ArevaEPRDCPEm Resource

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Sent: Wednesday, September 23, 2009 2:17 PM
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Subject: Draft - U.S. EPR Design Certification Application RAI No. 299 (3783,3784), FSAR Ch. 11
Attachments: Draft RAI_299_CHPB_3783_3784.doc

Attached please find draft RAI No. 299 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,
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Request for Additional Information No. 299 (3783, 3784), Revision 1

9/23/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 11.02 - Liquid Waste Management System
SRP Section: 11.03 - Gaseous Waste Management System

Application Sections: 11.2 and 11.3

QUESTIONS for Health Physics Branch (CHPB)

11.02-16

While the staff duplicated the estimates of yearly radioactive liquid effluent releases (Ci/yr) and offsite concentrations (uCi/ml), the evaluation identified a number of inconsistencies associated with assumptions and parameters used in calculations. Without such clarifications and corrections, the staff cannot complete its evaluation and conclude, with reasonable assurance, that the design features and supporting analyses demonstrate compliance with Part 20.1301 and 20.1302, effluent concentration limits of Appendix B, Table 2 of Part 20, and design objectives of Appendix I to Part 50. These observations should be evaluated by the applicant and corrected or justified in the next revision of the FSAR. Specifically, the observations include:

a. FSAR Table 11.2-3 – The table should state that the basis of the source term assumes an 80% capacity factor, being the default value in the PWR-GALE code, and provide the expected capacity factor for the U.S. EPR. In qualifying the expected capacity factor for the U.S. EPR, the discussion should acknowledge that the current fleet of operating reactors is operating at factors in excess of 90%, and discuss the rationale as to whether the estimated radioactive liquid effluent releases (Ci/yr) and offsite concentrations (uCi/ml) need to be scaled up in light of an expected higher capacity factor.

b. FSAR Table 11.2-3 – The table should note that the cited mass of primarily coolant does not include the mass of coolant contained in the pressurizer.

c. FSAR Table 11.2-3 – A review of the FSAR indicates that there are three values for the total steam flow rate: 2.07E+07 lbs/hr in Table 11.1-3; 1.9E+07 lbs/hr in Table 11.1-6; and 2.171E+07 lbs/hr in Table 11.2-3. Provide a justification for the use of 2.171E+07 lbs/hr in Table 11.2-3.

d. FSAR Table 11.2-3 – The table applies a value of 2.184E+05 lbs/hr as the SG blowdown rate. Table 11.1-6 lists a value of 1.9E+05 lbs/hr and Table 11.1-3 lists a value of 2.08E+05 lbs/hr. Provide a justification for the use of 2.184E+05 lbs/hr in Table 11.2-3.

e. FSAR Table 11.2-3 – The table applies a value of 0.33 as the fraction of condensate flow going to the condensate demineralizer. In Table 11.1-6, this fraction is listed as zero, and in Table 11.1-3, it is shown as 100% of the condensate. Provide a justification for the use of 0.33 in Table 11.2-3.

f. FSAR Table 11.2-3 – The table applies a value of 110 gpd as the shim bleed flow rate. Table 11.1-6 lists a value of 500 lbs/hr, which is equivalent to a flow rate of 2055 gpd, using the specific volume of Table 11.1-1. Provide a justification for the use of 110 gpd in Table 11.2-3.

g. FSAR Table 11.2-3 – The table applies a value of 1728 gpd for the equipment drain input and 9428 gpd for the clean waste input. However, these input rates could not be inferred from the design values listed in Table 11.2-1 or Group I, II, and III waste streams. Provide the basis and justification for these two input rates.

h. FSAR Table 11.2-3 – The table applies a DF of 10^7 for cesium and other nuclides for the processing of shim bleed and equipment drain. However, these DFs could not be inferred from the values listed in NUREG-0017. Provide the basis and justification for the use of a DF of 10^7.

i. FSAR Table 11.2-3 – The table applies a value of 27.7 days as the holdup time for xenon and 1.67 days for krypton, with the values being imported from FSAR Table 11.3-1. See staff comments on Table 11.3-1 about holdup times. Update Table 11.2-3 accordingly in light of the resolution of comments generated on this topic for Table 11.3-1.

j. FSAR Table 11.2-3 – The table applies a value of 4100 CFM for the containment internal cleanup rate and 2970 CFM for the containment low volume purge rate. However, these input rates could not be found in FSAR Rev. 1, Section 9.4. Table 12.2-19 provides values of 3210 CFM for the normal operation purge flow rate and 4100 CFM for the equipment area recirculation flow rate, and FASR Section 6.5.1.3 provides only operational ranges. Provide the basis and justification for the values used in Table 11.2-3.

