## ArevaEPRDCPEm Resource

**From:** WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
**Sent:** Monday, July 16, 2012 5:21 PM
**To:** Tesfaye, Getachew
**Cc:** BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); GUCWA Len (EXTERNAL AREVA)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6, Supplement 3
**Attachments:** RAI 540 Supplement 3 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for technically correct and complete responses to the 6 questions in RAI 540 on April 23, 2012. Supplement 1 response to RAI 540 was sent on June 13, 2012 to provide a technically correct and complete response to Question 06.02.01.05-2. Supplement 2 response to RAI 540 was sent on July 3, 2012 to provide a technically correct and complete response to Question 06.02.01.01.A-3.

The attached file, "RAI 540 Supplement 3 Response US EPR DC.pdf" provides a technically correct and complete response to the remaining 4 questions. The following table indicates the respective pages in the response document, "RAI 540 Supplement 3 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 540 — 06.02.05-27 | 2 | 2 |
| RAI 540 — 06.02.05-28 | 3 | 3 |
| RAI 540 — 06.02.05-29 | 4 | 4 |
| RAI 540 — 06.02.05-30 | 5 | 6 |

This concludes the formal AREVA NP response to RAI 540, and there are no questions from this RAI for which AREVA NP has not provided responses.

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

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**From:** RYAN Tom (RS/NB)
**Sent:** Tuesday, July 03, 2012 1:48 PM
**To:** Tesfaye, Getachew
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); Michael.Miernicki@nrc.gov; WILLIFORD Dennis (RS/NB); GUCWA Len (External RS/NB)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for technically correct and complete responses to the 6 questions in RAI 540 on April 23, 2012. Supplement 1 response to RAI 540 was sent on June 13, 2012 to provide a technically correct and complete response to Question 06.02.01.05-2.

The attached file, "RAI 540 Supplement 2 Response US EPR DC.pdf" provides a technically correct and complete response to Question 06.02.01.01.A-3. The following table indicates the respective pages in the response document, "RAI 540 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 540 — 06.02.01.01.A-3 | 2 | 3 |

The schedule for technically correct and complete responses for the remaining 4 questions is unchanged and provided below.

| Question # | Response Date |
|---|---|
| RAI 540 — 06.02.05-27 | **July 17, 2012** |
| RAI 540 — 06.02.05-28 | **July 17, 2012** |
| RAI 540 — 06.02.05-29 | **July 17, 2012** |
| RAI 540 — 06.02.05-30 | **July 17, 2012** |

Sincerely,

***Tom Ryan***
***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

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**From:** RYAN Tom (RS/NB)
**Sent:** Wednesday, June 13, 2012 3:02 PM
**To:** Tesfaye, Getachew
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB); Miernicki, Michael; WILLIFORD Dennis (RS/NB)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for technically correct and complete responses to the 6 questions in RAI 540 on April 23, 2012. The attached file, "RAI 540 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to Question 06.02.01.05-2.

The following table indicates the respective pages in the response document, "RAI 540 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question. 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 540 Question 06.02.01.05-2.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 540 — 06.02.01.05-2 | 2 | 3 |

The schedule for technically correct and complete responses for the remaining 5 questions is unchanged and provided below.

| Question # | Response Date |
|---|---|
| RAI 540 — 06.02.01.01.A-3 | **July 6, 2012** |
| RAI 540 — 06.02.05-27 | **July 17, 2012** |
| RAI 540 — 06.02.05-28 | **July 17, 2012** |
| RAI 540 — 06.02.05-29 | **July 17, 2012** |
| RAI 540 — 06.02.05-30 | **July 17, 2012** |

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

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**From:** WILLIFORD Dennis (RS/NB)
**Sent:** Monday, April 23, 2012 1:29 PM
**To:** Getachew.Tesfaye@nrc.gov
**Cc:** BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 540 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the six questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 540 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 540 — 06.02.01.01.A-3 | 2 | 2 |
| RAI 540 — 06.02.01.05-2 | 3 | 3 |
| RAI 540 — 06.02.05-27 | 4 | 4 |
| RAI 540 — 06.02.05-28 | 5 | 5 |
| RAI 540 — 06.02.05-29 | 6 | 6 |
| RAI 540 — 06.02.05-30 | 7 | 7 |

The schedule for a technically correct and complete response to these 6 questions is provided below.

