

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

### APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

**RAI No.:** 545-8739  
**SRP Section:** 09.01.03 – Spent Fuel Pool Cooling and Cleanup System  
**Application Section:** 09.01.03  
**Date of RAI Issue:** 04/21/2017

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### **Question No. 09.01.03-9**

Generic Design Criterion (GDC) 61, in Appendix A of 10 CFR 50, requires, in part, that the fuel storage system be designed to assure adequate safety under normal and postulated accident conditions. The system shall be designed with residual heat removal capability that reflects the importance to safety of decay heat and other residual heat removal.

In RAI 473-8582, Question No. 09.01.03-4, the staff requested the applicant to:

- a. clearly identify the minimum safety water level credited to be retained in the spent fuel pool (SFP) in order to ensure the proper operation of the safety-related SFP cooling system (SFPCS), and update the DCD accordingly;
- b. clearly demonstrate that the minimum safety water level still provides adequate net positive suction head (NPSH) to operate the SFPCS pumps, and to update the DCD accordingly; and
- c. revise the thermal-hydraulic calculations associated with the SFPCS using the revised minimum safety water level, and update the DCD accordingly.

On 07/07/2016 the applicant provided its responses to RAI 473-8582, Question No. 09.01.03-4, stating that the minimum safety water level for the SFP is EL.146 ft., which ensures sufficient NPSH for the SFPC pumps, located at EL. 100 ft. The applicant also indicated that a new thermal analysis will be completed by October 2016, and made available for staff's evaluation.

The staff evaluated the thermal analysis in late December 2016 (once it was made available for evaluation) and found that the minimum safety water level assumed in the analysis was 23 ft. above the spent fuel rack. According to the applicant's response to RAI 517-8670, Question 19.03-41, Figure B-1, "Spent Fuel Pool Monitoring Water Level," the elevation at the

top of the fuel rack is EL. 129'-8". Based on these elevations, the minimum safety water level assumed in the pool heat-up thermal analysis corresponds to EL.152 ft. 8 inch, not EL. 146 ft. as stated in the RAI response. This non-conservative discrepancy allows the applicant to credit an additional 6ft. 8 inch of water in the SFP.

The staff requests the applicant to revise the thermal-hydraulic calculations associated with the SFP cooling system using the proper minimum safety water level, update the DCD accordingly, and revise any other RAI response that gets impacted by a revision of the thermal analysis.

## **Response**

As described in Section 3 of the Thermal-Hydraulic (T-H) Analysis Calculation Report (APR1400-H-N-NR-14013-P/NP), the Applicant has analyzed two conditions for the SFP water level - 38.67 ft. (EL. 152 ft. 8 inch) and 32 ft. (EL. 146 ft.). The basis for these elevations used in the T-H analysis is discussed in the following paragraphs.

The SFP water level of 38.67 ft. (EL. 152 ft. 8 inch) was considered the "maintained water level" when it is operating normally. The technical basis for this water level was the following statement contained in Para. 4.3.2, Chapter 16 – TECHNICAL SPECIFICATION in the Design Control Document:

- 1) Paragraph 4.3.2 in Design Control Document Chapter 16

### "4.3.2 Drainage

The spent fuel pool is designed and shall be maintained above 7m (23 ft) from the top of the spent fuel storage rack to prevent inadvertent draining." (Representing EL. 152 ft. 8 inch)

- 2) Section 3 in T-H Analysis Calculation Report (APR1400-H-N-NR-14013-P/NP)

"~ The operating scenarios for thermal-hydraulic analysis are considered following three types of SFAs offloading. The SFP water level should be higher than 23ft above the top of the SFR (38.67ft). ~" (Representing EL. 152 ft. 8 inch)

The SFP water level of 32 ft. (EL. 146 ft.) was considered as the minimum safety water level under the postulated accident condition, which is a single gate failure. This level was provided in response to RAI 8582, Question No. 09.01.03-4 (ML16189A186) as follows;

- 1) Response for RAI 8582, Question No. 09.01.03-4, a

[Question] Clearly identify the minimum safety water level credited to be retained in the SFP in order to ensure the proper operation of the safety-related SFPCS, and update the DCD accordingly;

[Response] The minimum safety water level for the SFP is EL.146 ft. The minimum safety water level is selected based on the lowest SFP water level under the worst postulated

accident condition, which is a single gate failure. During a single gate failure, the SFP water level drops to EL.146 ft. The operation of the SFP cooling pump in the SFPCS is always ensured at EL.146 ft, since the elevation of the pump suction is EL.144 ft and the pump stop set point is at EL.144'-11". DCD Tier 2 Subsection 9.1.2.2.2 and 9.1.3.2.1.1 will be revised to clarify the minimum safety water level.

2) Section 3 in T-H Analysis Calculation Report (APR1400-H-N-NR-14013-P/NP)

“~ On top of that, operating scenarios for thermal-hydraulic analysis are considered following accident event from the above SFAs offloading.

1. Single gate failure accident – The SFP water level may be reduced by the drainage due to a single gate failure of the fuel-handling areas adjacent to the SFP. The lowest SFP water level in case of a single gate failure is 32ft. With consideration for the reduced SFP water level, the calculations for SFP bulk water temperature, SFP local water temperature and SFA cladding temperature are performed.” (Representing EL. 146 ft.)

The calculation results for above two conditions (Condition 1 : EL. 152 ft. 8 inch, Condition 2 : EL. 146 ft.) of SFP water level were contained in Section 8, Thermal-Hydraulic Analysis Calculation Report.

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### **Impact on DCD**

There is no impact on the DCD.

### **Impact on PRA**

There is no impact on the PRA.

### **Impact on Technical Specifications**

There is no impact on the Technical Specifications.

### **Impact on Technical/Topical/Environmental Reports**

There is no impact on any Technical, Topical, or Environment Report.