

ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Tuesday, January 26, 2010 10:31 AM
To: 'usepr@areva.com'
Cc: Eul, Ryan; Wheeler, Larry; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 361 (4260), FSAR Ch. 9
Attachments: Draft RAI_361_SBPA_4260.doc

Attached please find draft RAI No. 361 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1104

Mail Envelope Properties (0A64B42AAA8FD4418CE1EB5240A6FED10DF73AE1E7)

Subject: Draft - U.S. EPR Design Certification Application RAI No. 361 (4260), FSAR Ch.
9
Sent Date: 1/26/2010 10:31:00 AM
Received Date: 1/26/2010 10:31:02 AM
From: Tesfaye, Getachew

Created By: Getachew.Tesfaye@nrc.gov

Recipients:

"Eul, Ryan" <Ryan.Eul@nrc.gov>
Tracking Status: None
"Wheeler, Larry" <Larry.Wheeler@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Segala, John" <John.Segala@nrc.gov>
Tracking Status: None
"Hearn, Peter" <Peter.Hearn@nrc.gov>
Tracking Status: None
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"ArevaEPRDCPEm Resource" <ArevaEPRDCPEm.Resource@nrc.gov>
Tracking Status: None
"usepr@areva.com" <usepr@areva.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	Size	Date & Time
MESSAGE	737	1/26/2010 10:31:02 AM
Draft RAI_361_SBPA_4260.doc		56314

Options

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

Draft

Request for Additional Information No. 361(4260), Revision 0

1/26/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 09.02.02 - Reactor Auxiliary Cooling Water Systems

Application Section: 09.02.08

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

09.02.02-94

Follow-up to RAI 174, Question 09.02.02-53

Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design.

- a. Describe the reason for making this change since it is a departure from the independent four train system structure utilized in the original design.
- b. In the applicant's response, the word "division" is replaced with the word "train" when referring to the SWCS, but not in all instances. Add a note clarifying the differences, if any, between the words used throughout this section and provide consistency in their usage. For example, FSAR Section 9.2.8.1 says "Each SCWS train..." and 9.2.8.2.2 says "Each SCWS division..."

09.02.02-95

Follow-up to RAI 174, Question 09.02.02-53

Standard Review Plan (SRP) Section 9.2.2, which is being utilized as guidance for the review of the safety chilled water system (SCWS), specifies in Section III confirmation of the overall arrangement of the component cooling system (CCWS) in the Final Safety Analysis Report (FSAR). Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design.

- a. The staff noted that Tier 1 Table 2.7.2-2, "Safety Chilled Water System Equipment I&C and Electrical Design," identifies normal and alternate power

- supplies for the motor-operated SCWS cross-tie valves, but the valve power supplies are not described anywhere in the proposed Tier 2 FSAR sections provided in the response.
- b. Provide a description of these power supplies in the Tier 2 portion of the FSAR.
 - c. Update FSAR Table 3.9.6-2, "In-service Valve Testing Program Requirements" to include the motor-operated cross-tie valves.
 - d. Add the SCWS flow direction arrows to the Figure 9.2.8-1 (Sheets 1 through 4), "Safety Chilled Water Diagram," to confirm the directional flows in various sections of pipe under both independent and cross-tie alignments.

09.02.02-96

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be able to withstand natural phenomena such as hurricanes, tornadoes, floods, and earthquakes without the loss of function in accordance with General Design Criteria (GDC) 2 requirements. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. While the SCWS cross-tie valves are properly classified as Seismic Category I and located inside Seismic Category I structures, it lacks a description of the capability of the cross-tie piping that runs between safeguards building meeting the GDC 2 requirements. The staff requests the applicant describe the capability of the cross-tie piping to meet GDC 2 requirements.

09.02.02-97

Follow-up to RAI 174, Question 09.02.02-53

Standard Review Plan (SRP) 9.2.2 Section III, requires review of the failure-modes and effects analyses to determine whether the system can sustain the loss of any active component and whether the system meets minimum requirements (i.e. cooling load and flow) for these failure conditions. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. The staff requests the applicant provide failure-modes and effects analyses for the safety chilled water system (SCWS) including the cross-tie feature.

09.02.02-98

Follow-up to RAI 174, Question 09.02.02-53

General Design Criteria (GDC) 4 requires safety systems be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects of flow instabilities and attendant loads (i.e. water hammer). Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design.

- a. The staff requests that the applicant describe the capability of the safety chilled water system (SCWS) cross-tie piping connecting the two divisions meeting GDC 4 requirements.
- b. Depending on which division is in operation, SCWS flow could occur in either direction of the cross-tie piping. Upon a loss of one safety chilled water train, the other train would start and flow would reverse in cross-tie piping.
- c. Address the mitigation of the effects of water-hammer and flow instabilities with a particular focus on the cross-tie piping.
- d. Address the evaluation of intra-building impacts, such as internal flooding, for the safeguard buildings (SB) in view of the cross-ties that remove the independent nature of four SBs with four separate systems.

09.02.02-99

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be capable of removing heat from structures, system and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In order for the staff to confirm that the SCWS has been adequately sized, the applicant needs to clarify the FSAR and Technical Specifications (TS) with regards to sizing of the pumps, compressors, and chillers.

- a. With regards to percent capacity for the SCWS pumps, chillers, and compressors, identify whether the percent capacity references supplying two divisions or just one division considering the "normal" alignment is cross-tied. For example, TS Bases B3.7.9 states each chiller contains three 50%

compressors. It is unclear whether this value is based on maximum cross-connected loadings. If so, the total chiller capacity would be capable of 150% of the accident heat loads from two safeguards buildings and therefore, 300% of heat loads from a single building.

