ArevaEPRDCPEm Resource

From:	BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent:	Friday, July 16, 2010 4:31 PM
To:	Tesfaye, Getachew
Cc:	DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); KOWALSKI David (AREVA)
Subject:	Response to U.S. EPR Design Certification Application RAI No. 397, FSAR Ch. 9
Attachments:	RAI 397 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 397 Response US EPR DC.pdf" provides a technically correct and partial response to one of the three questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 397 Question 09.02.02-107 (Part a).

The following table indicates the respective pages in the response document, "RAI 397 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 397 — 09.02.02-107	2	3
RAI 397 — 09.02.02-108	4	4
RAI 397 — 09.02.05-36	5	6

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

Question #	Response Date
RAI 397 — 09.02.02-107 (Part b)	August 31, 2010
RAI 397 — 09.02.02-108	August 31, 2010
RAI 397 — 09.02.05-36	August 31, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, June 16, 2010 8:03 AM
To: ZZ-DL-A-USEPR-DL
Cc: Wheeler, Larry; Eul, Ryan; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 397 (4644,4680), FSAR Ch. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on May 4, 2010, and on June 15, 2010, 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. 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: 1712

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Sensitivity: Normal
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Request for Additional Information No. 397(4644, 4680), Revision 0

6/16/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems
SRP Section: 09.02.05 - Ultimate Heat Sink

Application Section: 9.2

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

Question 09.02.02-107:

Follow-up to RAI 334, Question 9.2.2-59 and RAI 174, Question 9.2.2-10

The staff's review of the applicant's response dated March 12, 2010 and associated FSAR markup provided for RAI 9.2.2-59 identified follow-up questions for parts (a) and (d), as described below:

a. Part (a) identified inconsistencies in the markup provided for FSAR Tier 1 Table 2.7.1-1. The response provided by the applicant in Supplement 1 of RAI 334 (RAI 9.2.2-59) included markups of both Tier 1 Table 2.7.1-1 and 2.7.1-2. While the originally noted inconsistency was adequately resolved in the markup, the staff found that Table 2.7.1-2 note (3) had also been changed. Note (3) was added by the applicant in response to RAI 9.2.2-12 (part 7d) of Supplement 3 to RAI 174. The note previously included an important explanation that multiple solenoid operated pilot valves were provided for each hydraulically operated valve and each pilot valve was powered from a different Class 1E uninterruptible power supply division to provide redundancy.

   The markup of Tier 1 Table 2.7.1-2 Note (3) is not acceptable to the staff since multiple solenoid operated pilot valves are still identified but the key point that "each solenoid operated pilot valve is powered by different uninterruptible Class 1E power sources..," has been deleted with no explanation. The applicant is requested to resolve this concern and consider the addition of this information to the Tier 2 Section 9.2.2.2 discussion of switchover valves, which currently discusses only a single pilot valve for each hydraulic operated valve.

   In addition, for Tier 1 Table 2.7.1-2, column "Description", several locations should state 'valves' instead of 'valve'. This should be corrected in the FSAR (editorial).

b. In a portion of part (d) the staff asked the applicant to justify the identification of the emergency surge tank makeup water source from the fire water distribution system (FWDS) as Seismic Category II, which is typically associated with equipment that must maintain sufficient integrity to prevent causing damage to other nearby safety-related, Seismic "Category I" SSCs from a seismic event rather than equipment that must remain functional. In response the applicant stated that the emergency makeup is from the seismically qualified portion of the fire water distribution system inside the nuclear island. Although the applicant described the makeup source as "seismically qualified," the staff noted that the FSAR text and FSAR figure markups identified the makeup source as non-safety related and seismic category II. The staff found this inconsistent with the definition provided for seismic category II provided in revision 1 of U.S. EPR FSAR Tier 2 paragraph 3.2.1.2, which states;

   "U.S. EPR SSCs classified as Seismic Category II are designed to withstand SSE seismic loads without incurring a structural failure that permits deleterious interaction with any Seismic Category I SSCs or that could result in injury to main control room occupants."

   Additionally, RG 1.29, "Seismic Design Classification," item C. 1. G, states that cooling water and component cooling should be seismic category I, and therefore, any cooling water makeup should also be seismic category I.

   Based on the FSAR definition above, the staff concluded that the use of a NSR/ Seismic

Category II surge tank makeup water source is inconsistent with guidance provided in SRP 9.2.2 paragraph III.3C for a safety related seismic makeup source. Accordingly, the applicant needs to specify that the makeup water source is safety related, seismic category I. The applicant should also identify the flow rate and water volume that is available from the finally selected makeup source to confirm that the requirements of the CCWS system can be met.