| Question # | Response Date |
|---|---|
| RAI 540 — 06.02.01.01.A-3 | **July 6, 2012** |
| RAI 540 — 06.02.01.05-2 | **June 14, 2012** |
| RAI 540 — 06.02.05-27 | **July 17, 2012** |
| RAI 540 — 06.02.05-28 | **July 17, 2012** |
| RAI 540 — 06.02.05-29 | **July 17, 2012** |
| RAI 540 — 06.02.05-30 | **July 17, 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

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**From:** Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
**Sent:** Thursday, March 22, 2012 4:43 PM
**To:** ZZ-DL-A-USEPR-DL
**Cc:** Peng, Shie-Jeng; Grady, Anne-Marie; McKirgan, John; Gleaves, Bill; Segala, John; ArevaEPRDCPEm Resource
**Subject:** U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 5, 2012, and discussed with your staff on March 15 and 22, 2012. Draft RAI Question 06.02.01.01.A-2 was deleted and Draft RAI Question 06.02.01.05-2 (a) was modified as a result of those discussions. 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/LB1
(301) 415-3361

**Hearing Identifier:** AREVA_EPR_DC_RAIs
**Email Number:** 3968

**Mail Envelope Properties** (2FBE1051AEB2E748A0F98DF9EEE5A5D4D4190D)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 540 (6300, 6308, 6329), FSAR Ch. 6, Supplement 3
**Sent Date:** 7/16/2012 5:21:21 PM
**Received Date:** 7/16/2012 5:22:35 PM
**From:** WILLIFORD Dennis (AREVA)

**Created By:** Dennis.Williford@areva.com

**Recipients:**
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"GUCWA Len (EXTERNAL AREVA)" <Len.Gucwa.ext@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

**Post Office:** auscharmx02.adom.ad.corp

| **Files** | **Size** | **Date & Time** |
|---|---|---|
| MESSAGE | 8050 | 7/16/2012 5:22:35 PM |
| RAI 540 Supplement 3 Response US EPR DC.pdf | 82192 | |

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

**Response to**

**Request for Additional Information No. 540, Supplement 3**

**3/22/2012**

**U. S. EPR Standard Design Certification**
**AREVA NP Inc.**
**Docket No. 52-020**
**SRP Section: 06.02.01.01.A - PWR Dry Containments, Including Subatmospheric Containments**
**SRP Section: 06.02.01.05 - Minimum Containment Pressure Analysis for Emergency Core Cooling System Performance Capability Studies**
**SRP Section: 06.02.05 - Combustible Gas Control in Containment**

**Application Section: 6.2**

**QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)**

**Question 06.02.05-27:**

**OPEN ITEM**

In RAI 410, Question 06.02.05-17, the following AREVA document was requested, and was reviewed by NRC staff in a Feb. 2012 audit:

AREVA document # 38-9175074-000

The original CEA document number is NT-SECA-LECC-96/003.

Study of Siemens FR 90/1/150 $H_2$ Recombiner Performance Under Spray Conditions.

This document summarizes performance tests conducted in the KALI vertical containment and referred to as “KALI H2”. The test spray water contained boric acid and sodium hydroxide, to be representative of actual containment sprays. However, in the U. S. EPR, the spray water from the IRWST will contain boric acid and trisodium phosphate (TSP). Explain or demonstrate how this test spray water is equivalent to the water to be used in the U. S. EPR IRWST. Discuss how these test results are applicable to the U. S. EPR PAR performance.

**Response to Question 06.02.05-27:**

A test program, in addition to the already performed $H_2$ KALI tests, was conducted to investigate the potential effects of TSP on the Passive Autocatalytic Recombiner (PAR) performance. The objective of this test program was to study the effects on PAR performance under containment spray conditions with a TSP, hydrazine, and boric acid solution. The test program identified that the PAR efficiency was not influenced by spraying of TSP, boric acid, and hydrazine.

Section 4.0 of the technical report ANP 10322P,“Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner,” discusses the effect of the TSP, hydrazine, and boric acid solution spray on the PAR performance.

**References for 06.02.05-27:**

1. ANP-10322P, Revision 0, “Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner,” AREVA NP Inc., June 2012.

**FSAR Impact:**

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

**Question 06.02.05-28:**

**OPEN ITEM**

38-9175080-000: Test Report for the Phase 3 EDF recombiner - Siemens recombiner Influence of combustion products of French electric cables on the Siemens hydrogen recombiner evaluated the PAR performance post exposure to the combustion products of an electric cable insulation fire.

