ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Wednesday, January 21, 2009 5:26 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 86, FSAR Ch 9, Supplement 2
Attachments: RAI 86 Supplement 2 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 7 of the 14 questions of RAI No. 86 on November 3, 2008. Supplement 1 response to RAI No. 86 was sent on December 19, 2008 to address 2 of the remaining 7 questions. The attached file, "RAI 86 Supplement 2 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 5 questions, as committed.

The following table indicates the respective pages in the response document, "RAI 86 Supplement 2 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 86 — 09.01.01-2	2	2
RAI 86 — 09.01.02-19	3	4
RAI 86 — 09.01.02-20	5	7
RAI 86 — 09.01.03-1	8	8
RAI 86 — 09.01.03-2	9	9

This concludes the formal AREVA NP response to RAI 86, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
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3315 Old Forest Road
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From: WELLS Russell D (AREVA NP INC)
Sent: Friday, December 19, 2008 2:08 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 86, FSAR Ch 9, Supplement 1

Getachew,

AREVA NP Inc. provided responses to 7 of the 14 questions of RAI No. 86 on November 3, 2008. The attached file, “RAI 86 Supplement 1 Response US EPR DC.pdf” provides technically correct and complete responses to 2 of the remaining 7 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 86 Question 09.01.02-21.

The following table indicates the respective pages in the response document, “RAI 86 Supplement 1 Response US EPR DC.pdf” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 86 — 09.01.01-1	2	3
RAI 86 — 09.01.02-21	4	5

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

Question #	Response Date
RAI 86 — 09.01.01-2	January 21, 2009
RAI 86 — 09.01.02-19	January 21, 2009
RAI 86 — 09.01.02-20	January 21, 2009
RAI 86 — 09.01.03-1	January 21, 2009
RAI 86 — 09.01.03-2	January 21, 2009

Sincerely,

(Russ Wells on behalf of)

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From: WELLS Russell D (AREVA NP INC)
Sent: Monday, November 03, 2008 7:31 PM
To: 'Getachew Tesfaye'
Cc: 'John Rycyna'; Pederson Ronda M (AREVA US); BENNETT Kathy A (OFR) (AREVA US); DELANO Karen V (AREVA US)
Subject: Response to U.S. EPR Design Certification Application RAI No. 86, FSAR Ch 9

Getachew,

Attached please find AREVA NP Inc.’s response to the subject request for additional information (RAI). The attached file, “RAI 86 Response US EPR DC.pdf” provides technically correct and complete responses to 7 of the 14 questions.

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 86 Questions 09.01.03-3 and 09.01.02-20.

The following table indicates the respective pages in the response document, "RAI 86 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 86 — 09.01.01-1	2	2
RAI 86 — 09.01.01-2	3	3
RAI 86 — 09.01.02-19	4	5
RAI 86 — 09.01.02-20	6	7
RAI 86 — 09.01.02-21	8	8
RAI 86 — 09.01.03-1	9	9
RAI 86 — 09.01.03-2	10	10
RAI 86 — 09.01.03-3	11	11
RAI 86 — 09.05.04-1	12	12
RAI 86 — 09.05.04-2	13	13
RAI 86 — 09.05.04-3	14	15
RAI 86 — 09.05.04-4	16	16
RAI 86 — 09.05.04-5	17	18
RAI 86 — 09.05.04-6	19	20

A complete answer is not provided for 7 of the 14 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 86 — 09.01.01-1	December 19, 2008
RAI 86 — 09.01.01-2	January 21, 2009
RAI 86 — 09.01.02-19	January 21, 2009
RAI 86 — 09.01.02-20	January 21, 2009
RAI 86 — 09.01.02-21	December 19, 2008
RAI 86 — 09.01.03-1	January 21, 2009
RAI 86 — 09.01.03-2	January 21, 2009

Sincerely,

(Russ Wells on behalf of)

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, October 03, 2008 3:09 PM
To: ZZ-DL-A-USEPR-DL
Cc: Jeffrey Poehler; David Terao; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 86(1216,1143,1227,1106), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on September 19, 2008, and discussed with your staff on October 3, 2008. Draft RAI Questions 09.01.02-21 and 09.01.03-2 were modified 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: 136