Response to Question 09.02.02-107:

a) Each hydraulically-operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy.

   U.S. EPR FSAR Tier 1, Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design and U.S. EPR FSAR Tier 2, Section 9.2.2.2.2 will be revised to include this information.

b) A response to this question will be provided by August 31, 2010.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.7.1-2 and U.S. EPR FSAR Tier 2, Section 9.2.2.2.2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.02.02-108:

Follow-up to RAI 334, Question 9.2.2-60 and RAI 174, Question 9.2.2-11

In RAI 9.2.2-60 the applicant was asked several follow-up questions in regard to addressing hydraulic transients such as water hammer and two phase flow the CCWS design. The questions included: (1) specifically address the potential for two-phase flow as identified in NRC Generic Letter 96-06, (2) explain the means by which the CCWS withstands “adverse transients,” and (3) provide details on I&C design features to avoid water hammer.

The staff’s review of the applicant’s response provided for RAI 9.2.2-60 identified the follow-up questions, as described below:

a. The applicant needs to provide an explanation of preventing or mitigating two phase flow in the return pipes from any CCWS heat exchanger exposed to post accident conditions inside containment. The response should address heat exchangers that may be automatically isolated (e.g. Containment HVAC) as well as those that can remain in service (e.g. RCP and, CVCS HP cooler loads etc). For this response the applicant needs to provide assurance that CCWS worst case fluid outlet temperatures will remain below saturation for the expected fluid pressure conditions.

b. The applicant needs to explain the mitigation of a hydraulic transient that could result from automatic closing of the 10 second switchover valve by the time sequence of opening the LHSI isolation valve. The discussion should include the source and relative timing of valve initiating signals as well as valve stroke timing for the 18” butterfly valve (AA005) to provide assurance that the LHSI path will open in time to support switchover valve closure. The applicant should also add a discussion of this water hammer mitigating design feature in FSAR Tier 2 Section 9.2.2.

c. Describe if a similar water hammer transient concern exists upon automatic isolation of non-safety loads outside of containment by fast closing hydraulic valves (i.e. 80AA0015,16,19 and 50AA001, 004 and 006). Several control signals are discussed in FSAR Tier 2 Section 9.2.2 that will automatically initiate closure of these fast closing hydraulic valves (e.g. a mismatch in flow between the inlet and outlet). Describe if design features are also provided to mitigate the potential for a water hammer transient for this scenario.

d. The applicant should identify the indications and controls referenced in the initial response to RAI 174, Supplemental 2 (page 2), that will help to avoid water hammer and add them to the appropriate sections of the FSAR (for example FSAR Tier 1 and FSAR Tier 2 Section 9.2.2 and Chapter 14).

Response to Question 09.02.02-108:

A response to this question will be provided by August 31, 2010.

Question 09.02.05-36:

Follow-up to RAI 277, Question 09.02.05-21:

Based on the staff's review of the RAI 277, Question 09.02.05-21 response dated September 16, 2009, the applicant did not address the 10 CFR 52.47(a)(24) and (a)(25) regulations for the ultimate heat sink (UHS) emergency make-up water system which state:

"(24) A representative conceptual design for those portions of the plant for which the application does not seek certification, to aid the NRC in its review of the Final Safety Analysis Report (FSAR) and to permit assessment of the adequacy of the interface requirements in paragraph (a)(25) of this section;

(25) The interface requirements to be met by those portions of the plant for which the application does not seek certification. These requirements must be sufficiently detailed to allow completion of the FSAR;"

a. Since the design of the raw water supply system (RWSS) submitted in the response is designated as "non-safety" and supplies only the normal make-up water supply to the UHS, the EPR design certification (DC) application still lacks a description of the safety-related emergency make-up water system to the UHS. Therefore, to comply with 10 CFR 52.47(a)(24), the applicant should revise the FSAR to include a certified or conceptual design for the UHS emergency make-up water system.

b. Also, to comply with 10 CFR 52.47(a)(25), the FSAR, including Chapter 4, "Interface Requirements," of Tier 1, needs to be revised to include sufficiently detailed interface requirements for this system that must be satisfied by combined license applicants when they provide their plant specific RWSS design. Currently, the staff could find only a 300 gpm interface requirement for the safety-related, UHS emergency make-up water system, which has no certified or conceptual design provided. The current interface requirement is not comprehensive in that it does not take into account the temperature and chemistry of potential make-up water sources and their impact on the UHS performing its intended safety function over a period of 30 days. The applicant should address the staff's concern on the comprehensiveness of the interface requirement for the UHS emergency make-up water system.

