

ArevaEPRDCPEm Resource

From: DUNCAN Leslie E (AREVA NP INC) [Leslie.Duncan@areva.com]
Sent: Thursday, February 18, 2010 1:56 PM
To: Tesfaye, Getachew
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); LENTZ Tony F (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 347, FSAR Ch. 14, Supplement 1
Attachments: RAI 347 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for responding to RAI No. 347 on January 28, 2010. The attached file, "RAI 347 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 4 questions, as committed.

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 347 Questions 14.02-146, 14.02-147, and 14.02-148.

The following table indicates the respective pages in the response document, "RAI 347 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 347 — 14.02-145	2	2
RAI 347 — 14.02-146	3	3
RAI 347 — 14.02-147	4	4
RAI 347 — 14.02-148	5	5

This concludes the formal AREVA NP response to RAI 347, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Les Duncan
Licensing Engineer
AREVA NP Inc.
An AREVA and Siemens Company
Tel: (434) 832-2849
Leslie.Duncan@areva.com

From: DUNCAN Leslie E (AREVA NP INC)
Sent: Thursday, January 28, 2010 1:36 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); LENTZ Tony F (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 347, FSAR Ch. 14

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 347 Response US EPR DC.pdf," provides the schedule for technically correct and complete responses to these questions.

The following table indicates the respective pages in the response document, "RAI 347 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 347 — 14.02-145	2	2
RAI 347 — 14.02-146	3	3
RAI 347 — 14.02-147	4	4
RAI 347 — 14.02-148	5	5

A complete answer is not provided for the 4 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 347 — 14.02-145	February 19, 2010
RAI 347 — 14.02-146	February 19, 2010
RAI 347 — 14.02-147	February 19, 2010
RAI 347 — 14.02-148	February 19, 2010

Sincerely,

Les Duncan
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, December 22, 2009 11:57 AM
To: ZZ-DL-A-USEPR-DL
Cc: Tomon, John; Rasmussen, Richard; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 347 (4129), FSARCh. 14

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 18, 2009, and on December 21, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs, excluding the time period of **December 25, 2009 thru January 3, 2010, to account for the holiday season** as discussed with AREVA NP. For any RAIs that cannot be answered **within 40 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-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: 1151

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From: DUNCAN Leslie E (AREVA NP INC)

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Response to

Request for Additional Information No. 347 (4129), Supplement 1, Revision 0

12/22/2009

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

**SRP Section: 14.02 - Initial Plant Test Program - Design Certification and New
License Applicants**

Application Section: SRP 14.02 (NUREG 0800)

QUESTIONS for Quality and Vendor Branch 2 (ESBWR/ABWR) (CQVB)

Question 14.02-145:

Follow-up to RAI 176, Question 14.02-93 (b)

The NRC staff reviewed the applicant's response to RAI question 14.02-93 part (b) and requests that the applicant clarifies and/or includes the following information into U.S. EPR FSAR section 14.2.12.5.5, "Component Cooling Water System (CCWS) (Test #046)":

- a. In test method item 3.4, the lead sentence requires verification of flow path isolations in response to "emergency signals." Since the terminology "emergency" is frequently used in reference to design basis accidents, the NRC staff requests that the applicant clarify whether emergency signal applies only to accident conditions (e.g. safety injection) or if it is also intended to apply to individual surge tank level set-points independent of a safety injection signal.
- b. In test method item 3.4.a the applicant use the term "non-safety headers outside of the reactor building" is confusing; therefore, the NRC staff requests that the applicant define these headers to avoid confusion with other loads (e.g. fuel handling building) that are not isolated on a safety-injection signal.
- c. Test method item 3.4.b indicates that non-safety piping will be isolated when the surge tank level is below MIN2 if there is a difference between inlet and outlet flow rate. This also appears to apply to the non-safety loads in the reactor auxiliary and radwaste buildings. Therefore the NRC staff requests that the applicant revise the description to be consistent and also state whether or not a safety injection signal is required for this action to occur.
- d. Test method item 3.4.d describes control actions that take place "below" various surge tank level set-points. However, US FSAR Tier 2 Section 9.2.2 indicates that control actions take place when the level set-points are reached. Therefore the NRC staff requests that the applicant clarify test method item 3.4.d to accurately reflect when the control actions occur.
- e. The NRC staff requests that the applicant clarify the terminology used in describing the equipment isolation.

