KHNPDCDRAIsPEm Resource

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Sent: Friday, May 22, 2015 10:42 AM
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Subject: APR1400 Design Certification Application RAI 15-7896 (12.3 Radiation Sources)
Attachments: APR1400 DC RAI 15 RPAC 7896.pdf; image001.jpg

KHNP

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests and we grant 60 days to respond to the RAI. We may adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 15-7896

Issue Date: 05/22/2015
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 12.02 - Radiation Sources
Application Section: 12.2

QUESTIONS

12.02-4

REGULATORY BASIS

10 CFR 52.47(a)(5) requires that the FSAR contain the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR 20.

10 CFR 50, Appendix A, Criterion 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity be designed to assure adequate safety under normal and postulated accident conditions, with suitable shielding for radiation protection, and with appropriate containment, confinement, and filtering systems.

SRP Section 12.2 also indicates that source descriptions should include the methods, models and assumptions used as the bases for all values provided in SAR Section 12.2. The source terms provided in FSAR Section 12.2 are the basis for the shielding design for those components, provided in FSAR Section 12.3

ISSUE

As indicated within FSAR Section 12.2, the decontamination factors for some waste treatment components are based on NUREG-0017, “Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors,” Rev. 1 (1985). However, the decontamination factors for some other components are not based on the values provided in NUREG-0017 and the basis for the decontamination factors assumed for those components is not provided in the FSAR.

For example, the CVCS pre-holdup ion exchanger is identified as a mixed-bed ion exchangers in FSAR Section 9.3.4.2.8.4. While NUREG-0017, Table 1-4 “Decontamination Factors for PWR Liquid Waste Treatment Systems,” provides CVCS mixed bed ion exchanger decontamination factors of 100 for anions, 2 for Cesium (Cs) and Rubidium (Rb), and 50 for other nuclides, FSAR Section 12.2 indicates that the CVCS pre-holdup ion exchanger has a decontamination factor of 100 for Cs and Rb and a decontamination factor of 1 for Yttrium (Y).

Another example is in FSAR Table 11.1-5 (the assumptions in Table 11.1-5 are used in the Chapter 12 source term analysis), which uses a decontamination factor of 100 for Cs and Rb when NUREG-0017, Table 1-4 uses a value of 10.

The decontamination factors provided in NUREG-0017 represent the expected equipment performance averaged over the life of the plant, based on the time NUREG-0017 was developed. In general, the staff accepts the use of the decontamination factors provided in NUREG-0017 for developing radiation source terms. However, if the actual design of the systems and components in the plant would be expected to result in different decontamination factors than what is provided in NUREG-0017 then the more realistic values should be used in the calculation of radiation source terms in FSAR Section 12.2. For those components which use different decontamination factors than those provided in FSAR Section 12.2, the basis for the values chosen should be provided in the FSAR.

QUESTION

Staff does not intend to list all areas where inconsistencies exist within this question. Therefore, please review the source term information provided in FSAR Section 12.2 and update the FSAR to provide a basis for the use of all decontamination factors which are different than the decontamination factors provided in NUREG-0017.

12.02-5

BASIS

10 CFR 52.47(a)(5) requires that the FSAR contain the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR 20.

10 CFR 50, Appendix A, Criterion 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity be designed to assure adequate safety under normal and postulated accident conditions, with suitable shielding for radiation protection, and with appropriate containment, confinement, and filtering systems.

SRP Section 12.2 indicates that sources should be based 0.25 percent fuel cladding defect and that the source term used for determining shielding and ventilation design of PWR components provided for purification of secondary coolant, should consider isotopic concentrations associated with operation at the technical specification allowed limits for primary-to-secondary leakage and/or the secondary coolant specific activity concentrations. Finally, SRP Section 12.2 indicates that source descriptions should include the methods, models and assumptions used as the bases for all values provided in SAR Section 12.2, and that the staff will review the descriptions of the sources. The source terms provided in FSAR Section 12.2 are the basis for the shielding design for those components, which is provided in FSAR Section 12.3.

As a result of the above regulations and guidance documents, staff has the following questions related to secondary side sources.

ISSUES AND QUESTIONS

1. FSAR Section 12.2.1.1.5.2 indicates that the blowdown rate for calculating the steam generator blowdown system source terms is assumed to be 0.2 percent of the maximum steaming rate. However, a review of FSAR Section 10.4.8.2.3 indicates that during startup the blowdown rate may be as high as 1 percent of the steam generators maximum steaming rate until the water quality is within the normal limits. It also indicates that the normal operation blowdown rate is 0.2 percent, but is 1 percent during abnormal blowdown. Please justify the use of 0.2 percent of the maximum steaming rate for calculating steam generator blowdown sources instead of 1 percent.

2. For the condensate polishing system, FSAR Section 12.2.1.1.5.3 indicates that, “It is assumed that 65 percent of the condensate flows through the CPS and that one out of six CPS demineralizers is used to process the condensate during normal operation.” However, FSAR Section 10.4.6.2.1 indicates that there are seven pairs of cation-bed ion exchanger vessels and mixed-bed ion exchanger vessels in the condensate polishing system (CPS) and that the CPS processes approximately 16 to 100 percent of the condensate flow during normal plant operation.

    a. Please provide the number of cation-bed and mixed-bed ion exchangers in the CPS system and ensure that the FSAR is updated so that FSAR Sections 10.4.6 and 12.2.1.1.5.3 are consistent regarding how many cation-bed and mixed-bed ion exchangers exist in the CPS system. In addition, please ensure that the FSAR is clear when it is discussing pairs of demineralizers versus single individual demineralizers.

    b. Please indicate if during normal operation condensate is expected to flow through only one pair of demineralizers at a time or if multiple pairs of demineralizers will be used at the same time.

    c. Please justify why 65 percent of the condensate was assumed to flow through a demineralizer when FSAR Section 10.4.6.2.1 indicates that the CPS can process as much as 100 percent of the condensate flow during normal plant operations.


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