ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Thursday, October 14, 2010 2:52 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. 430, FSARCh. 10, NEW PHASE 4 RAI
Attachments: RAI 430 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 430 Response US EPR DC," provides a schedule since technically correct and complete responses to the three questions are not provided.

The following table indicates the respective pages in the response document, "RAI 430 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 430 — 10.02-8	2	2
RAI 430 — 10.02-9	3	4
RAI 430 — 10.02-10	5	7

The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 430 — 10.02-8	November 17, 2010
RAI 430 — 10.02-9	December 21, 2010
RAI 430 — 10.02-10	December 21, 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: Tuesday, September 14, 2010 1:37 PM
To: ZZ-DL-A-USEPR-DL
Cc: Reddy, Devender; Lee, Samuel; Segala, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 430 (4801), FSARCh. 10, NEW PHASE 4 RAI

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 5, 2010, and on September 14, 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: 2130

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Subject: Response to U.S. EPR Design Certification Application RAI No. 430, FSARCh. 10, NEW PHASE 4 RAI
Sent Date: 10/14/2010 2:51:56 PM
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From: BRYAN Martin (EXTERNAL AREVA)

Created By: Martin.Bryan.ext@areva.com

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Files	**Size**	**Date & Time**
MESSAGE	2248	10/14/2010 2:51:58 PM
RAI 430 Response US EPR DC.pdf	74267	

Options
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Return Notification: No
Reply Requested: No
Sensitivity: Normal
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Response to

Request for Additional Information No. 430(4801), Revision 1

9/14/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 10.02 - Turbine Generator
Application Section: 10.2

QUESTIONS for Balance of Plant Branch 1 (SBPA)

Question 10.02-8:

OPEN ITEM
Follow Up to OPEN ITEM RAI 329, Question 10.2-7

With respect to turbine–generator (T-G) overspeed protection for the U.S.EPR, the staff issued Supplemental RAI 329, Question 10.2-7 as a follow-up to EPR RAI 243, Question 10.02-6. In this supplemental RAI, the staff requested in part that AREVA (the applicant) provide Tier 1 inspections, tests, analyses and acceptance criteria (ITAAC) for the two redundant electrical overspeed protection systems. This Tier 1 ITAAC is needed to confirm that the as built turbine overspeed protection systems are diverse consistent with the description in Tier 2 Section 10.2. In a response dated February 25, 2010. AREVA stated that Tier 1, Section 2.8.1 and Table 2.8.1-3, "Turbine-Generator System ITAAC," will be revised to include confirmation that the two redundant overspeed protection systems are diverse. A mark-up of Tier 1 Table 2.8.1-3 (Item 3.2) was included in the response.

Based on a review of the applicant's response to RAI 329, Question 10.2-7, the staff found that the proposed Tier 1 changes are inadequate. The information provided for Item 3.2 in Tier 1 Table 2.8.1-3 does not provide sufficient specificity to enable inspectors to complete this ITAAC. In particular, design provisions that are referred to in Tier 2 and considered necessary to ensure adequate diversity between the two electrical turbine overspeed protection systems need to be specified. Also, the ITAAC need to include inspections for those design features that are capable of being inspected, such as equipment locations and power supplies. Therefore, the Tier 1 information needs to be revised accordingly to include this information.

Response to Question 10.02-8:

A response to this question will be provided by November 17, 2010.

Question 10.02-9:

OPEN ITEM
New Phase 4 RAI

SRP Section 10.2 specifies that turbine overspeed protection systems should include both redundancy and diversity. Additionally, operating experience insights need to be addressed in accordance with 10 CFR 52.47(a)(22) requirements. The October 2, 2008, response to RAI 10.2-2 described the diversity that is provided by the primary and backup overspeed trip systems for the EPR turbine and included a markup of Tier 2 Section 10.2.2.9 to include this information. In general, the response indicated that diversity is provided by design and manufacturing strategies that are used. However, because the EPR design does not provide the same level of diversity as that called for by SRP Section 10.2 (i.e., one electrical and one mechanical overspeed trip system), it tends to be more subject to common cause and common mode failures than designs that include a mechanical overspeed trip system.

