ArevaEPRDCPEm Resource

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Sent: Thursday, July 16, 2009 3:16 PM
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Subject: U.S. EPR Design Certification Application RAI No. 257 (3288), FSAR Ch. 19
Attachments: RAI_257_SPLA_3288.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on July 7, 2009, and on July 15, 2009, 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,
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U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19.1

QUESTIONS for PRA Licensing, Operations Support and Maintenance Branch 1 (AP1000/EPR Projects) (SPLA)

19-316

(Follow-up to Question 19-166) Following the submission of Final Safety Analysis Report (FSAR) Revision 1, the staff has reviewed the various tables of design features, insights, and assumptions in Chapter 19. Specifically, these tables are Table 19.1-2—Features for U.S. EPR that Address Challenges for Current PWRs [pressurized water reactors], Table 19.1-5—Systems Analyzed in U.S. EPR PRA [probabilistic risk assessment], Table 19.1-102—U.S. EPR Design Features Contributing to Low Risk, Table 19.1-108—U.S. EPR PRA-Based Insights, and Table 19.1-109—U.S. EPR PRA General Assumptions. The staff's objective was to confirm that the design details match descriptions elsewhere in the FSAR and that the assumptions are reasonable. The staff found several apparent inconsistencies and areas needing clarification. Please address each of the following and revise the FSAR as appropriate.

a. In Table 19.1-2, the entry on station blackout (SBO) refers to "cross-ties available for selected loads important to the PRA." It is unclear whether this statement refers to the alternate feed connections described in FSAR Section 8.3.1.1.1 or to other electrical cross-ties.

b. In Table 19.1-2, the entry on response to loss-of-coolant accidents (LOCA) refers to the capability to perform fast cooldown (FCD) using the main steam relief trains (MSRT). Although this operation is described in Chapter 19 and the response to Question 19-60, there appears to be no discussion of FCD elsewhere in the FSAR (e.g., in Chapter 10). If FCD is part of the plant design, it should not be described only in Chapter 19.

c. In Table 19.1-2, the entry on potential for reactor coolant pump (RCP) seal failure refers to an automatic trip of the RCPs given total loss of seal cooling. FSAR Section 5.4.1.2.1 also refers to a trip on loss of cooling. The response to Question 19-206 provides the logic for standstill seal system (SSSS) actuation and indicates that the process automation system (PAS) generates a sequence including an RCP trip. However, other FSAR Sections (e.g., Tier 1, Section 2.4.1 and Tier 2, Section 7.3.1.2.15) describe only the protection system (PS) RCP trip on stage two containment isolation or a safety injection (SI) signal combined with a 75-percent pressure difference across two RCPs. If the SSSS sequence

including RCP trip is part of the plant design, it should not be described only in Chapter 19 and a single reference in Section 5.4.1.2.1.

d. In Table 19.1-5, the entry on the safety chilled water system (SCWS) states that SCWS provides “direct room cooling to the EFWS [emergency feedwater system] pump rooms.” The first bullet on FSAR page 10.4-86 also refers to SCWS room cooling. This function is not included in the Tier 1 or Tier 2 descriptions of SCWS or in the list of major SCWS users provided in response to Question 09.02.02-41. If SCWS provides direct room cooling of the EFWS pump rooms, the function should not be described only in Chapters 10 and 19.

e. The first bullet in item 5 of Table 19.1-102 provides a disposition for full load rejection. This function is also described in Tier 2, Sections 7.7.2.3.4, 10.2.2.7, and 14.2.12.21.4. References to these portions of the FSAR (and others as appropriate) should be added for completeness.

f. Item 8 of Table 19.1-102 provides several references for a medium head safety injection (MHSI) shutoff head lower than the main steam safety valve (MSSV) setpoint. These values are presented in Tier 1, Tables 2.2.3-3 and 2.8.2-3. References to these portions of the FSAR (and others as appropriate) should be added for completeness.

g. The third portion of item 9 in Table 19.1-102 refers only to Tier 2, Section 7.1.1.4.1. The diverse reactor trip devices are described in Tier 2, Section 7.2.1.1. Functional diversity is discussed in Section 10 of topical report ANP-10281P. These references (and others as appropriate) should be added for completeness.

h. Item 10 of Table 19.1-102 refers to Tier 2, Section 9.2.8.2.2. Diversity of the SCWS refrigeration units is stated more clearly in Tier 2, Section 9.2.8.4. This reference (and others as appropriate) should be added for completeness.

i. Item 14 of Table 19.1-102 refers to Tier 2, Section 19.2.3.3.3.1. Passive cooling by the severe accident heat removal system (SAHRS) is described more fully in Tier 2, Section 19.2.3.3.3.2. This reference (and others as appropriate) should be added for completeness.

j. Item 15 of Table 19.1-102 describes the use of SAHRS for backup cooling of the in-containment refueling water storage tank (IRWST) if low head safety injection (LHSI) fails. Although Figure 19.2-2 shows a loop from the IRWST to the SAHRS heat exchanger, this function is not explicitly listed in the Tier 1 or Tier 2 descriptions of SAHRS. Tier 2, Section 6.2.1.1.1 only describes LHSI heat removal from the IRWST, not the SAHRS backup. If the use of SAHRS as a backup source of IRWST cooling is part of the plant design, it should not be discussed only in the description of the Level 1 PRA.

k. Item 20 of Table 19.1-102 refers to Tier 2, Section 5.3.3.1.1. Absence of penetrations in the lower vessel head is stated more clearly in Tier 2, Section 5.3.3.1.3. This reference (and others as appropriate) should be added for completeness.

