ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Tuesday, August 17, 2010 5:53 PM
To: Tesfaye, Getachew
Cc: Hearn, Peter; ROMINE Judy (AREVA); KOWALSKI David (AREVA)
Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Attachments: Blank Bkgrd.gif; DRAFT RESPONSE RAI 345 Q.09.02.01-48.pdf; DRAFT RESPONSE RAI 345 Q.09.02.01-50.pdf; DRAFT RESPONSE RAI 351 Q.09.02.05-30 (f)(Part 1).pdf; DRAFT RESPONSE RAI 351 Q.09.02.05-31 (3).pdf; DRAFT RESPONSE RAI 351 Q.09.02.05-32 (2c).pdf; DRAFT RESPONSE RAI 351 Q.09.02.05-31 (d).pdf

Importance: High

Getachew,

Attached are the requested hard copies from the telecon today.

Thanks,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
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From: KOWALSKI David (RS/NB)
Sent: Tuesday, August 17, 2010 5:23 PM
To: BRYAN Martin (External RS/NB)
Cc: BALLARD Bob (EP/PE); CONNELL Kevin (EP/PP); HUDDLESTON Stephen (EP/PE); HARTSELL Jody (EP/PE); BRYANT Chad (EP/PE); GARDNER Darrell (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 345 and 351 questions. These responses were shared with the NRC reviewers thru a GoToMeeting during Tuesday afternoon's (8/17/10) FSAR Chapter 9 Weekly Telecon. The reviewers have requested that a hard copy be made available to them.

Attached are the following DRAFT response(s):

- Response to RAI 345 - Question 09.02.01-48.
- Response to RAI 345 - Question 09.02.01-50.
- Response to RAI 351 - Question 09.02.05-30(f)(1).
- Response to RAI 351 - Question 09.02.05-31(d).
- Response to RAI 351 - Question 09.02.05-31(3).

- Response to RAI 351 - Question 09.02.05-32(2c).

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

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Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Sent Date: 8/17/2010 5:52:40 PM
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From: BRYAN Martin (EXTERNAL AREVA)

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Files	**Size**	**Date & Time**
MESSAGE	1871	8/17/2010 5:53:01 PM
Blank Bkgrd.gif	210	
DRAFT RESPONSE RAI 345 Q.09.02.01-48.pdf	316351	
DRAFT RESPONSE RAI 345 Q.09.02.01-50.pdf	274027	
DRAFT RESPONSE RAI 351 Q.09.02.05-30 (f)(Part 1).pdf	226468	
DRAFT RESPONSE RAI 351 Q.09.02.05-31 (3).pdf	261706	
DRAFT RESPONSE RAI 351 Q.09.02.05-32 (2c).pdf	307790	
DRAFT RESPONSE RAI 351 Q.09.02.05-31 (d).pdf	226733	

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

Response to

Request for Additional Information No. 345

3/04/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.01 - Station Service Water System
Application Section: 9.2.1

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

DRAFT

Question 09.02.01-48:

Follow-up to RAI 119, Question 9.2.1-22

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the information provided in Table 2.7.11-3, "Essential Service Water System Inspections, Tests, Analyses, and Acceptance Criteria," to confirm that the proposed ITAAC are adequate for EPR design certification. In addition to the items referred to in RAI 9.2.1-1 through -9 and RAI 9.2.1-21, some of which involve ITAAC considerations, the staff found that the proposed ITAAC are incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

Part 4: Quantitative acceptance criteria needed to be established for all ITAAC as applicable (flow rates, heat transfer rates, completion times, etc.).

Based on the staff's review of response to RAI 119, Question 9.2.1-22 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.

1. The applicant's response to Question 4 of RAI 9.2.1-22 states that FSAR Tier 1, Section 2.7.11 and Table 2.7.11-3 would be revised to list quantitative acceptance criteria for applicable ESWS ultimate heat sink (UHS) ITAAC. This information was missing from the FSAR markup.
2. The acceptance column of ITAAC 7.6 Part b, which requires confirmation of "the following" ESWS response time, however, no response time requirement is identified.
3. The acceptance column of ITAAC 7.6 Part b states "a report exists and concludes that the ESWS starts within the following required time in reponsed to a simulated actuation signal". The applicant should consider adding the response time to Tier 1.