In accordance with 10 CFR 52.47(a)(9), ANP-10292, "U.S. EPR Conformance with SRP Acceptance Criteria," AREVA NP Inc., Rev. 1, dated May 2009, needs to be revised to indicate that a mechanical trip device is not used to provide overspeed protection for the EPR turbine and appropriate justification for this exception to the SRP needs to be included in Tier 2 Section 10.2. The discussion in the FSAR should be sufficient for the staff to find that the level of protection provided by the overspeed protection system for the U.S. EPR turbine is at least equivalent to the level of protection that would be provided by the diverse design called for by SRP Section 10.2. The following items are pertinent to the staff's evaluation in this regard and should be addressed in this RAI response and reflected in the FSAR as appropriate:

1) The description of the turbine overspeed protection systems (including air and hydraulic systems/interfaces as applicable) need to clearly indicate the parts that are shared between the primary and backup systems. For example, shared air and hydraulic dump lines and components such as dump valves and reservoirs need to be described in the FSAR. For clarity, the response should include schematic diagrams that show these flow paths, applicable components, and valves being actuated.

2) A summary description of the results of a reliability comparison of the two types of overspeed trip systems (or other analysis) is needed that establishes the basis for concluding that the reliability of the proposed design is at least equivalent to those that include a diverse mechanical overspeed trip system.

3) Factors and assumptions that are important for the analysis referred to in (2) to be valid need to be described and COL information items should be established as appropriate to ensure that these considerations are properly implemented and maintained. For example, the amount of time that either the primary or emergency overspeed trip system can be out of service for maintenance without inserting a turbine trip for the affected channel is an important factor. Periodic inspections, maintenance, testing, and corrective actions that are necessary to ensure reliable performance is another important factor in this regard.

4) Common mode and common cause failure vulnerabilities that could prevent the turbine overspeed trip systems from functioning properly and are pertinent to the design need to be addressed. NUREG-1275, Volume 11, "Operating Experience Feedback Report – Turbine-Generator Overspeed Protection Systems," dated April 1995, describes problems that have

been identified and should be considered in this regard. For example, the performance of solenoid valves, steam isolation valves, hydraulic systems and air systems have historically been problematic. Also, the potential for flow restrictions to occur in hydraulic or air system dump lines is of concern (especially in those cases when redundant flow paths are not provided) and need to be addressed. Design and programmatic measures that provide assurance that these common mode and common cause failures are not likely to occur need to be described and means to ensure proper implementation by COL applicants should be established as appropriate.

a. The use of certain materials that are not subject to corrosion, conditioning equipment, desiccants, filters and design standards are examples of design considerations that may be pertinent for addressing common mode and common cause failures.

b. Implementation of periodic surveillance and inspections (including diagnostic routines that assess the status of turbine generator control and overspeed protection functions), maintenance, testing, and corrective actions are examples of programmatic controls that may be applicable for assuring that common mode and common cause failures are prevented from occurring. For example, measures that assure the reliable performance of components and the quality of hydraulic and air systems are pertinent in this regard.

Response to Question 10.02-9:

A response to this question will be provided by December 21, 2010.

Question 10.02-10:

OPEN ITEM
New Phase 4 RAI

SRP Section 10.2, Subsection III, specifies review considerations that pertain to turbine-generator systems. Sufficient information needs to be provided to enable the reviewer to evaluate the turbine-generator system, including subsystems and components, that are considered essential for the safe integrated operation of the facility. Additionally, operating experience insights need to be addressed in accordance with 10 CFR 52.47(a)(22) requirements. The responses that were provided to RAI Numbers 10.2-1 through 10.2-7 and related FSAR markups provided additional information and clarification concerning the design of the turbine generator control and overspeed protection systems. However, the information in the FSAR continues to be incomplete and confusing in some respects. Consequently, additional information is needed and the description in the FSAR needs to be revised accordingly to address the following considerations:

1. Typically, extraction steam non-return isolation valves (NRVs) must be credited to prevent the turbine from exceeding the design overspeed limit of 120 percent of rated speed following a loss of load event (given a single failure and no credit for normal speed control). However, the description does not address this consideration and identify those NRVs that must be credited in this regard, including when they are needed (including locations when two valves are necessary to address single failure considerations) and valve types that are used; the valves interface with the turbine overspeed protection systems; closure times that are necessary (including basis); and the program for these valves to inspect, perfom maintainance, and test to ensure adequate performance over the life of the plant. Also, while the closure times are provided for the turbine steam admission valves, the bases for these times are not explained. This information needs to be included in the FSAR.
2. The FSAR needs to explain the confirmation and maintainance of the valve closure times and seat leakage over time for the turbine steam isolation valves (for both the high pressure and intermediate pressure turbines) and for the extraction steam NRVs.
3. The FSAR needs to include a description of the local (at the turbine) and remote (in the control room) manual turbine overspeed trip circuits, including how they interface with the turbine overspeed protection systems and testing that is performed to assure functional capability over the life of the plant.
4. The response to RAI 10.2-6 indicates that the normal turbine generator speed control governor is independent of the turbine overspeed protection systems, but the design is not adequately described in the FSAR. The FSAR needs to include a description of the normal speed control system for the turbine generator, including major components that are included in the design and the system functioning and interfacing with other systems to prevent a turbine trip following a load rejection during full power operation.
5. The response to RAI 10.2-6 establishes COL Information Item 10.2-4 for COL applicants to provide schematic and logic diagrams for the turbine control system. This item was established because the original design included an optional turbine that could be selected by the COL applicants. Because the optional turbine has been eliminated from the design and the response to RAI 10.2-7 included the necessary figures in a markup of the FSAR, the proposed COL item is no longer necessary and should be eliminated.