l. Item 3 in Table 19.1-108 indicates that the current PRA models one component cooling water system (CCWS) header supplying two RCP thermal barriers. The design has been changed to supply all four RCPs from a single header. Until this design change is incorporated in the PRA, the table should acknowledge the difference; once it is incorporated, the table will need further revision.

m. Item 9 in Table 19.1-108 describes automatic isolation of the essential service water system (ESWS) and demineralized water system (DWS) on high sump level. ESWS isolation is described in Sections 3.4.3.4, 9.2.1.3.5, and 9.3.3.3, but appears not to be included in Chapter 7. Fuel building (FB) level measurements and alarms are described in FSAR Sections 3.4.3.6 and 9.2.1.3.5, but automatic isolation of DWS appears not to be included in these sections or in Chapter 7. In addition, the bounding FB flood source identified in Section 3.4.3.5 is the fire water distribution system (FWDS), not DWS. These inconsistencies should be corrected as needed, and the isolation functions should be considered for inclusion in Chapter 7.

n. Item 16 in Table 19.1-108 refers to Tier 2, Section 9.3.4.2.2. Reactor coolant system (RCS) loop level limitation is described more fully in Tier 2, Section 7.7.2.3.13. This reference (and others as appropriate) should be added for completeness.

o. Item 17 in Table 19.1-108 refers to Tier 2, Section 5.4.7.2.1. Reactor coolant system (RCS) loop level control is described more fully in Tier 2, Section 7.7.2.2.3. This reference (and others as appropriate) should be added for completeness.

p. Item 18 in Table 19.1-108 refers to “Insight #3,” but the referenced insight is now the third item in Table 19.1-102.

q. Item 19 in Table 19.1-108 describes residual heat removal (RHR) isolation on high safeguard building (SB) sump level. Although this function appears in the referenced FSAR section, it appears not to be described in Chapter 7. If this isolation function is part of the plant design, it should not be described only in Chapter 19 and the list of mid-loop design features in Section 5.4.7.2.1.

r. Item 20 in Table 19.1-108 refers to Tier 2, Section 5.4.7.2. These two MHSI actuation signals are also presented in Tier 1, Table 2.4.1-4. This reference (and others as appropriate) should be added for completeness.

s. Item 21 in Table 19.1-108 refers to “Insight #20,” but the referenced insight is now the fourth item in Table 19.1-108.

t. Item 22 in Table 19.1-108 addresses feed and bleed during shutdown, but refers to the FSAR section related to overpressure protection. The pressurizer safety relief valves (PSRV) and severe accident depressurization valves (SADV) are described more fully in Tier 1, Section 2.2.1 and Tier 2, Sections 5.4.13 and 19.2.3.3.4.1. These references (and others as appropriate) should be added for completeness.

u. Item 23 in Table 19.1-108 refers to “Insight #2,” but the referenced insight is now the second item in Table 19.1-102.

v. Item 24 in Table 19.1-108 refers to the thermal barrier cooling design documented in Tier 2, Section 9.2.2.1. This reference (and others as appropriate) should be added for completeness.

w. Item 20 in Table 19.1-109 refers to “EDWS.” This abbreviation is undefined and may be a typographical error meaning DWS, ESWS, or another system.

x. As in part (d) above, item 36 in Table 19.1-109 refers to local room cooling of the EFWS pump rooms. If revisions are made in response to part (d), this assumption may also need clarification.

y. Item 57 in Table 19.1-109 states that the equipment hatch is open in shutdown plant operating states (POS) CA, CB, and E and closed in D. This statement is consistent with Table 19.1-110 and Section 19.1.6.3.1.4, but is not consistent with Table 19.1-89, which states that the hatch is closed in POS CA and CB. The assumed containment status should be verified and made consistent throughout Chapter 19.

19-317

(Follow-up to Question 19-275) In a teleconference on June 30, 2009, the applicant indicated that in POS CBD, the RCS is at mid-loop and vented via four valves: the pressurizer degas line (30JEF10AA503 and 30JEF10AA504) and the nitrogen supply connection (30JEF10AA501 and 30JEF10AA502). The staff’s understanding is that no other RCS penetrations (e.g., pressurizer manway) are assumed to be open. Are all connections to the RCS in this state (e.g., the connection to the nitrogen system) designed to withstand the pressure increase required for steam generator heat removal, indicated as 175 psi in the response to Question 19-133? Please discuss the assumption that the only RCS openings (even after pressurization) are the four vent valves described above. Because this information is important for concluding that the containment environment will support closure within the stated times, the assumption should be documented in the FSAR.

19-318

(Follow-up to Question 19-291) The response to Question 19-271 indicates that the possible heating, ventilation, and air conditioning (HVAC) dependency “can be addressed through the plant procedures that, on a loss of HVAC for a specific division, instruct operators to make sure that a running CCW[S] pump is not supplied from this division (perform a CCW[S] switchover if necessary.” If the applicant expects the plant to be operated in this way, this assumption should be included in the appropriate table of the FSAR. If the operator succeeds in following this procedure, only one division of equipment (rather than two) would fail following a loss of HVAC to one SB. The staff is concerned that this “conservative” treatment may result in a significant overestimation of the importance of HVAC, losses of offsite power (LOOP), and potentially other systems and operator actions. Unless it can be demonstrated that the risk profile and important PRA insights would not be affected by this conservatism, the model should be updated to reflect realistic plant operations. Please provide a justification for the current treatment or update the PRA and FSAR as appropriate.