Response to Question 09.02.01-48:

1. Refer to the RAI 345, Q 09.02.01-45 for the quantitative acceptance criteria applicable to the ESWS ultimate heat sink (UHS) ITAAC.

2. The ESWS response time will be added to ITAAC 7.6 Part b as indicated on the enclosed markup.

3. Refer to Item 2 response above.

FSAR Impact:

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

DRAFT

INSERT for RAI 345, Question 09.02.01-48 Response

INSERT for Item 7.6 in Table 2.7.11.-3:

7.6		b. An integrated system test will be performed to verify the startup time of the ESWS.	b. The ESWS starts and delivers water to the CCWS and EDG heat exchangers, and the ESWPBVS room cooler within 120 seconds at the following minimum design flow rate: a. CCWS $\geq$ 7.54E+06 lb_m/hr b. EDG $\geq$ 1.06E +06 lb_m/hr c. A report exists and concludes: ESWPBVS $\geq$ 0.0685E +06 lb_m/hr

Editorial

Make the first part of ITA and AC a part "a."

DRAFT

Response to

Request for Additional Information No. 345

3/04/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.01 - Station Service Water System
Application Section: 9.2.1

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

DRAFT

Question 09.02.01-50:

Follow-up to RAI 119, Question 9.2.1-21

Applications for standard plant design approval must contain proposed ITAAC in accordance with 10 CFR 52.47(b)(1) requirements. Proposed ITAAC for the ESWS are provided in Tier 1 FSAR Section 2.7.11. The staff reviewed the descriptive information, arrangement, design features, environmental qualification, performance requirements, and interface information provided in Tier 1 FSAR Section 2.7.11 to confirm completeness and consistency with the plant design basis as described in Tier 2 Section 9.2.1. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed and the applicant needs to revise the Tier 1 information to address the following considerations in this regard:

> Part 13 question: Figure 2.7.11-1, "Essential Service Water System Functional Arrangement," does not show nominal pipe sizes, which are necessary for design certification.

Based on the staff's review of response to RAI 119, Question 9.2.1-21, the following related item was identified.

Tier 1 Figure 2.7.11-1 does not clearly show ASME Code Classifications, for example, ASME Class 2 or 3, reference Appendix A to RG 1.206, Page C.II.1-A-1, item 4. The applicant should consider adding this information to Tier 1 Figure 2.7.11-1.

Response to Question 09.02.01-50:

Refer to RAI 399 Question 14.03.03-47 for the response to this question.

FSAR Impact:

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

DRAFT

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 09.02.05-30:

Follow-up to RAI 175, Question 9.2.5-17:

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 descriptive information, arrangement, design features, environmental qualification, performance requirements, and interface information provided in Tier 1 Final Safety Analysis Report (FSAR) Section 2.7.11 to confirm completeness and consistency with the plant design basis as described in Tier 2 Section 9.2.5. The staff found that the Tier 1 information is incomplete, inconsistent, inaccurate, or that clarification is needed with respect to the following considerations:

a. Although the Introduction Section in Chapter 1 of the Tier 1 FSAR states that the information in the Tier 1 portion of the FSAR is extracted from the detailed information contained in Tier 2, the staff found that much of the information provided in FSAR Tier 1 is not described in Tier 2 FSAR Section 9.2.5 (e.g., equipment locations, valve functional requirements, indication and control information, priority actuation and control system description and functions, automatic actuation and interlock details, valve failure modes, and harsh environment considerations). This Tier 1 information needs to be added to Tier 2.

b. FSAR Tier 1 does not stipulate that the ultimate heat sink (UHS) is accessible for performing periodic inspections as required by General Design Criteria (GDC) 45.

c. FSAR Tier 1 does not stipulate that the UHS design provide for flow testing of makeup water for accident and emergency conditions.

d. FSAR Tier 1 does not stipulate that the essential service water system (ESWS) pumps are protected from debris from the cooling towers.

e. FSAR Tier 1 does not stipulate that the safety related UHS outdoor piping is adequately protected from the elements and postulated hazards.