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Subject: Response to U.S. EPR Design Certification Application RAI No. 86, FSAR Ch 9, Supplement 2
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From: WELLS Russell D (AREVA NP INC)

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Priority: Standard
Return Notification: No
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Response to

Request for Additional Information No. 86 Supplement 2 (1216,1143,1227,1106), Revision 0

10/3/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.01 - Criticality Safety of Fresh and Spent Fuel Storage and Handling
SRP Section: 09.01.02 - New and Spent Fuel Storage
SRP Section: 09.01.03 - Spent Fuel Pool Cooling and Cleanup System
SRP Section: 09.05.04 - Emergency Diesel Engine Fuel Oil Storage and Transfer System
Application Section: FSAR Ch. 9
CIB1 Branch

Question 09.01.01-2:

The information provided in the Topical Report Report UN-TR-08-001(P) only addressed the issue of general corrosion rate. Based on the information contained in IN 2002-09, verify that the licensee proposes to use 304L versus 304 stainless steel to avoid the long-term, stress-corrosion cracking issue in the SFP environment. If not, provide the tests or surveillances that will be performed to ensure low concentration of contaminants to avoid stress-corrosion cracking of the 304 stainless steel critical parts.

Response to Question 09.01.01-2:

AREVA proposes to allow both 304 and 304L stainless steel materials to be used in the spent fuel racks. While 304 stainless steel can be susceptible to pitting corrosion, stress corrosion cracking and Intergranular Stress Corrosion Cracking (IGSCC), these mechanisms depend greatly on the presence of halogens and oxygen or the presence of sulfates and oxygen. Spent fuel pool water chemistry programs normally keep the concentrations of halogens and sulfates at very low levels. The lower levels help to avoid corrosion problems with spent fuel assemblies and other systems such as those that are relied upon for the operation of the spent fuel pool. The fuel storage racks temperature during normal operation is below the 200°F temperature threshold to avoid cracking from dissolved oxygen. Holtec-designed fuel racks with tens of thousands of storage locations have been installed in spent fuel pools worldwide without any evidence of pitting, stress corrosion cracking,or IGSCC.

See the Response to Question 09.01.02-19 for information on contaminants in the SFP environment.

FSAR Impact:

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

Question 09.01.02-19:

Criticality control requirements in the SFP are identified in 10 CFR 50.68. Neutron absorber materials that have been used in SFP in the past (e.g., Boraflex^{TM}) have been tested in radiation fields with dry air or in borated water solutions without a radiation field, but never both together. A design flaw that was unrealized was that in borated water and in the presence of a radiation field, hydrogen peroxide and peroxide radicals form (as well as other free radicals) that attack the Boraflex^{TM} causing it to decompose and decrease its geometric neutron capture capability. The proposed material for neutron absorption in the spent fuel pool, Metamic^{TM}, is similarly comprised of an aluminum alloy encasing a boron carbide aluminum powder compressed solid and exposed to the same conditions. NRC Information Notice 2002-09 identifies the incidence of stress-corrosion cracking (SCC) of Type 304 stainless steel in the SFP of a nuclear unit. This is at a temperature of less than 200°C.

Neither report UN-TR-08-001(P), "Spent and New Fuel Storage Analyses for U.S. EPR Topical Report," nor "AP1000 Response to Requests for Additional Information (NUREG-08009.1.2)" Westinghouse Document ID No. DCP/NRC2167 (June 20, 2008) address the following questions that require clarification:

1. Although specific conductivity is a general measure of contaminant level, it cannot identify intrusion of contaminants that will induce SCC in the harsh SFP environment. Identify the contaminants that a licensee would analyze in the SFP on a routine basis to ensure that corrosive conditions do not exist.
2. Provide the frequency at which contaminant concentrations in the SFP should be analyzed.
3. Provide the limits on the contaminants that a licensee should use to ensure that the level is well below the level at which stress-corrosion cracking of Alloy 6061 and 304 stainless steel occurs.
4. Visual observation will not determine if SCC has initiated or if it is progressing. Provide the methodology to ensure that early detection of SCC will occur so that timely corrective actions can be taken to prevent lack of sufficient absorber.
5. Discuss whether periodic nondestructive examination or destructive examination (for stress corrosion cracking or inter-granular attack) of test coupons would be useful in determining absorber material long-term integrity.

