

## 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.: 396-8463  
SRP Section: 12.3-12.4 – Radiation Protection Design Features  
Application Section: 12.3 – Radiation Protection Design Features  
Date of RAI Issue: 02/03/2016

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### **Question No. 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 2.5mrem/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 ensure 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.

### **Response**

The response to RAI 8275-12.03-28 states that "The resulting radiation level from the spent fuel is 2.5 mrem/hour or less in the work area when the shielding of the fuel handling equipment is taken into account."

This statement means that the geometric design of the fuel handling equipment such as a grapple, a hoist box and mast (only for the refueling pool) is reflected in the shielding analysis model, which determined that the dose rate to operators in the work area is less than 2.5 mrem/hour. It is ensured that additional shielding material and/or a shielding wall is not needed.

The detailed information about the shielding analysis models for the refueling pool (RP) and the spent fuel pool (SFP) are as follows:

The spent fuel assembly is modeled from the center of the active fuel to the top of the fuel. Also the grapple and the hoist box are included in the model. Water is modeled to cover up to 9' above the active fuel and dry-air is modeled above the water. For the refueling pool model, the mast of the refueling machine is additionally included in the model. Any other components or structures in the RP and SFP are not considered in the shielding models for the APR 1400. The shielding analysis results for the RP and SFP models described above shows that the dose rates at the working areas during the fuel transfer operation are below the dose limit (2.5 mrem/hour) without additional materials for shielding.

Therefore, additional shielding is not necessary since the dose rate to the operators is less than 2.5 mrem/hour when the shielding effects of the fuel handling equipment are considered in the shielding analysis.

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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.