f. Tier 1, Figure 2.7.11-1, “Essential Service Water System Functional Arrangement,” does not show nominal pipe sizes for the UHS, which are necessary for design certification. This table does not show design information for the UHS fans.

g. Tier 1, Table 2.7.11-2, “Essential Service Water System Equipment I&C and Electrical Design,” does not include information pertaining to the UHS fans and corresponding power supplies.

h. The point of Note 2 for Tier 1, Table 2.7.11-2 is not clear since it does not appear to pertain to anything on the table. However, this appears to be due to an oversight whereby dedicated ESWS components are not listed in the table.

i. The discussion under Item 6 Tier 1 of Table 2.7.11-2 related to environmental qualification is inconsistent with the information provided in Table 2.7.11-2 in that no equipment is listed in the table for harsh environment considerations.

Based on the staff’s review of the applicant's response to RAI 9.2.5-17 (ID1817/6814) AREVA #175, Supplement 3, the following were determined as unresolved and needed further clarification/resolution by the applicant.

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The applicant's response to Item (b) focuses on inservice inspection requirements, while the question that was asked focuses on the requirement specified by 10 CFR 50, Appendix A, General Design Criterion (GDC) 45. GDC 45 requires that "the cooling water system shall be designed to permit appropriate periodic inspections of important components, such as heat exchangers and piping, to assure the integrity and capability of the system." Therefore, the capability to perform periodic inspections of important components needs to be described in FSAR Tier 2 and ITAAC need to be established to confirm this aspect of the design.

With regard to the response to Item (d), the staff does not agree that screens and filters that are solely for equipment protection are not safety significant. Filters and screens are relied upon to ensure that debris, aquatic organisms, and other material that find their way into the cooling tower basins do not adversely impact the capability of the essential service water system and ultimate heat sink to perform their safety functions. Without the screens and filters, pumps and valves can be damaged and rendered inoperable, heat exchanger tubes and cooling tower spray nozzles can become clogged, and heat transfer surfaces can become fouled. Therefore, ITAAC are needed to confirm the installation and proper mesh size of the filters and screens that are relied upon. Additionally, FSAR Tier 2 Sections 9.2.1 and 9.2.5 need to be revised to describe important filter and screen design specifications such as maximum allowed differential pressure and mesh size, including the bases for these specifications.

The response to Item (e) indicates that the UHS does not have any safety-significant outdoor piping within the scope of design certification. Based on this, the staff agrees that ITAAC are not needed to confirm adequate protection of exposed equipment. However, ITAAC are needed to confirm that ESWS and UHS piping and components are not exposed to the elements and postulated hazards. Additionally, based upon further review, the staff found that additional information needs to be included in the FSAR to address freeze protection considerations, especially for divisions that are in standby and for those parts of the cooling tower that are exposed and vulnerable to cold weather conditions.

The response to Item (f) refers to a response that was provided to RAI 9.2.1-22 (AREVA RAI No. 119, Supplement 1). The response indicates that line sizing details will be identified later in the design process. Consequently, this item remains open pending submittal of the information that was requested and a schedule for providing this information needs to be established.

In response to second part of Item (f), the applicant stated that design information for the UHS fans will be added to FSAR Tier 1, Table 2.7.11-2, "Essential Service Water System Equipment I&C and Electrical Design," as part of the response to Item (g) of this RAI. The staff noted that the FSAR markup of Table 2.7.11-2 does not specify alternate power supplies for the two fans in Essential Service Water (ESW) Building 4. In this regard, additional information is needed to explain why an alternate power source is not specified for the ESW Building 4 cooling tower fans since they are necessary to support operation of the dedicated ESW train. The dedicated ESW train is provided to mitigate accidents that are beyond the design basis when normal backup power may not be available. Therefore, the applicant should specify an alternate power source for these fans similar to that shown for several other dedicated ESW train components in FSAR Tier 1 Table 2.7.11-2.