Response to Question 14.02-145:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 will be revised as described in the Response to Question 14.02-147.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 will be revised as described in the Response to Question 14.02-147.

Question 14.02-146:

In U.S. EPR FSAR section 14.2.12.5.5, "Component Cooling Water System (CCWS) (Test #046), the applicant states in acceptance criteria item 5.1.6 that "CCW pump differential pressure signal starts the idle pump in each division; " however, FSAR section 9.2.2 design safety related (SR) CCWS train contains only a single pump per division. Therefore, the NRC staff requests that the applicant clarify the intent of acceptance criteria item 5.1.6 and update the FSAR accordingly.

Response to Question 14.02-146:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 acceptance criteria will be revised to clarify that the response to safety-related simulated signals meets design requirements, which will encompass acceptance criteria 5.1.6. Acceptance criteria 5.1.6 will be deleted.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-147:

Follow-up to RAI 176, Question 14.02-93 (d)

In RAI question 14.02-93 part (d), the NRC staff requested that AREVA revise test abstract #046 to include the testing of the automatic switchover function and the partial switchover function of the common headers in response to the various control signals or justify the exclusion of such testing. In its response to this question the applicant stated that "the U.S. EPR design generates a non-safety header closure with a CCWS surge tank level less than MIN2 concurrent with a measured difference between the inlet and outlet flow of each branch and that test abstract #046 was revised in the response to RAI 144, Question 14.02-72 to address this correction. However, neither the applicant's responses to part (d) nor the markup of test abstract #046 addressed these features for the automatic common header switchover function and the partial switchover functions. Therefore, the NRC staff requests that the applicant revise test abstract #046 to include the testing of the automatic switchover function and the partial switchover function of the common headers in response to the various control signals or justify the exclusion of such testing.

Response to Question 14.02-147:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 will be revised to include the testing of the automatic switchover function and the partial switchover function of the common headers in response to the control signals.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2, Test #046 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-148:

The NRC staff requests that the applicant revise US EPR FSAR section 14.2.12.3.2, "Containment Personnel Airlock Functional Leak Test (Test #025)," to replace the term "portion" with the term "position" in test method items 3.2 and 3.3.

Response to Question 14.02-148:

U.S. EPR FSAR Tier 2, Section 14.2, Test #025 will be revised to replace "portion" with "position" in test method items 3.2 and 3.3.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2, Test #025 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

5.0 ACCEPTANCE CRITERIA

- 5.1 Verify leak rate, when summed with the total of other Type B and C LRTs, does not exceed the limits as required by the Technical Specifications and 10 CFR 50, Appendix J.
- 5.2 The equipment hatch assembly operates in accordance with manufacturer instructions.
- 5.3 The equipment hatch meets design requirements (refer to Sections 3.1.5, 3.8.1, and 3.8.2).
 - 5.3.1 [Structural integrity test.](#)
 - 5.3.2 [Appendix J LRT.](#)
 - 5.3.3 [Verify alarms, interlocks, and system controls.](#)

14.2.12.3.2 Containment Personnel Airlock Functional and Leak Test (Test #025)

1.0 OBJECTIVE

- 1.1 To verify the measured leakage, through each containment personnel airlock, [when summed with the total of other Type B and Type C LRTs](#) is within the limits as required by the Technical Specifications and 10 CFR 50, Appendix J.
- 1.2 To verify each, containment personnel airlock, operates as designed in Sections 3.1.5, 3.8.1, and 3.8.2.

2.0 PREREQUISITES

- 2.1 Construction activities on the containment personnel airlocks have been completed.
- 2.2 Temporary pressurization equipment is installed and instrumentation is calibrated.
- 2.3 Electrical checks are complete on the hatches.

3.0 TEST METHOD

- 3.1 Operate each airlock in accordance with manufacturer instructions; verify alarms, interlocks and indications.

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- 3.2 Place each airlock in the closed [portionposition](#) and perform a 10 CFR 50, Appendix J, **and** Type B LRT.
- 3.3 Place each airlock in the closed [portionposition](#) and perform a structural integrity test at 110 percent of design basis accident pressure.

