KHNPDCDRAIsPEm Resource

From: Ciocco, Jeff
Sent: Monday, June 08, 2015 9:05 AM
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Cc: Lee, Samuel; Olson, Bruce; Stutzcage, Edward; McCoppin, Michael
Subject: APR1400 Design Certification Application RAI 23-7929 (12.02 - Radiation Sources)
Attachments: APR1400 DC RAI 23 RPAC 7929.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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United States Nuclear Regulatory Commission
Protecting People and the Environment

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Subject: APR1400 Design Certification Application RAI 23-7929 (12.02 - Radiation Sources)
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REQUEST FOR ADDITIONAL INFORMATION 23-7929

Issue Date: 06/08/2015
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

12.02-6

REQUIREMENTS

10 CFR 50, Appendix A, *Criterion 61 requires that* fuel storage and handling systems be designed to assure adequate safety under normal and postulated accident conditions, with suitable shielding for radiation protection, with appropriate containment, confinement, and filtering systems, with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and with an ability to prevent significant reduction in fuel storage coolant inventory under accident conditions.

10 CFR 50, Appendix A, Criterion 62 requires that criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

10 CFR 50, Appendix A, Criterion 63, requires that appropriate systems be provided in fuel storage areas (1) to detect conditions that may result in loss of residual heat removal capability and excessive radiation levels and (2) to initiate appropriate safety actions.

10 CFR 50, Appendix A, Criterion 2, requires that structures, systems, and components important to safety shall be appropriately designed to withstand the effects of natural phenomena.

10 CFR 52.47(a) requires that the application contain a final safety analysis report (FSAR) that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole.

10 CFR 52.47(a)(2), requires that the FSAR discuss fuel handling systems insofar as they are pertinent.

ISSUE

The initial September 2013 version of the application contained discussion of an intermediate fuel storage rack which could be used to temporarily store fuel during refueling operations. It also contained a discussion of the control element assembly (CEA) transport container being physically capable of housing a fuel assembly. This information has been removed from the current version of the application; however, the CEA transport container is still included in the design.
It is important that all areas and equipment in the plant used to store or transport fuel are identified so that staff can conduct the proper safety reviews on that equipment. Staff review of fuel storage areas includes radiological aspects, including safety under potential accident conditions, such as potential drain down events, criticality analysis, and seismic design. In

addition, if there are temporary fuel storage areas inside the refueling cavity, operational limits, including technical specifications may be required for when fuel is stored in these areas.
Tier 1, Section 2.7.4, provides design information and ITAAC for fuel handling and storage systems. In subsection 2.7.4.4, "light load handling system," the applicant mentions various equipment that handle, move, and store fuel assemblies and CEAs (including the CEA change platform and elevator). However, the applicant does not explain whether fuel can be handled or stored on the CEA change platform and elevator and does not describe which equipment is intended for the handling and storage of fuel.

INFORMATION NEEDED

1. Please identify all equipment and areas within the refueling cavity which are intended to be used or could be used to store and handle fuel.

2. Indicate if the current design of the APR1400 physically excludes the intermediate fuel storage racks discussed in the September 2013 application.

3. SRP Section 14.3 states that the type of information and level of detail in Tier 1 are based on a graded approach commensurate with the safety significance of the structures, systems, and components for the design. Staff believes that information regarding which equipment stores and handles fuel is safety significant information which should be included in Tier 1. Therefore, please update Tier 1, Section 2.7.4 to identify all equipment and locations within the plant which will be used to handle or store reactor fuel. Include a statement in Tier 1 indicating that no other equipment or locations will be used to store or handle fuel beyond the items listed.

12.02-7

REQUIREMENT

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.

SRP Section 12.2 indicates that the description of airborne sources should include a tabulation of the calculated concentrations of radioactive material, by nuclide, expected during normal operation, AOOs, and accident conditions for areas normally occupied by operating personnel and that the FSAR should provide the models and parameters used for the calculations.

ISSUE

FSAR Section 12.2.2.3 describes how the applicant determined airborne activity concentrations throughout the plant. This section provides an equation for calculating the equilibrium airborne calculations in rooms and cubicles. In addition, Table 12.2-26 provides assumptions and parameters used in the airborne source term calculations.

Staff is unable to duplicate the applicant's airborne source terms due to a lack of information and apparent inconsistencies between Chapter 12 and other FSAR questions. Therefore, the staff has the following questions related to airborne source terms.

