KHNPDCDRAIsPEm Resource

From:	Ciocco, Jeff
Sent:	Wednesday, February 03, 2016 7:20 AM
To:	apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Harry (Hyun Seung) Chang; Andy Jiyong Oh; Christopher Tyree
Cc:	Stutzcage, Edward; McCoppin, Michael; Burkhart, Lawrence; Vera, John; Lee, Samuel
Subject:	APR1400 Design Certification Application RAI 395-8463 (12.03-12.04 - Radiation Protection Design Features)
Attachments:	APR1400 DC RAI 396 RPAC 8463.pdf

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, the following days to the respond to the RAI questions. We may adjust the schedule accordingly.

12.03-50: 45 days
12.03-51: 30 days
12.03-52: 60 days

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

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 396-8463

Issue Date: 02/03/2016
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3

QUESTIONS

12.03-50

10 CFR 50, GDC 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) 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 (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

ANSI/ANS-57.1-1992, which is referenced by the applicant, indicates that fuel handling equipment shall be designed so that the operator will not be exposed to greater than 2.5 mrem/hour from an irradiated fuel unit, control component, or both, elevated to the up position interlock with the pool at normal operating water level.

This question is a follow-up to RAI 8275, Question 12.03-28.

In Question 12.03-28, the staff requested that the applicant provide the maximum lift height of the maximum raised fuel assembly in the refueling pool and spent fuel pool in the FSAR and to ensure that the dose rate to operators during fuel movement met the 2.5 mrem/hour criteria provided in ANSI/ANS-57.1-1992. In the response, the applicant updated the FSAR to include the lift height, but indicated that shielding would need to be included in the design in order to meet the 2.5 mrem/hour criteria from the maximum assembly. SRP 12.3-12.4 specifies that the staff will evaluate the radiation shielding and zoning design.

1. Please provide information on this shielding (such as what material the shielding is made out of, its density, its thickness, where it will be located, how it will be held in place, is the refueling platform capable of holding the shield, and information demonstrating that it is adequate to ensures that the 2.5 mrem/hour criteria will be met).

2. Update the FSAR to include information on the material, density, thickness, and location of the shields.

3. Since additional shielding is needed to reduce the dose to operators on the refueling platform and spent fuel pool handling machine platform to less than 2.5 mrem/hour, please provide additional information on the dose rate to personnel in the general refueling pool and spent fuel pool area during fuel movement. Indicate if any shielding or design features will be in place to ensure that the dose rate to these individuals will be in accordance with the 2.5 mrem/hour radiation zone designation provided for the general spent fuel pool area in FSAR Figure 12.3-7.

12.03-51

SRP Section 12.3-12.4 indicates that the acceptability of facility design features will be based on evidence that major exposure accumulating functions, such as maintenance, have been considered in the plant design that will keep potential radiation exposure from these activities ALARA. It also states that compliance with 10 CFR 20.1406 requires the applicant to describe how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

This question is a follow-up to RAI 8275, Question 12.03-36.

In the response to Question 12.03-36, the applicant provided a description of the containment sumps and how the sumps meet the above criteria. Please include the following information from that response in the FSAR:

1. Specify that there are a total of two sumps in containment (the containment building drain sump and the ICI cavity sump) and that each sump contains two pumps.

2. Specify that the sumps and sump pumps are designed in order to facilitate repair of the pumps, taking into account maintenance and removal, and that an easy removal path is provided to remove the pumps without obstacles.

3. Specify that the sump area on the floor is designed so that personnel can perform the ingress, egress, equipment laydown/pull, maintenance, and/or decontamination work for the pump and the pump motor without any platform.

4. Specify that the sump areas are epoxy coated to assist in decontamination.

12.03-52

10 CFR 20.1101(b) and 10 CFR 20.1406(b) require licensees to describe design features to maintain Occupational Radiation Exposure (ORE) ALARA, reduce contamination of the facility, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. 10 CFR 52.47 requires applications to include information describing how operating experience has been incorporated into the design. SRP Section 12.3-4 Acceptance Criteria, and Regulatory Guides 8.8 and 4.21, provide guidance for meeting the requirements of 10 CFR 20.1001 and 10 CFR 20.1406. Regulatory Guide 1.206 sections C.I.5.4 and C.I.9.3 note that applicants should discuss system reliability considerations.