k. A review of FSAR Rev. 1, Section 11.2.2.1.1 and Table 11.2-4 indicates that the grouping of liquid effluent streams listed in Table 11.2-4 is inconsistent with that of Section 11.2.2.1.1. For example, turbine building floor drain, miscellaneous wastes, and shim bleed waste inputs shown in Table 11.2-4 are not listed in Section 11.2.2.1.1. Similarly, the category of “Misc. Wastes” shown in Table 11-2-4 is not explained as to which waste input streams it includes given the grouping scheme of Section 11.2.2.1.1. Review and revise for consistency the information presented in Section 11.2.2.1.1 and Table 11.2-4. Also, provide in Table 11.2-4 appropriate notations describing how the grouping scheme of Section 11.2.2.1.1 was translated into the one shown in Table 11.2-4.

l. A review of FSAR Rev. 1, Section 11.2.3.5 and Table 11.2-7 indicates that the basis of the adjustment factor applied in estimating releases characterized by maximum fuel defects is not described in Section 11.2.3.5. A review of the results presented in Table 11.2-7 indicates that the scaling factor (max/normal) ranges from 1 to 10^3. For example, the results for corrosion and activation products and

tritium are greater than one, which should not be the case since their production is insensitive to the assumed fraction of failed fuel. The scaling factor is presumed to be four, i.e., 1.0% vs 0.25% assumed failed fuel fraction given the information presented in Section 11.1. However, the factors were found to be much higher and variable in many instances. For example, the ratio is 3.8 for H-3, 131 for Mo-99, 1000 for Rh-103m, 69 for Te-129m, 35 for I-131, 1.9 for I-132, 16.7 for I-133, 4.4 for I-135, and 96 for Cs-137, among others. Review and revise the basis of the scaling factor and describe the rationale and application of the scaling factor in FSAR Section 11.2.3.5 and presentation of the results in Table 11.2-7.

11.03-14

While the staff duplicated the estimates of yearly radioactive gaseous effluent releases (Ci/yr) and offsite concentrations (uCi/ml), the evaluation identified a number of inconsistencies associated with assumptions and parameters used in calculations. Without such clarifications and corrections, the staff cannot complete its evaluation and conclude, with reasonable assurance, that the design features and supporting analyses demonstrate compliance with Part 20.1301 and 20.1302, effluent concentration limits of Appendix B, Table 2 of Part 20, and design objectives of Appendix I to Part 50. These observations should be evaluated by the applicant and corrected or justified in the next revision of the FSAR. Specifically, the observations include:

a. A review of FSAR Rev. 1, Section 11.3.3.5 indicates that the discussion and results do not include the sum-of-the-ratios in demonstrating compliance with Part 20, Appendix B, Table 2, Column 1 concentrations for both types of gaseous effluent releases, normal and maximum failed fuel. In contrast, compliance with Part 20, Appendix B, Table 2, sum-of-the-ratios was provided for liquid effluent releases in Section 11.2.3.5. Provide this information for gaseous effluent releases in a revision of Table 11.3-6.

b. FSAR Table 11.3-1 – The table applies a value of 27.7 days as the holdup time for xenon and 1.67 days for krypton. The basis for these values is also presented in Table 11.3-1. First, it is noted that the values for dynamic absorption coefficients of Xe and Kr are reversed in Table 11.3-1, given that the FSAR adopts the default values of NUREG-0017. Second, the staff was unable to confirm these holding times using a design flow rate of 0.0765 lbs/sec (about 61.1 t^3/min at NTP) and a charcoal mass of 16,320 lbs, as listed in Table 11.3-1. Confirm the above findings, provide the basis and justification for these holdup times, and revise Table 11.3-1 accordingly.

c. FSAR Table 11.3-2 - A review of Tables 11.3-1 and 11.3-2 indicates that the useable volume of charcoal is about 89% of the actual volume of each charcoal delay bed. The inventory of charcoal in each delay beds is reported to be 5440 lbs. However, it is not clear if this inventory reflects the actual or useable volume of each delay bed. Confirm the basis of the amount of charcoal in each delay bed, qualify the value presented in Table 11.3-1 as to whether the amount of 5440 lbs reflects the useable volume of charcoal, and revise the Xe and Kr holdup times as needed in Table 11.3-1.

d. A review of FSAR Rev. 1, Section 11.3.3.5 and Table 11.3-6 indicates that the basis of the adjustment factor applied in estimating releases characterized by maximum fuel defects is not described in Section 11.3.3.5. A review of the results presented in Table 11.3-6 indicates that the scaling factor (max/normal) ranges from 0.8 to 10^3. For

example, the results for corrosion and activation products and tritium are greater than one, which should not be the case as their production is insensitive to the assumed fraction of failed fuel. The scaling factor is presumed to be four, i.e., 1.0% vs 0.25% assumed failed fuel fraction given the information presented in Section 11.1. However, the factors were found to be much higher and variable in many instances. For example, the ratio is 4 for H-3, 1.8 for Kr-87, 2.8 for Kr-88, 1000 for Sr-90, 36 for I-131, 16 for I-133, and 1000 for Cs-137, among others. Review and revise the basis of the scaling factor and describe the rationale and application of the scaling factor in Section 11.3.3.5 and presentation of the results in Table 11.3-6.