (exceeding 81°F, 78.72°F or 85.3°F) is not necessary.

Item d:

The U.S. EPR UHS cooling tower basin water temperature (SR 3.7.19.2) requires verification at a 24-hour frequency that the water temperature of each UHS cooling tower basin is ≤ 90°F. Under the limiting combination of environmental conditions and bounding DBA heat loads, Technical Specification limit of 90°F, plus 2°F for instrument uncertainty, provides reasonable assurance that the maximum UHS cooling tower basin temperature does not exceed the U.S. EPR DBA temperature limit of 95°F.

The UHS basin temperature and water level provide reasonable assurance, in accordance with RG 1.27, that the UHS is capable of performing its intended heat removal functions. Per the guidance of RG 1.27, an appropriate limiting combination of controlling meteorological parameters were used to confirm the adequacy of the design and neither the design or Technical Specifications need to address the potential or consequences of exceeding those limiting meteorological parameters. Thus, the impact of exceeding the limiting wet bulb temperature has not been calculated (and the RG does not require that it be calculated), although it is known that increasing wet bulb temperature decreases the performance of the system. RG 1.27 has been confirmed to be implemented in this manner in the Standard Technical Specifications and in the Technical Specifications for numerous operating plants.

<u>Item e:</u>

U.S. EPR FSAR Tier 2, Section 9.2.5 contains the following related discussion:

- U.S. EPR FSAR Tier 2, Section 9.2.5.3.1 states:

  "To account for potential recirculation and interference effects of the cooling towers, an inlet wet bulb correction factor is used."

- U.S. EPR FSAR Tier 2, Section 9.2.5.3.3 states:

  "For site-specific meteorological conditions that are outside the bounds of the assumptions presented in Table 9.2.5-3 and Table 9.2.5-4 the COL applicant will confirm by analysis that the U.S. EPR design acceptably meets any additional requirements that may be imposed by the more limiting site-specific meteorological conditions and that the design maintains conformance to the design commitments and acceptance criteria described in this FSAR."

- U.S. EPR Combined License Information Item No. 9.2-6 states:

  "A COL applicant that references the U.S. EPR design certification will confirm by analysis of the highest average site-specific wet bulb and dry bulb temperatures over a 72-hour period from a 30-year hourly regional climatological data set that the site-specific evaporative and drift losses for the UHS are bounded by the values presented in Table 9.2.5-3."

U.S. EPR FSAR Tier 2, Table 1.8-2 – U.S. EPR Combined License Information Items, and U.S. EPR FSAR Tier 2, Section 9.2.5.3.3, both reflect the information in COL Information Item No. 9.2-6.

- U.S. EPR FSAR Tier 2, Section 9.2.5.3.1 contains COL Information Item No. 9.2-7:

  "A COL applicant that references the U.S. EPR design certification will confirm that the site characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor does not exceed the value provided in Table 9.2.5-2. If the value in Table 9.2.5-2 is exceeded, the maximum UHS cold-water return temperature of 95°F is to be confirmed by analysis (see Section 9.2.5.3.3)."

U.S. EPR FSAR Tier 2, Table 1.8-2 – U.S. EPR Combined License Information Items, COL Information Item No. 9.2-7, will be revised so that it correctly reflects the text in U.S. EPR FSAR Tier 2, Section 9.2.5.3.1.

- U.S. EPR FSAR Tier 2, Section 9.2.5.3.3 contains COL Information Item No. 9.2-11:

> “A COL applicant that references the U.S. EPR design certification will confirm that the maximum UHS cold-water return temperature of 95°F is met by an analysis that confirms that the limiting combination of site-specific wet bulb and dry bulb temperatures over a 24-hour period from a 30-year hourly regional climatological data set are bounded by the values presented in Table 9.2.5-4.”

U.S. EPR FSAR Tier 2, Table 1.8-2 – U.S. EPR Combined License Information Items, will be revised to add COL Information Item No. 9.2-11.

U.S. EPR COL Information Item Nos. 9.2-6, 9.2-7 and 9.2-11 adequately address the ambient wet bulb temperature issues identified in RAI 518, Question 09.02.05-38. Except for the administrative changes made to U.S. EPR FSAR Tier 2, Table 1.8-2, no additional changes to any U.S. EPR COL information items are required.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.8-2 and Section 9.2.5.4 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 23 of 41

Item No.	Description	Section
9.2-1	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).	9.2.5.2
9.2-2	A COL applicant that references the U.S. EPR design certification will provide site-specific details related to the sources and treatment of makeup to the potable and sanitary water system along with a simplified piping and instrument diagram.	9.2.4.2.1
9.2-3	The raw water supply system (RWSS) and the design requirements of the RWSS are site-specific and will be addressed by the COL applicant.	9.2.9
9.2-4	A COL applicant that references the U.S. EPR design certification will provide a description of materials that will be used for the essential service water system (ESWS) at their site location, including the basis for determining that the materials being used are appropriate for the site location and for fluid properties that apply.	9.2.1.3.5
9.2-5	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.	9.2.5.2
9.2-6	A COL applicant that references the U.S. EPR design certification will confirm by analysis of the highest average site-specific wet bulb and dry bulb temperatures over a 72-hour period from a 30-year hourly regional climatological data set that the site-specific evaporative and drift losses for the UHS are bounded by the values presented in Table 9.2.5-3.	9.2.5.3.3
9.2-7	A COL applicant that references the U.S. EPR design certification will confirm that the site characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor~~, which accounts for potential recirculation and interference effects of the cooling towers,~~ does not exceed the value provided in Table 9.2.5-2. If the value in Table 9.2.5-2 is exceeded, ~~a COL applicant will complete an analysis that demonstrates that~~ the maximum UHS cold-water return temperature of 95°F is to be confirmed by analysis (see Section 9.2.5.3.3)~~not exceeded using the worst combination of site-specific wet bulb and dry bulb temperatures over a 24-hour period from a 30-year hourly regional climatological data set~~.	9.2.5.3.1