Response to Question 09.02.05-30:

Item (f)(1)

DRAFT

As stated in the response to RAI 345 9.2.1-28 part a, “Pipe diameters for all branches of the ESWS are based on limiting the flow velocity to 10 ft/sec for normal modes of operation that are expected to occur frequently. ESW piping in each train is sized to provide sufficient flow in that train to remove design head loads from system user heat exchanges under normal operating, shutdown/cooldown, design basis accident, and (for ESW Train 4 only) severe accident conditions with flow velocities less than 10 feet per second.” This response explaining the basis for ESWS pipe diameter sizing criteria also applies to the UHS piping inside the Essential Service Water Pump Building and Cooling Tower Structure (ESWPB and ESWCT(S)).

FSAR Impact:

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

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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 09.02.05-31:

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 3

Tier 1 Table 2.7.11-3 ITAAC 7.1 verifies the equipment as listed in Table 2.7.11-1 has the capacity to remove the design heat load from the CCWS. 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 addition, the cooling tower fans are verified through Tier 2 Section 14.2 Test 049 and periodically confirmed through Tier 2 Section 16 Surveillance Requirements 3.7.19.3. As stated in response to RAI 351 9.2.5-32(2)(c), the Test 049 section 3.1.2 will be revised to say "Demonstrate that fans operate in each speed setting and direction, including reverse". Surveillance 3.7.19.3 requires operating each cooling tower fan for ≥ 15 minutes in each speed setting and direction, including reverse verifies that all fans are OPERABLE and that all associated controls are functioning properly. It also ensures that fan or motor failure, or excessive vibration, can be detected for corrective action at a frequency of 31 days.

Tier 1 Table 2.7.11-3 ITAAC 4.3 verifies equipment listed as being controlled by a PACS module in Table 2.7.11-2, which includes the eight cooling tower fans, responds to the state requested by the test signal. In addition, Surveillance 3.7.19.4 verifies proper automatic operation of the UHS cooling tower fans on an actual or simulated actuation signal at a frequency of 24 months. Thus, the cooling tower fan response to actuation signal is verified through ITAAC and periodically through a surveillance requirement.

FSAR Impact:

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

DRAFT

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.

DRAFT

Response to Question 09.02.05-32:

Item (2)(c)

Test 049 Section 3.1.2 will be revised to say “Demonstrate that fans operate in each speed setting and direction, including reverse”.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 14.2.12.5.8 (Test 049) will be revised as described in the response and indicated on the enclosed markup.

DRAFT

2.5 Test instrumentation available and calibrated per applicable procedures.

2.6 Appropriate AC and DC power sources are available.

2.7 UHS basin support systems required for operation of the UHS and ESWS are available, as required.

2.8 The UHS basin is filled to normal operating levels.

3.0 TEST METHOD

3.1 Demonstrate operation of the UHS tower over the design range of operation.

each speed setting and direction, including reverse.

3.1.1 Simulate a UHS operating temperature that corresponds to the lower range of operation.

3.1.2 Demonstrate that fans operate in the reverse direction.

3.1.3 Demonstrate that tower bypass paths realign to mitigate ice formation.

3.1.4 Simulate a gradual increase in ambient UHS temperature and terminate the ambient temperature increase at the upper end of the design operation band.

3.1.5 Record changes to tower fans and critical component operation during temperature increase.

3.2 Perform valve performance tests (e.g., valve position response of valves to loss of motive power, thrust, stroke time).

3.3 Demonstrate that UHS makeup flow rate meets design flow requirements.

3.3.1 During normal operation.

3.3.2 During emergency operation.

3.4 Demonstrate that UHS blowdown flow rate meets design flow requirements.

3.4.1 During normal operation.

3.4.2 During emergency operation.

3.5 Demonstrate the operation of UHS level and temperature instruments and alarms.

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

3.7 Demonstrate that the chemical treatment system functions as designed.

3.7.1 Injection flow rate to UHS.

3.7.2 Interlocks with UHS blowdown.

DRAFT

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 (d)

The acceptance criteria for Tier 1 Table 2.7.11-3 ITAAC 7.6 was revised to say the following in response to RAI 345 9.2.1-45: “A report exists and concludes that the ESWS delivers the combined total flow rate of at least 19,340 gpm to the CCWS and EDG heat exchangers, and the ESWPBVS room cooler”. The request to add “greater than or equal to” was met with the inclusion of “at least”.

FSAR Impact:

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

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