4.0 DATA REQUIRED

- 4.1 Individual airlock leak data.

- 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.
- 3.3 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).

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3.4 ~~Verify the following responses to emergency signals:~~
 a. ~~Non-safety related headers and the spent fuel pool heat exchangers are isolated on an SIAS.~~

3.4 Verify the ~~non-safety related headers and RCP headers are isolated on a surge tank low-low level signal~~stroke closure time of the CCWS switchover valves.

3.5 Verify ~~a low CCW pump differential pressure signal starts the idle pump in each division~~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 ~~MCR~~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.

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- 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 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.
 - 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.
 - 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.
 - CCWS Train 2 common 1.b supply and return switchover valves open.
 - CCWS Train 2 pump starts.
- 3.15 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.

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- 3.16 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.
 - 3.16.1 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). Verify the following actions occur:
 - CCWS common 1.b non-safety users isolation valves close.
 - CCWS common 1.b supply outer RB isolation valve closes.
 - 3.16.2 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.
 - 3.16.3 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 Emergency Backup Switchover function is enabled.
 - CCWS Emergency Temperature Control function is enabled.
- 3.17 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.
 - CCWS Train 1/2/3/4 LHSI heat exchanger isolation valves open.
 - CCWS common 2 non-safety users supply isolation valve closes.
 - CCWS common 2 non-safety users upstream and downstream isolation valves close.
 - CCWS common 1.b NAB non-safety users isolation valves close.
- 3.18 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.
 - 3.18.1 Simulate a containment stage 1 isolation signal to CCWS. Verify the following actions occur:
 - CCWS common 1 supply outer containment isolation valve closes.
 - CCWS common 1 return inner and outer containment isolation valves close.

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- 3.18.2 Simulate a containment stage 2 isolation signal to CCWS. Verify the following actions occur:
- CCWS 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.
- 3.19 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.
- 3.20 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:
- CCWS Train 1 common 1.a switchover valves with Train 2 common 1.a switchover valves
 - CCWS Train 3 common 2.a switchover valves with Train 4 common 2.a switchover valves
 - CCWS Train 1 common 1.b switchover valves with Train 2 common 1.b switchover valves
 - CCWS Train 3 common 2.b switchover valves with Train 4 common 2.b switchover valves
- 3.21 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Containment Isolation Valve Interlock function. Verify the following action occurs:
- CCWS common Train 1.b and 2.b can not be placed into service at the same time.
- 3.22 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.

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- CCWS Train 1 common 1.b supply and return switchover valves close.
- 3.23 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.
- 3.24 Verify that CCWS Train 1 is supplying the common 1.b header (main common user group), then perform test of CCWS Temperature Control function.
 - 3.24.1 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.
 - 3.24.2 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.
- 3.25 Perform Steps 3.14 through 3.24 for CCWS Trains 2, 3, and 4 to verify appropriate responses.

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, ~~CSAS~~CIAS, ~~low-low~~ surge tank level signal, and CCW ~~pump-high~~header differential ~~pressure~~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 ~~emergency~~safety-related simulated signals meets design requirements.
- 14.02-146 → 5.1.5 Non-safety-related headers and RCP headers are isolated on simulated signals.
- ~~5.1.6 CCW pump differential pressure signal starts the idle pump in each division.~~
- 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 ~~MCR~~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.
- 5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.5.6 Reserved (Test #047)

14.2.12.5.7 Essential Service Water System (Test #048)

1.0 OBJECTIVE

- 1.1 To demonstrate the ability of the ESWS to supply cooling water as designed under normal and emergency conditions, where the emergency includes postaccident system realignments, if applicable.
- 1.2 To demonstrate the ability of the ESWS to provide cooling water to the SAHRS in beyond design basis conditions.
- 1.3 To demonstrate the ability of the ESWS to provide cooling water to the essential service water pump building ventilation system (ESWPBVS).
- 1.4 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

- 2.1 Construction activities on the ESWS are complete and the system is functional.
- 2.2 ESWS instrumentation has been calibrated and is functional for performance of the following test.
- 2.3 Test instrumentation available and calibrated per applicable procedures.