c. The applicant's response included an FSAR markup including a conceptual design of a non-safety related RWSS in FSAR Section 9.2.9. The sentence "[[Connections to the UHS cooling tower basins are made at safety-related motor operated valves (MOV), identified in Section 9.2.5]]" is notated as "conceptual" design while these MOVs are shown to be part of the standard design in all of the corresponding figures. The applicant should clarify and maintain consistency regarding what portions are conceptual design, and what portions are part of the certified design in figures, tables, and text for FSAR Sections 9.2.1, 9.2.5, and 9.2.9. For figures and tables that include both conceptual design portions and certified design portions, a clear notation should be used to illustrate the distinctions. The applicant should address the apparent discrepancy in the example cited above as well as review the FSAR for other inconsistencies.

d. The opening sentence of FSAR Chapter 9.2.9 provided in the response states that the RWSS provides ultimate heat sink make-up. Figure 9.2.9-1 shows the RWSS supplies only "normal" make-up to the UHS. The applicant should add the word "normal" to the text portion so that there is clarity that the RWSS does not provide both normal and emergency make-up water to the UHS per the conceptual design provided.

Response to Question 09.02.05-36:

A response to this question will be provided by August 31, 2010.

U.S. EPR Final Safety Analysis Report Markups

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (7 Sheets)

Description	Tag Number [(1)]	Location	IEEE Class 1E [(2)]	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Component Cooling Water Pumps	KAA10AP001 KAA20AP001 KAA30AP001 KAA40AP001	Safeguards Building 1 Safeguards Building 2 Safeguards Building 3 Safeguards Building 4	1 2 3 4	Yes	Yes	On-Off	Start-Stop
Train Switchover Valves 09.02.02-107(a)	KAA10AA006 KAA10AA010 KAA10AA032 KAA10AA033	Safeguards Building 1	NA [(3)]	Yes	Yes	Pos	Open-Close
Train Switchover Valves 09.02.02-107(a)	KAA20AA006 KAA20AA010 KAA20AA032 KAA20AA033	Safeguards Building 2	NA [(3)]	Yes	Yes	Pos	Open-Close
Train Switchover Valves 09.02.02-107(a)	KAA30AA006 KAA30AA010 KAA30AA032 KAA30AA033	Safeguards Building 3	NA [(3)]	Yes	Yes	Pos	Open-Close
Train Switchover Valves	KAA40AA006 KAA40AA010 KAA40AA032 KAA40AA033	Safeguards Building 4	NA [(3)]	Yes	Yes	Pos	Open-Close
Heat Exchanger Bypass Valve	KAA10AA112	Safeguards Building 1	1[N] 2[A]	Yes	Yes	Pos	Open-Close

09.02.02-107(a)

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (7 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 1b Safety Related Loads Containment Isolation Valves	KAB60AA013	Safeguards Building 1	1N 2A	Yes	Yes	Pos	Open-Close
	KAB60AA018	Reactor Building	4N 3A				
	KAB60AA019	Safeguards Building 1	1N 2A				
Common Header 2b Safety Related Loads Containment Isolation Valves	KAB70AA013	Safeguards Building 4	4N 3A	Yes	Yes	Pos	Open-Close
	KAB70AA018	Reactor Building	1N 2A				
	KAB70AA019	Safeguards Building 4	4N 3A				
Common Header 1b RCP Thermal Barriers Containment Isolation Valves	KAB30AA049	Safeguards Building 1	1N 2A	Yes	Yes	Pos	Open-Close
	KAB30AA051	Reactor Building	4N 3A				
	KAB30AA052	Safeguards Building 1	1N 2A				

09.02.02-107(a)

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (7 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Common Header 2b RCP Thermal Barriers Containment Isolation Valves	KAB30AA053	Safeguards Building 4	4^N 3^A	Yes	Yes	Pos	Open-Close
	KAB30AA055	Reactor Building	1^N 2^A				
	KAB30AA056	Safeguards Building 4	4^N 3^A				
Surge Tank Demin. Water Makeup Isolation Valves	KAA10AA027	Safeguards Building 1	1^N 2^A	N/A	Yes	Pos	Open-Close
	KAA20AA027	Safeguards Building 2	2^N 1^A				
	KAA30AA027	Safeguards Building 3	3^N 4^A				
	KAA40AA027	Safeguards Building 4	4^N 3^A				
Common Header 1a Fuel Pool Cooling Heat Exchanger 1 Downstream Control Valve	KAB10AA134	Fuel Building	1^N 2^A	N/A	Yes	NA / NA	NA / NA
Common Header 2a Fuel Pool Cooling Heat Exchanger 2 Downstream Control Valve	KAB20AA134	Fuel Building	4^N 3^A	N/A	Yes	NA / NA	NA / NA

09.02.02-107(a)

Table 2.7.1-2—Component Cooling Water System Equipment I&C and Electrical Design (7 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Safety Chilled Water Chiller CCWS Flow Control Valve	KAA22AA101	Safeguards Building 2	2^N 1^A	N/A	Yes	NA / NA	NA / NA
Safety Chilled Water Chiller CCWS Flow Control Valve	KAA32AA101	Safeguards Building 3	3^N 4^A	N/A	Yes	NA / NA	NA / NA

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes the division the component is normally powered from; ^{A} denotes the division the component is powered from when alternate feed is implemented.