REQUEST FOR ADDITIONAL INFORMATION 23-7929

INFORMATION NEEDED

1. The equation in FSAR Section 12.2.2.3 for calculating equilibrium airborne concentration contains a “P” variable for the fraction of activity released to air. The applicant does not provide any information on what the P values are or how they were determined. Therefore, the applicant should describe how the P values were determined and list the P values in FSAR Table 12.2-26.

2. FSAR Table 12.2-26 provides parameters for calculating airborne source terms. This table indicates that the RCS letdown flow rate is “364 L/min (80 gpm).” However, FSAR Table 9.3.4-3, which provides parameters for the chemical and volume control system, indicates that the normal RCS letdown and purification flow rate is “302.8 L/min (80 gpm).” Please update the FSAR to ensure both tables contain the correct values. If an incorrect value was used in any calculations or assumptions made in the FSAR (in airborne activity calculations or otherwise) please make the appropriate modifications and update the FSAR as appropriate, or justify an alternative.

3. As indicated above, Table 12.2-26 provides assumptions and parameters for the airborne source term calculations. However, some of the parameters given would appear to provide extra information beyond what it needed to perform the calculation. For example, Table 12.2-26 (1 of 8) provides a filter efficiency for low-volume purge filters for calculating containment building airborne activity, even though it does not appear the efficiency of these filters would have an effect on the airborne source term in containment since air sent through the purge system is not returned to containment.

   It is acceptable to provide additional information beyond the parameters needed to perform the calculation, however, staff cannot duplicate the applicant’s results for airborne source terms.

   a. Therefore, the staff requests that the applicant select one non-noble gas isotope and demonstrate how the values in Table 12.2-23 (1 of 4) “Reactor Containment Building (Normal Operation)” and Table 12.2-23 (2 of 4) “Reactor Containment Building (48 hr after Shutdown)” for that isotope were obtained.

   b. In addition, select one cubicle in FSAR Table 12.2-23 (3 of 4) “Auxiliary Building Cubicles (Normal Operation)” (for example, Charging Pump room) and demonstrate how all values for “Airborne Radioactivity Concentration” and “Derived Air Concentration (DAC) Fraction” were obtained.

4. In sheets 3 of 4 and 4 of 4 of FSAR Table 12.2-23, the applicant contains column providing concentrations for Kr and Xe together and Br and I together and derived air concentration fractions for each, however the combined concentration of many different isotopes does not appear to have much meaning and it is unclear how it is compared to the DAC values when DAC values are isotope specific. Please explain what the values in the following columns represent; 1) “Kr, Xe” under Airborne Activity concentration; 2) “Br, I” under Airborne Activity Concentration; 3) “Kr, Xe” under DAC fraction; 4) “Br, I” under DAC fraction; and 5) Total under DAC Fraction.

5. In sheets 3 of 4 and 4 of 4 of FSAR Table 12.2-23, please indicate if other radionuclides beyond those shown in the tables were considered and how the specific nuclides shown were selected for inclusion in the table.

6. Please indicate why the Kr, Xe and Br, I airborne activity concentrations for the fuel handling area (normal operations) and fuel handling area (refueling) in Table 12.2-23, sheet 3 of 4 are blank when all cubicles listed in sheets 3 of 4 and 4 of 4 of FSAR Table 12.2-23 contain numerical values in those columns (even if the value is zero). Please update FSAR Table 12.2-23 sheet 3 of 4 to provide numerical values in these columns. In addition, provide justification for the values that are provided.

7. Please demonstrate how the information in FSAR Table 12.2-26 (2 of 8) was used to develop the airborne activity source term for the fuel handling area (both normal and refueling). In the response please indicate if the information in FSAR Table 12.2-17, "Fission and Corrosion Product Activities in the Spent Fuel Pool" was used in calculating the airborne activity concentrations in the fuel handling area (both normal and refueling).

12.02-8

REQUIREMENT

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.

INFORMATION NEEDED

FSAR Table 12.2-25 provides cask loading pit source dimensions that appear consistent with the dimensions of a single fuel assembly. 1) Please indicate if spent fuel is intended to be located within the cask load pit other than during cask loading operations. 2) Please update the FSAR to specify which source term was used to determine cask loading pit shielding.

12.02-9

REQUIREMENT

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.

INFORMATION NEEDED

FSAR Table 12.2-25 provides the material and densities of radiation sources. For the shutdown cooling heat exchanger (SC HX) the applicant indicates that the material is 6% vapor, and that the density contribution for the vapor phase is 0.453 grams per cubic centimeter. This density appears inconsistent for what would be expected for the density of water vapor or air and appears inconsistent with the density provided for other equipment containing vapor. Please correct this apparent discrepancy or provide justification for the 0.453 grams per cubic centimeter vapor density value.

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