Response to Question 09.01.02-19:

1. Consistent with current U.S. operating plant experience, the contaminants to be analyzed in the spent fuel pool (SFP) on a routine basis to ensure that corrosive conditions do not exist are chloride, fluoride, and sulfate.
2. A chemical analysis should be performed for chloride, fluoride, and sulfate in the SFP water on a quarterly (four times per year) basis.
3. During refueling, the water volume in the SFP, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, chloride, fluoride, and sulfate in the SFP water are controlled to the same limits as applied to the reactor coolant system (RCS), or 0.100 mg/kg (ppm).
4. This question is addressed in the original RAI 86 Response provided on November 3, 2008.

5. This question is addressed in the original RAI 86 Response provided on November 3, 2008.

FSAR Impact:

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

Question 09.01.02-20:

The ALARA description of 10 CFR 20.1101 relates to design of a leak detection system that will minimize dose to the public as well as protection of workers from direct exposure to the spent fuel. The history of SFP leak off channels has demonstrated that build up of boric acid residues (due to evaporation at low leak rates) has created blockage of these channels making them ineffective to monitor SFP leaks. Additionally, these blockages have allowed back up of leaking SFP water leading to leaks in areas that were not anticipated. When the line was no longer free-flowing, the leakage was assumed to have 'stopped.' In several cases, this has resulted in an unplanned and unmonitored release of radioactivity directly to the environment.

Furthermore, plants that have groundwater in-leakage into the sumps in the fuel storage buildings often have any leakage from the pool masked by that water which has no plant-related activity. This groundwater in-leakage will dilute the radioactivity concentration from the SFP leak, causing the detection levels required to be significantly lower. The location of the sump described in this FSAR is below grade; groundwater in-leakage is a likely issue.

Sufficient water supply to the SFP is needed to ensure that there is always sufficient water coverage of the fuel to shield workers from spent fuel and minimize the direct radiation dose at the site boundary to be in conformance with 10 CFR 20.1101. Also, a source of make-up cooling water that can supply the SFP during accident conditions is required per GDC 61.

Please identify:

1. Provide the actions that will be taken with the frequency of the actions, in order to prevent build up of boric acid deposits in leak off channels so that the leak monitoring from the spent fuel areas may be accurately assessed.
2. Provide the routine analyses that will be performed with the frequency in order to accurately assess and diagnose a leak rate from the SFP.
3. Provide additional details about the size and configuration of these leak off channels that show how monitoring will be accomplished.
4. Show in a diagram, if possible, the materials of construction of the leak-off channels and all surfaces with which the SFP liquid comes into contact.
5. Describe the actions should be taken by a licensee to monitor groundwater in-leakage.
6. Identify the "redundant seismic Category I emergency water make-up supply" in the FSAR Tier 2 Section 9.1.2.1 that ensures conformance with GDC 61.

Response to Question 09.01.02-20:

1. Proper fabrication and construction of the leak chase system (LCS) reduces the chance of formation of blockages. Frequent, methodical inspection keeps the LCS free-flowing to perform its leakage-transfer function. Described below are the routine LCS inspections and maintenance activities to limit the possibility of blockages from boric acid deposits.

   <u>LCS Inspection and Maintenance</u>

   Routine LCS inspections will be performed as part of the plant's regular maintenance program. The primary objective of the inspection is to: 1) confirm that the LCS is unobstructed to the collection point (tank) – reducing the potential for offsite contamination; 2) determine the pool leakage magnitude; and 3) be able to identify the leak location or chase blockage for subsequent repair.

Inspections

Initial routine LCS inspections will consist but will not be limited to the following:

- Visual inspection and recording of evidence (e.g., discoloration) of a past spill, leakage, or seepage.
- Maintain an Inspection and Maintenance Report for the pool liner LCS.

Maintenance

Evidence of LCS blockage will be removed utilizing the following methods:

- Mechanical removal utilizing a coiled reamer (snake), and/or
- Flushing the LCS with warm de-ionized (demineralized) water.

2. The spent fuel pool LCS will be regularly monitored for leakage during plant operation. Regular LCS testing and inspections will be performed to verify that the LCS is free from obstructions that could potentially block flow between the pool liner welds and the collection points.