3) Each hydraulically operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy.

09.02.02-107(a)

CCWS Surge Tanks

The CCWS surge tanks are concrete structures with a steel liner. Each tank is connected to the suction side of its respective train CCWS pump.

Each surge tank has sufficient storage capacity to compensate for normal system leaks or component draining. Makeup water is supplied from the DWDS.

An additional makeup source of water to each surge tank originates from the seismically qualified ~~(Seismic II)~~ portion of the fire water distribution system inside the Nuclear Island. This makeup source provides sufficient post seismic event surge tank capacity to accommodate an assumed system leakage of 20 gpm for seven days. Emergency makeup to the surge tanks is a manual operation performed by inserting a spool piece between valves AA141 and AA142. The manual valves AA141 and AA142 are then opened to provide the emergency makeup.

Plant procedures and controls associated with the installation of the spool piece will be implemented by the COL applicant.

Dedicated CCWS Surge Tank

The dedicated CCWS surge tank is connected to the dedicated CCWS pump suction line.

The surge tank makeup is provided from the DWDS and nitrogen overpressure is provided to prevent a leak of radioactive fluids into the dedicated CCWS from the SAHRS.

09.02.02-107(a)

The surge tank is provided with overpressure protection.

Common Header Switchover Valves

The common header switchover valves are fast-acting, hydraulically operated valves. ~~Actuation of the valves is provided by a hydraulic circuit. A normally closed pilot valve blocks the hydraulic fluid path to the reservoir and the associated hydraulic pump generates the motive force to compress the valve actuator spring to open the valve. Closure of the valve is accomplished by energizing the pilot valve to bleed off the hydraulic fluid pressure, while the actuator spring closes the valve.~~

The valves provide the physical train separation for the support of the common cooling loads. They are used to transfer cooling of the common users during normal plant operation or in the event of a failure during a design basis event.

The valves are interlocked so that two trains may not be simultaneously connected to the same common header. The stroke time of these fast-acting valves is sufficient to minimize the interruption of cooling to the CCWS loads.

09.02.02-107(a)

To provide reliability of the switchover function, an uninterruptible power supply (UPS) is provided to the hydraulic actuation pilot valves. A failure of the electrical distribution system does not inhibit the transfer of the common header to the non-faulted train.

The non-safety load isolation valves are also fast-acting, hydraulically-operated valves. Each hydraulically-operated valve has multiple solenoid-operated pilot valves. Each pilot valve is powered from a different Class 1E uninterruptible power supply division to provide redundancy. ~~The difference between the isolation and switchover valves is in the actuation of the pilot valves. The pilot valves for the non-safety load isolation valves are de-energized to open and bleed off the hydraulic fluid pressure.~~

LHSI Heat Exchanger Isolation Valves

These valves are motor-operated valves. The valves are normally closed to prevent dilution of the LHSI fluid and may be opened when necessary to provide an adequate flow path to support long term pump operation. The valves automatically open when the train associated LHSI system is placed into service.

LHSI Pump Seal Fluid Cooler Isolation Valves

These valves are motor-operated valves. The valves are normally closed to prevent dilution of the LHSI fluid and automatically open when the train associated LHSI system is placed into service.

Containment Isolation Valves

The CCWS containment isolation valves are motor-operated valves. The normally open valves provide the means for containment isolation to maintain the integrity of the containment penetrations and thus prevent the release of potentially radioactive material during a design based accident. The containment isolation valves for non-safety-related loads are automatically closed by containment isolation actuation signals. The containment isolation valves for the RCP thermal barrier coolers are not provided with a containment isolation signal but may be remote manually closed from the control room if required.

9.2.2.3 System Operation

9.2.2.3.1 Normal System Operation

The safety-related CCWS is a four train concept which allows sharing of operational and safety users during normal operation and to separate them in case of design and beyond design based accidents. Each physically separated train consists of a main pump, motor cooler, an HX, surge tank, sample piping with permanently installed radiation monitor, a chemical addition tank and pairs of common header isolation valves. Each train also supplies cooling to the associated MHSI pump motor cooler and