- b. Describe the chiller capacities in tons of refrigeration. In addition, no changes were proposed for FSAR Table 9.2.8-1, "Safety Chilled Water Design Parameters," in the applicant's response. Address whether the stated evaporator capacities (275 ton air-cooled/250 ton water-cooled) are single train capacities or need to be modified for cross-tie (2-train) capacity and update Table 9.2.8-1, "Safety Chilled Water Design Parameters," as necessary.
- c. Address the removal of the 100% values (for both pumps and chillers) from Section 9.2.8.2.2 but maintaining them in TS Bases B3.7.9. Also, TS Bases B3.7.9 states the four trains are independent. The staff requests the applicant address if the word "independent" still applies.

09.02.02-100

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be capable of removing heat from structures, system and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In order for the staff to confirm that the SCWS has been adequately sized, address the following:

- a. Final Safety Analysis Report (FSAR) Section 9.2.8.2.2 states that SCWS pump head is based on dynamic pressure losses and head losses of the mechanical equipment of the associated SCWS at full load operation. The staff requests the applicant describe in the FSAR whether full load operation assumes a cross-connected configuration (i.e. loads from two safeguard buildings) or a single SCW train.
- b. Based on the fact that now multiple SCWS pumps will be running simultaneously during normal and accident conditions, the staff requests that the applicant readdress and respond to the issue of "strong pump vs. weak pump" testing in ITAAC that was originally addressed in RAI 9.2.2-55 Areva #174 Supplement 4, Item (d).

09.02.02-101

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating

and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In order to satisfy the above requirements, address the following regarding instrumentation and controls (I&C):

- a. Clarify the difference between a single pump tripping/failing and multiple pumps tripping/failing along with the logic for maintaining the proper flow to ensure adequate cooling for both trains.
 1. Table 2.7.2-3, "Safety Chilled Water ITAAC," Item 4.4 states that the standby chiller and its pump(s) start on a trip of the running chiller or its pump(s). Describe the SCWS response (i.e. how many pumps start) on a loss of a single pump in the operating train. Also describe the SCWS response to a loss of both pumps in the operating train.
 2. Final Safety Analysis Report (FSAR) Section 9.2.8.6 states that the affected chilled water system train is deactivated by "pump" failure. Clarify if this deactivation occurs for the loss of a single pump or requires loss of both pumps.
- b. FSAR Section 9.2.8.6 indicates the cross-tied loops isolate on low-low system pressure. The staff requests that the applicant address if there is a similar isolation based on low expansion tank level. If not, describe the SCWS would response to a slow leak of the inventory lost but no activation of the low-low pressure trip.
- c. Technical Specification (TS) Bases B3.7.9 states that the chiller standby units start on trip of the running chiller. Address the SCWS response to increasing temperatures if the running chiller is overloaded or degraded but not tripped.
- d. Address any I&C logic associated with the motor-operated cross-tie valves (auto-close or auto-open) if applicable.

09.02.02-102

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Under seismic or post-accident conditions with the demineralized water unavailable for safety chilled water system (SCWS) makeup, the expansion tanks should contain sufficient water volume to assure reliable system operation without makeup for at least seven days. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section

9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In the cross-tied configuration, the staff requests the applicant describe whether the expansion tank in the non-operating train is isolated from the system. If not, address precluding of the SCWS design from the sluicing of water between the two expansion-tanks as system loads cycle (or on trip of a chiller and start of the standby unit) and describe the tanks volume requirements to account for sluicing. If isolated, describe the operation of the expansion tank isolation valves during operation and accident conditions.

09.02.02-103

Follow-up to RAI 174, Question 09.02.02-53

The safety chilled water system (SCWS) must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with general design criteria (GDC) 44 requirements. Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In Final Safety Analysis Report (FSAR) section 9.2.8.3.2, the applicant states "At or before the end of 24 hours post DBA, the cross-tie isolation valves are manually isolated to protect against a passive failure." The staff requests the applicant address the basis for the 24-hour period and the tracking or controlling of this time post accident (i.e. valve timing logic, COL applicant action item for procedures, etc.)

09.02.02-104

Follow-up to RAI 174, Question 09.02.02-53

Based on the staff's review of the applicant's response to RAI 174, Question 9.2.2-53, Supplement 5 and information provided in the associated markup of the Final Safety Analysis Report (FSAR), Section 9.2.8, "Safety Chilled Water System" the staff found a significant design change to the system. The safety chilled water system (SCWS) design now utilizes "cross-ties" between Trains 1 and 2 and between Trains 3 and 4, instead of the independent four-train system structure utilized in the original design. In reviewing the modified Technical Specifications (TS) for the safety chilled water system (SCWS), the staff requests that the applicant address the following:

- a. The staff noticed that the limiting-condition-for-operation (LCO) for TS 3.7.9 states that "Four SCW trains shall be OPERABLE and in operation." Provide the definition of "in operation" for the cross-tie alignment. In addition, if 4 trains are OPERABLE and one train is not "in operation," the TS (as currently written) would require the applicant to enter LCO 3.0.3 because the associated action (one train not in operation) is no longer provided. Justify having one of four

- SCWS trains not in operation requiring entry into LCO 3.0.3 or remove the term “in operation” from the LCO.
- b. The note under the “Actions” for TS 3.7.9 states to enter LCO 3.4.6 for any residual heat removal loops made inoperable by the SCWS. With the divisions cross-tied, explain the basis for this note in TS 3.7.9.
 - c. Surveillance Requirement (SR) 3.7.9.3 says to verify each SCW train has the capability to remove the design heat load every 24 months. Explain the basis for removing this surveillance from the TS.