Plant Operation – Leakage Monitoring Frequency

The LCS leakage rates will be monitored with actual monitoring frequencies provided as part of the regular plant maintenance program.

Accessible Liners during Operation
Components of the LCS that are accessible during normal plant operation will initially be monitored every three months for evidence of liner leakage.

Inaccessible Liners during Operation
Components of the LCS that are inaccessible during normal plant operation will be monitored at the beginning of a scheduled refueling outage, and again prior to the plant going back into operation.

Plant Operation – Leakage Location Detection

When a leak has been identified, the liner leak location needs to be identified for repair. The following actions will be taken to locate a spent fuel pool liner leak:

- Perform an air test after plugging all inspection access points to allow slight pressurization of the leakage channels behind the liner weld seams.
- Monitor the inside of the pool, below fluid level, for the release of air bubbles.
- Document the location of any air bubbles (liner leakage location) for liner repair.
- Repair liner in accordance with the liner designer's recommendations or alternate approved procedure.

3. This question is addressed in the original RAI 86 Response provided on November 3, 2008.

4. This question is addressed in the original RAI 86 Response provided on November 3, 2008.
5. This question is addressed in the original RAI 86 Response provided on November 3, 2008.
6. This question is addressed in the original RAI 86 Response provided on November 3, 2008.

FSAR Impact:

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

Question 09.01.03-1:

GDC 61 requires that the flow rate of the cooling and purification system be appropriately sized to maintain temperatures and radiation levels at acceptable values. The current design does not appear to be consistent with typical industry practice where demineralizer filters use a large micron size on the demineralizer inlet and a smaller micron size on the demineralizer outlet. This arrangement provides for continuous flow while removing large particles (on the inlet) that would plug the demineralizer resin pathways, and removing resin fines and small particulate from returning to the SFP. This design also minimizes the change out of the inlet filter by not overwhelming it with small (from fuel clad corrosion product spallation) and large particulate (atmospheric depositions not removed by the skimmer pumps).

Therefore, the staff requests the applicant to justify the reversing of the filter sizes from the typical design configuration.

Response to Question 09.01.03-1:

This question is addressed in the Response to RAI 87, Supplement 2, Question 09.01.03-7.

FSAR Impact:

There is no additional FSAR impact. U.S. EPR FSAR Tier 2, Table 9.1.3.1 will be revised as described in the Response to RAI 87, Supplement 2, Question 09.01.03-7.

Question 09.01.03-2:

GDC 61 requires that provisions for containment of the fuel and cooling water for the spent fuel be assured. Minimizing general corrosion and potential stress corrosion cracking is an important aspect of maintaining structural integrity of all Spent Fuel Pool metallic components. SRP Section 9.1.3 also recommends that appropriate instrumentation and sampling be provided to monitor the water purity and need for demineralizer resin replacement, including the chemical and radiochemical limits such as conductivity, gross gamma and iodine activity, demineralizer differential pressure, pH and crud level, which are used to initiate corrective action. FSAR Tier 2 Section 9.1.3.3.1 indicates the Fuel Pool Purification System will be periodically sampled for chemical impurities, and FSAR Tier 2 Table 9.3.2-1 identifies two grab sample points in the FPPS and two grab sample points in the Fuel Pool Cooling System. However, the FSAR does not provide the required chemical parameters and impurity levels for the spent fuel pool and FPPS. Therefore, the staff requests the following additional information:

1. Provide the normal operating limits for impurities and chemical parameters for the spent fuel pool and FPPS.
2. Confirm that the recommended chemistry limits and sampling periodicity for the SFP and FuelPPS are consistent with those recommended by the most recent revision of the EPRI PWR Primary Water Chemistry Guidelines.
3. Provide the parameters that will be sampled in the FPPS and FPCS.

Response to Question 09.01.03-2:

1. See the Response to Question 09.01.02-19 for impurities. U.S. EPR FSAR Tier 2, Chapter 16, Section 3.7.15 specifies the normal operating limit for boron in the spent fuel pool.
2. U.S. EPR FSAR Tier 2, Chapter 16, Section 3.7.15 is consistent with NUREG-1431, Revision 3.1.
3. See the Response to Question 09.01.02-19. The limits for parameters used to determine demineralizer performance and resin replacement frequency will be assessed as part of the plant’s regular maintenance program.

FSAR Impact:

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