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 24 of 41

Item No.	Description	Section
9.2-8	A COL applicant that references the U.S. EPR design certification will confirm that the site-specific UHS makeup capacity is sufficient to meet the maximum evaporative and drift water loss after 72 hours through the remainder of the 30-day period consistent with RG 1.27.	9.2.5.3.3
9.2-9	A COL applicant that references the U.S. EPR design certification will compare site-specific chemistry data for normal and emergency makeup water to the parameters in Table 9.2.5-5. If the specific data for the site fall within the assumed design parameters in Table 9.2.5-5, then the U.S. EPR standard design is bounding for the site. For site-specific normal and emergency makeup water data or characteristics that are outside the bounds of the assumptions presented in Table 9.2.5-5, the COL applicant will provide an analysis to confirm that the U.S. EPR UHS cooling towers are capable of removing the design basis heat load for a minimum of 30 days without exceeding the maximum specified temperature limit for ESWS and minimum required basin water level.	9.2.5.2
9.2-10	A COL applicant that references the U.S. EPR design certification will perform an evaluation of the interference effects of the UHS cooling tower on nearby safety-related air intakes. This evaluation will confirm that potential UHS cooling tower interference effects on the safety related air intakes does not result in air intake inlet conditions that exceed the U.S. EPR Site Design Parameters for Air Temperature as specified in Table 2.1-1.	9.2.5.3.1
9.2-11	A COL applicant that references the U.S. EPR design certification will confirm that the maximum UHS cold-water return temperature of 95°F is met by an analysis that confirms that the worst combination of site-specific wet bulb and dry bulb temperatures over a 24-hour period, from a 30-year hourly regional climatological data set, is bounded by the values presented in Table 9.2.5-4.	9.2.5.3.3
9.4-1	A COL applicant that references the U.S. EPR design certification will provide site-specific design information for the turbine building ventilation system (TBVS).	9.4.4
9.4-2	A COL applicant that references the U.S. EPR design certification will provide site-specific design information for the switchgear building ventilation system, turbine island (SWBVS).	9.4.4
9.5-1	A COL applicant referencing the U.S. EPR certified design will identify additional site-specific communication locations necessary to support effective communication between plant personnel in all vital areas of the plant during normal operation, as well as during accident conditions.	9.5.2.3

needed, any other piping and components subject to freezing conditions are provided with freeze protection design features, such as heat tracing.

Based on the increase in heat removal during a DBA, a temperature of less than or equal to 90°F is maintained in the UHS basin during normal operation, so that the cooling tower basin temperature does not exceed 95°F. 95 °F is the maximum design basis UHS basin temperature for the duration of a DBA. The normal UHS basin temperature of less than or equal to 90 °F and DBA UHS basin temperature of less than or equal to 95 °F are the bases for ESWS temperatures listed in Table 9.2.5-1. A value of 92 °F normal ESWS temperature is used for sizing the CCWS heat exchanger.

If the ambient wet bulb temperature increases to above the design inlet wet bulb temperature (81°F) specified in U.S. EPR FSAR Tier 2, Table 9.2.5-2, due to diurnal variations shown in U.S. EPR FSAR Tier 2, Table 9.2.5-4, the UHS basin water temperature will increases. However, analyses demonstrate that the maximum basin water temperature does not exceed the maximum design cold water (outlet) temperature (95°F) given in U.S. EPR FSAR Tier 2, Table 9.2.5-2 during a DBA condition.

9.2.5.5 Safety Evaluation

The UHS pump buildings and cooling towers are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles and other natural phenomena. Sections 3.3, 3.4, 3.5, 3.7, and 3.8 provide the basis for the adequacy of the structural design of these structures. The aboveground piping and components are protected by the structures.

The UHS is designed to remain functional after a safe shutdown earthquake (SSE). Sections 3.7 and 3.9 provide the design loading conditions that are considered. Sections 3.5, 3.6 and 9.5.1 provide the hazards analyses to verify that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

The four division design of the UHS provides complete redundancy; therefore a single failure will not compromise the UHS system safety-related functions. Each division of UHS is independent of any other division and does not share components with other divisions or with other nuclear power plant units.

Considering preventative maintenance and a single failure, two UHS divisions may be lost, but the ability to achieve the safe shutdown state under DBA conditions can be reached by the remaining two UHS divisions. In case of LOOP the four UHS cooling towers have power supplied by their respective division EDGs. Isolation valves can isolate non-safety-related portions of the system if necessary without compromising the safety-related function of the system.