The French cables tested were NC type, with PVC insulation and sheathing, and ADR K1 type insulation and Hypalon sheathing. Both types were tested. In the U. S. EPR design the cable insulation and sheathing is Hypalon. Please explain how these test results represent the effect of contamination by combustion products from the cable insulation in the U. S. EPR.

**Response to Question 06.02.05-28:**

The U.S. EPR cable design does not use a Hypalon sheathing over Hypalon insulation. The U.S. EPR cable design is expected to be consistent with an industry-typical design.

Two different electrical cable burn tests were performed: tests containing French plant-typical cables and tests containing U.S. plant-typical cables. In the U.S. plant-typical electrical cable test, cables containing chlorosulfonated polyethylene (the trade name is Hypalon) as cable jacket material were used. Hypalon contains halogenated agents and is identified as a recombiner poison. In the French plant-typical design, a PVC sheathing/insulation design and Hypalon sheathing/ethylene propylene rubber insulation design were tested. PVC is also a known recombiner poison. These two sets of tests bound the U.S. EPR cable design.

Section 5.0 of the technical report ANP 10322P,“Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner” discusses the cable burn tests and results.

**References for 06.02.05-28:**

1. ANP-10322P, Revision 0, “Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner,” AREVA NP Inc., June 2012.

**FSAR Impact:**

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

**Question 06.02.05-29:**

**OPEN ITEM**

RAI 474, Question 06.02.05-25 requested test reports documenting PAR functional behavior following exposure to $HNO_3$, produced from the radiolysis of water, and HCl, produced from the radiolysis of the cable insulation materials Hypalon and PVC. Provide the test reports that demonstrate acceptable PAR performance following exposure to these chemicals.

**Response to Question 06.02.05-29:**

See the response to RAI 474, Question 06.02.05-25.

**Question 06.02.05-30:**

**OPEN ITEM**

The NRC staff reviewed the following document in a Feb. 2012 audit.

AREVA doc # ETK 50/91/PB02, 1992; Siemens AG Power Generation Group KWU; Seligenstadter Str.; 8757 Karlstein (Main)

In the above report which summarized the results of several tests, the following detailed test reports addressing Siemens PAR functional performance were identified.

a. Siemens Working Report No. E 443/90/008

b. Test Report KSA 10/PB01/88

These tests investigated PAR capability under loads such as mechanical vibration, thermal and radiological loading, and chemical impurities in the containment atmosphere, and, of PAR integrity during operational vibrations and loads occurring during earthquakes.

Additional tests included:

- Functional test after prior loading through $H_2$ deflagration
- Long-term recombination tests after the catalyst had been subjected to severe fouling by residues from oil and cable fires.

Provide the two detailed tests reports identified above, so that Siemens PAR performance under these various conditions can be evaluated.

**Response to Question 06.02.05-30:**

The requested references “Siemens Working Report No. E 443/90/008” and “Test Report KSA 10/PB01/88” do not contain the desired detailed content regarding mechanical vibrations, thermal and radiological loading, $H_2$ deflagration tests and exposure to oil and cable fires.

These topics are discussed in the technical report ANP-10322P, Revision 0, “Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner.” The supporting test reports are available for NRC review.

Section 10.0 of ANP-10322P discusses the load calculations and structural stability analyses performed to verify the mechanical strength of a typical recombiner unit. The following load cases were considered in the calculation: normal operating, loss of coolant accident, design basis earthquake, and severe accident.

Chemical impurities are addressed in Section 2.0 of ANP-10322P, which discusses the Integrated Core-Melt Tests. The Passive Autocatalytic Recombiner (PAR) verified the functional capability to efficiently reduce the hydrogen concentration even under extreme adverse conditions such as simulation of realistic post-accident atmosphere with release of core melt aerosols including catalytic poisons (e.g., Te, Se, Sb, I). The presence of vapor and fission product aerosols did not cause detectable poisoning of the catalyst.

Section 6.0 of ANP-10322P discusses the PAR performance, based on several independent test series, after loading through $H_2$ deflagrations. No influence on the functional PAR behavior was observed in these tests.

Section 8.0 of ANP-10322P discusses the recombination test after exposure to an oil fire. The functional test after an oil fire exposure verified an immediate hydrogen depletion where the recombiner worked close to its nominal hydrogen depletion rate without significant degradation.

**References for 06.02.05-30:**

1. ANP-10322P, Revision 0, “Qualification and Testing of the U.S. EPR Passive Autocatalytic Recombiner,” AREVA NP Inc., June 2012.

**FSAR Impact:**

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