6. The response to RAI 10.2-7 included Tier 2 Figures 10.2-2 and 10.2-3 in proposed FSAR markups. However, these figures are incomplete in that they don't indicate if they represent the tripped configuration or the normal operating configuration, and the designations of "E" and "S" on Figure 10.2-3 are not defined. Also, the hydraulic interface with the trip block seems to be a single flow path in some areas which does not satisfy design considerations with respect to independence and redundancy, and small hydraulic flow passages could be subject to flow blockage. Furthermore, the response to RAI 10.2-6 indicates that the trip block dumps hydraulic fluid to a hydraulic tank which causes a low pressure signal to be sent to a safety relay for each turbine steam admission valve actuator. These safety relays cause hydraulic fluid to be dumped from the valve actuators for the turbine steam admission valves resulting in valve closure. From the figure and related description in the FSAR, it is not clear that this is accomplished and in particular, that independence and redundancy is provided by the design in this regard. The FSAR and figures need to be revised to provide a more clear description. Similarly, this sort of information needs to be provided for the extraction steam NRVs that are relied on for preventing turbine overspeed.

7. The orientation of the turbine with respect to safety-related SSCs is discussed in Tier 2 Section 3.5.1.3. However, the orientation of the turbine with respect to SSCs that are important to safety also needs to be described in the FSAR and evaluated by the staff. In particular, the FSAR needs to address the orientation of the turbine with respect to those SSCs identified in the appendix to Regulatory Guide 1.117, "Tornado Design Classification," consistent with the guidance in SRP Section 3.5.1.3 and Regulatory Guide 1.115. Also, to the extent that SSCs important to safety are located within the low-trajectory turbine missile strike zone, justification is needed for considering the turbine to be favorably oriented.

8. The FSAR indicates that the steam admission valves for the high pressure and intermediate pressure turbines and the extraction non-return valves are exercised monthly. However, the review guidance specified in SRP Section 3.5.1.3, Revision 3, under the SRP acceptance criteria listed in Paragraph II, Item 5.C.ii (page 3.5.1.3-8), specifies that this test should be performed weekly and additional information is needed to justify the extended frequency that is proposed for performing this test.

9. The FSAR indicates that the turbine generator primary and backup trip systems are automatically tested on a daily basis while the turbine is operating. A more detailed description is needed to identify the information that is encompassed by the testing that is performed, the status of the overspeed trip systems during the period when testing is being completed, and the requirement that occurs when abnormalities exist and/or are identified. A summary discussion of any diagnostic routines that are routinely performed to assess the status of the turbine generator control and overspeed protection systems also need to be included, along with the frequency of performance and outputs that are generated (this relates to common cause and common mode failure considerations as discussed in RAI 10.2-9).

10. A summary discussion in the FSAR is needed of indication and annunciation that are provided for monitoring the status of the turbine generator and to alert operators to abnormal conditions.

11. A description is needed in the FSAR of the failure modes and effects associated with the turbine overspeed protection systems. For example, Tier 2 Section 10.2.2.10 indicates that a loss of speed signals will result in a turbine trip. However, the FSAR does not discuss the number of speed signals that need to be lost on each trip system before a turbine trip occurs and that the design satisfies single failure considerations in this regard. The description in

the FSAR needs to be sufficient to demonstrate that single failure considerations are satisfied and that the design is fail safe.

12. SRP Section 10.2, Revision 3, provides guidance for NRC staff evaluation of turbine generators. Item 3 of the acceptance criteria listed under paragraph II (page 10.2-5) indicates that a failure of the connection joints between the low-pressure turbine exhaust and the main condenser should not adversely impact safety-related equipment. Additional information is needed to address this SRP consideration, and the FSAR needs to be revised accordingly to reflect this information.

Response to Question 10.02-10:

A response to this question will be provided by December 21, 2010.