ArevaEPRDCPEm Resource

From:	Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent:	Monday, March 09, 2009 3:56 PM
To:	Getachew Tesfaye
Cc:	WELLS Russell D (AREVA NP INC); DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC)
Subject:	Response to U.S. EPR Design Certification Application RAI No. 134, Supplement 1
Attachments:	RAI 134 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 24 of the 28 questions of RAI No. 134 on November 3, 2008. The attached file, "RAI 134 Supplement 1 Response US EPR DC.pdf" provides a technically correct and complete response to 3 of the 4 remaining question, 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 134 Question 04.06-3.

The following table indicates the respective pages in the response document, "RAI 134 Supplement 1 US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 134—04.06-3	2	2
RAI 134—04.06-9	3	3
RAI 134—04.06-10	4	4

The schedule for the technically correct and complete response to the remaining question in RAI No. 134 is unchanged and is provided below:

Question #	**Response Date**
RAI 134—04.04-23	April 15, 2009

Sincerely,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
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3315 Old Forest Road
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From: WELLS Russell D (AREVA NP INC)
Sent: Thursday, January 29, 2009 4:49 PM
To: 'Getachew Tesfaye'
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); SLIVA Dana (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 134, FSAR Ch 4

Getachew,

The proprietary and non-proprietary versions of the response to RAI No. 134 are submitted via AREVA NP Inc. letter, "Response to U.S. EPR Design Certification Application RAI No. 134" NRC 09:005, dated January 29, 2009. The enclosure to that letter provides technically correct and complete responses to 24 of the 28 questions in RAI No. 134. An affidavit to support withholding of information from public disclosure, per 10CFR2.390(b), is provided as an enclosure to that letter.

The schedule for technically correct and complete responses to the remaining 4 questions in RAI No. 134 is provided below:

Question #	Response Date
RAI 134—04.04-23	April 15, 2009
RAI 134—04.06-3	March 20, 2009
RAI 134—04.06-9	March 20, 2009
RAI 134—04.06-10b	March 20, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
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New Plants Deployment
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, December 15, 2008 7:51 AM
To: ZZ-DL-A-USEPR-DL
Cc: John Budzynski; Shanlai Lu; Joseph Donoghue; Jason Carneal; Prosanta Chowdhury; Joseph Colaccino; John Rycyna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 134 (1435, 1279,1436), FSAR Ch. 4

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on November 6, 2008, and discussed with your staff on November 19, 2008. Draft RAI Questions 04.04-28 and 04.06-7 were deleted, Draft Questions 04.04-32, 04.04-35, 04.06-4, 04.06-5, and 04.06-8 were moved to other FSAR chapters, and Draft Questions 04.03-10, 04.06-3, 04.06-9, and 04.06-10 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, excluding the time period of December 20, 2008 thru January 1, 2009, to account for the holiday season as discussed with AREVA NP Inc. For any RAIs that cannot be answered within 45 days, it is expected that a date for receipt of this information will be provided to the staff within the 45-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: 300

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Subject: Response to U.S. EPR Design Certification Application RAI No. 134, Supplement 1
Sent Date: 3/9/2009 3:56:10 PM
Received Date: 3/9/2009 3:56:15 PM
From: Pederson Ronda M (AREVA NP INC)

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Response to

Request for Additional Information No. 134, Supplement 1

12/15/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 04.03 - Nuclear Design
SRP Section: 04.04 - Thermal and Hydraulic Design
SRP Section: 04.06 - Functional Design of Control Rod Drive System
Application Section: FSAR Ch. 4

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

Question 04.06-3:

In Section 4.6.1 of the FSAR, it is stated that the CRDM equipment is designed and qualified to operate in the reactor vessel cavity environment. In the response to RAI 95, question 03.09.04-1a, provides the documentation of the qualification of the CRDM to operate in the reactor vessel cavity environment. However, no statement is available in Subsection 4.6.1 that connects the necessary information to satisfaction of the GDC 4 requirement in other sections.