The following questions are a follow-up to the applicant's response to RAI 8275, Questions 12.03-44 and 12.03-45.

1. In the response to Part 1 of Question 12.03-44, the applicant indicated that, "The application of metallic bellows and diaphragms is limited to the valves with low-stroke length applications, or infrequent movement in the APR1400 design." Please include this statement in the FSAR.

2. In the response to Part 2 of Question 12.03-44, the applicant indicates that they are using graphite lantern rings in accordance with industry guidance. In the response to Question 12.03-45, the applicant updated FSAR Figures 5.1.2-3, 6.3.2-1, and 9.3.4-1 to show valves with leak off lines (and therefore, double packing with lantern rings), and there are a large number of valves with this feature. Also, even though the applicant did not update the figures for other systems such as the liquid radwaste management system or component coolant water system, FSAR Sections 12.3.1.2.e and 12.3.1.2.i specify that graphite lantern rings with leak off between the double packing is provided for valves 4 inches and larger as well as normally open valves greater than 2 inches and all valves greater than 2 inches inside the containment building.

   However, the more recent documents referenced by the applicant in the response either recommend against the use of lantern rings (URD, Vol. 2, Chapter 1, Section 12.2.2.10) or only recommend graphite lantern rings for limited circumstances when monitoring and a leak off line is required (EPRI-TR-1000923, Section 4.2.5). The reference EPRI-NP-5697 is from 1988.

   Leaking valves or valve failures can result in increased worker dose for workers fixing the problem and leaks can result in contamination in the plant. In addition, valve leaks and failures can result in other operational problems and safety hazards (for example, see NRC Information Notice 93-90).

   a. Please provide additional justification for the widespread use of lantern rings and leak off lines in the APR1400 design and indicate why lantern rings and leak off lines are appropriate for use instead of live loading and other designs for valves greater than 4 inches, valves normally open over 2 inches, and valves greater than 2 inches in containment; or revise the FSAR (text and appropriate figures) to limit the use of lantern rings and leak off lines to only valves where a leak off feature is necessary and update the FSAR to revise the criteria for specifying the use of lantern rings and leak off lines in the FSAR.

   b. The response indicates that where lantern rings are used, they are graphite lantern rings, however, certain sections of the FSAR do not specify if the lantern rings used are made of graphite (such as FSAR Section 9.3.4.3.3). Please ensure that all FSAR sections specify that the lantern rings being used are graphite lantern rings or include a statement in Chapter 12 clearly stating that all lantern rings specified within the design are graphite lantern rings.

   c. In the response to Question 12.03-45 the applicant updated FSAR Figures 5.1.2-3, 6.3.2-1, and 9.3.4-1 to show where leak off lines are located in those figures. Please specify if there are any other valves in the FSAR which contain leak off lines and update the FSAR, as appropriate, to label these valves. Please ensure that the text in the FSAR is consistent with the information in the figures.

3. In the response to Part 5 of Question 12.03-44, the applicant indicates that the reactor coolant pump casing is fabricated with austenitic stainless steel cladding and that the finished surface of the cladding is machined to have smooth surfaces to limit the buildup of radioactive contamination on its surface. Besides the reactor coolant pumps, specify if other pumps

have similar design features to limit the buildup of radioactive material and if not, specify why it is not necessary. Update FSAR Section 12.3.1.2.a to include these design features.

4. In the response to Part 5 of Question 12.03-44, the applicant indicated that electro-polishing was not used on pumps. Electro-polishing can significantly reduce the dose rate from components and is recommended for consideration in industry guidance documents, (such as URD, Vol. 2, Chapter 1, Section 8.3.3) for areas where the dose rate can be significantly reduced, such as large diameter reactor system piping, steam generator channel heads and divider plates, and reactor cavity and transfer canal liners. Please specify if electro-polishing was considered and will be used for any components in the plant, such as those specified above. If so, please update the FSAR to specify which components electro-polishing will be used on. If electro-polishing is not specified in the design, please provide an explanation for why electro-polishing is not necessary to maintain doses ALARA and to minimize contamination as part of the APR1400 design.


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