1. Provide a statement in Section 4.6.1 that connects GDC 4 requirement to the discussion in other DCD subsections.

2. Also, since the ASME code requirements do not apply to the non-pressure boundary components of the CRDM, what effect does the failure of non-pressure boundary component of the CRDM have on the pressure boundary components of the CRDM?

Response to Question 04.06-3:

1. SRP 4.6 states: "To meet the requirements of GDC 4, the CRDS should remain functional and provide reactor shutdown capabilities under adverse environmental conditions and after postulated accidents." U.S. EPR FSAR Tier 2, Section 4.6.2 states that the control rod drive system (CRDS) is part of the environmental qualification program as described in U.S. EPR FSAR Tier 2, Section 3.11. U.S. EPR FSAR Tier 2, Section 4.6 will be revised to add references to other U.S. EPR FSAR Tier 2 sections that also demonstrate compliance with GDC 4.
2. As noted in the Response to RAI 15, Supplement 1, Question 04.05.01-5, the U.S. EPR control rod drive mechanism (CRDM) design is a proven German design used in Kraftwerk Union (KWU) pressurized water reactors. The only known mechanical failure involved the compression spring in the lifting armature, which has no impact on the release function of the latch unit for rod drop for the CRDM design.

   As shown in U.S. EPR FSAR Tier 2, Table 3.2.2-1, the CRDM pressure boundary components are Seismic Category I. The impact of the failure of non-safety-related equipment or structures not designated to Seismic Category I Criteria structures, systems, and components (SSC) on safety-related, Seismic Category I components is reflected in the classification summary in U. S. EPR Tier 2, Table 3.2.2-1. Failure of the non-safety–related, non-seismic portions of the CRDMs will not prevent or degrade the safety function of any safety-related Seismic Category I component.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 4.6 will be revised as described in the response and indicated on the enclosed markup.

Question 04.06-9:

The mechanical adequacy Section 4.6.3 refers to Section 3.9.4.4 where it is stated that to confirm the mechanical adequacy of the CRDS, a prototype testing program was created. According to Section 3.9.4.4, this program comprises performance tests, stability tests and endurance tests. No reference to the results of this test program is given, and it is not clear from Section 3.9.4.4 how the status and results of this test program support Section 4.6 and other sections of the FSAR. The tests are reported to verify the performance of the equipment under a broad range of conditions. However, the range and conditions are not specified. In response to RAI 95, question 03.09.04-1b, the applicant describes two tests that have been completed for the U.S. EPR design, but does not provide a reference to a report or documentation of the type of tests and test results. In addition, the response to RAI 95, question 03.09.04-1b states that testing is currently underway but does not describe tests that are currently in progress.

What is the status and results of the CRDS prototype testing program and the range of environmental conditions that support the FSAR? This information is necessary to evaluate the performance of the CRDS to ensure an extremely high probability of accomplishing their safety functions in accordance with GDC 29.

Response to Question 04.06-9:

Testing related to the environmental conditions for the control rod drive system has been completed. The test results are available for NRC inspection.

FSAR Impact:

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

Question 04.06-10:

In Section 4.6.4, it is written that mechanical overheating of the CRDM causes failure of only one RCCA from inserting into the core by gravity, and the other CRDMs remain functional.

a. What is the rationale for this statement and the reference to the analysis that supports this conclusion? This information is required to confirm the CRDM is designed to fail into a safe state in accordance with GDC 23 in the event of adverse conditions or environments.

b. Each CRDM is independent of the other CRDMs in respect to electrical and mechanical failure modes of individual CRDM components. However, under adverse environment conditions are there any individual component failures of the CRDMs that may prevent the RCCA from inserting by gravity. Identify the types of adverse conditions analyzed and the CRDM fail safe response results that satisfy the requirements of GDC 23.

Response to Question 04.06-10:

a. See the Response to RAI 95, Question 03.09.04-1c.

b. SRP 4.6 states: "to meet the requirements of GDC 23, the CRDS should fail in an acceptable condition, even under adverse conditions, that prevents damage to the fuel cladding and excessive reactivity changes during failure." U.S. EPR FSAR Tier 2, Section 4.6.2 states: "As described in U.S. EPR FSAR Tier 2, Section 3.9.4, the CRDMs fail in an acceptable condition in accordance with GDC 23." Additionally, as noted in the Response to RAI 95, Question 03.09.04-1, mechanical failure of any individual control rod drive mechanism (CRDM) does not cause failure of the other CRDMs. If a mechanical failure occurs (i.e., latch assembly failure, broken latch), the other CRDMs remain operational. The mechanical operation of each CRDM is independent of the mechanical operation of the other CRDMs. Therefore, the failure of a latch unit would not cause more than one CRDM rod cluster control assembly (RCCA) from dropping into the core. As noted in U.S. EPR FSAR Tier 2, Section 15.0.0.3.4, the total negative reactivity inserted following reactor trip excludes the reactivity of the most reactive rod that is assumed to be stuck out of the core. Mechanical failures that could result in a single dropped RCCA or a dropped RCCA bank have been evaluated and the results presented in U.S. EPR FSAR Tier 2, Section 15.4.3.1. The analysis results conclude that the plant instrumentation, protection functions, and equipment are sufficient to preclude fuel or cladding damage and that the core remains adequately cooled throughout these events. Therefore, the failure of a CRDM to insert does not affect the capability to safely shutdown the plant.

FSAR Impact:

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

U.S. EPR Final Safety Analysis Report Markups

4.6 Functional Design of Reactivity Control Systems

The control rod drive system (CRDS) consists of the control rods and related mechanical components that provide the means for mechanical movement. For the U.S. EPR, the CRDS consists of the control rod drive mechanisms (CRDM) and rod cluster control assemblies (RCCA). Additional systems, such as the protection system (PS), the reactor control surveillance and limitation (RCSL) system, and the control rod drive control system (CRDCS) support the CRDS by providing the control logic and electrical power for CRDS movement and trips.

As addressed in Sections 4.6.1 through 4.6.5, the CRDS design satisfies the following GDC of 10 CFR 50, Appendix A:

04.06-3

- GDC 4, which requires the CRDS to remain functional and provide reactor shutdown capabilities under adverse environmental conditions and after postulated accidents. Verification of the adequacy of the control rod drive mechanisms to perform their mechanical functions (e.g., rod insertion and withdrawal, scram operation and time) and to maintain the reactor coolant pressure boundary is performed under Section 3.9.4. Verification that the design and requirements are met, as applicable to the assigned safety class and seismic category, is performed under Section 3.2.1 and Section 3.2.2. Postulated piping failures inside the containment, including their associated locations and dynamic effects, are evaluated in Section 3.6.2, as they relate to the protection of SSC against such effects.
- GDC 23, which requires the CRDS to fail in an acceptable condition, even under adverse conditions, to prevent damage to the fuel cladding and excessive reactivity changes during failure.
- GDC 25, which requires the design of reactivity control systems to prevent a single malfunction of the CRDS from causing acceptable fuel design limits to be exceeded.
- GDC 26, which requires the CRDS to provide sufficient operational control and reliability during reactivity changes under normal operation and anticipated operational occurrences (AOO).
- GDC 27, which requires the combined capability of CRDS and the safety injection system (SIS) to reliably control the reactivity changes establishing the capability of cooling the core under postulated accident conditions.
- GDC 28, which requires the CRDS to prevent reactivity accidents from damaging the reactor coolant pressure boundary (RCPB), or resulting in sufficient damage to the core or support structures to significantly impair reactor cooling capability.
- GDC 29, which requires the CRDS to provide an extremely high probability of functioning during AOOs.