

## KHNPDCDRAIsPEm Resource

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**From:** Ciocco, Jeff  
**Sent:** Wednesday, May 25, 2016 8:33 AM  
**To:** apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource; Jung-ho Kim (jhokim082@gmail.com); Andy Jiyong Oh; Christopher Tyree  
**Cc:** Stutzcage, Edward; Burkhardt, Lawrence; Schiller, Alina; Williams, Donna  
**Subject:** APR1400 Design Certification Application RAI 490-8599 (12.03-12.04 - Radiation Protection Design Features)  
**Attachments:** APR1400 DC RAI 490 RPAC 8599.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.

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

Thank you,

Jeff Ciocco  
New Nuclear Reactor Licensing  
301.415.6391  
[jeff.ciocco@nrc.gov](mailto:jeff.ciocco@nrc.gov)



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**From:** Ciocco, Jeff

**Created By:** Jeff.Ciocco@nrc.gov

**Recipients:**

"Stutzcage, Edward" <Edward.Stutzcage@nrc.gov>  
Tracking Status: None  
"Burkhart, Lawrence" <Lawrence.Burkhart@nrc.gov>  
Tracking Status: None  
"Schiller, Alina" <Alina.Schiller@nrc.gov>  
Tracking Status: None  
"Williams, Donna" <Donna.Williams@nrc.gov>  
Tracking Status: None  
"apr1400rai@khnp.co.kr" <apr1400rai@khnp.co.kr>  
Tracking Status: None  
"KHNPDCDRAIsPEm Resource" <KHNPDCDRAIsPEm.Resource@nrc.gov>  
Tracking Status: None  
"Jungcho Kim (jhokim082@gmail.com)" <jhokim082@gmail.com>  
Tracking Status: None  
"Andy Jiyong Oh" <jiyong.oh5@gmail.com>  
Tracking Status: None  
"Christopher Tyree" <Christopher.tyree@aeacom.com>  
Tracking Status: None

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# REQUEST FOR ADDITIONAL INFORMATION 490-8599

Issue Date: 05/25/2016

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: 12.2, 12.3-12.4, and 3.11

## QUESTIONS

12.03-53

### Requirements and Guidance

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 50.34(f)(2)(vii) requires that the applicant preform radiation and shielding design reviews of spaces around systems that may, as a result of an accident, contain accident source term, and design as necessary to permit adequate access to important areas and to protect safety equipment from the radiation environment and references NUREG-0737, Section II.B.2.

10 CFR 50.49(e)(4) requires the identification of the radiation environment, including the total dose, expected during normal operation over the installed life of the equipment, and the radiation environment associated with the most severe design basis accident during or following which the equipment is required to remain functional, including the radiation resulting from recirculating fluids for equipment located near the recirculating lines and including dose-rate effects. This requirement is reflected within the guidance of SRP section 3.11 "Environmental Qualification of Mechanical and Electrical Equipment."

GDC 61 states that system should be provided with suitable shielding for radiation protection.

NUREG-0737, Section II.B.2, provides the systems that should be assumed in the post-accident shielding analysis to contain high levels of radioactivity.

SRP 12.3-12.4 indicates that the staff will conduct shielding design review to ensure that the design permits adequate access to important areas and provides for protection of safety equipment from radiation, following an accident. In addition, SRP 12.3-12.4 indicates that the staff will review the basis for the radiation shielding design.

### Issue

As a result of the DCD Chapter 12 shielding audit, it was determined that the source term for systems re-circulating accident fluid, used in the radiation shielding analysis, was inconsistent with the source term provided in the response to RAI 8247, Question 12.02-16. The applicant later confirmed that the source term provided in the response to RAI 8247, Question 12.02-16, were the correct values.

Furthermore, the applicant indicated that the cumulative effects of this issue with other source term issues identified in previous staff RAIs may result in potential shielding design changes or other changes in the DCD. Other RAIs that could impact the radiological dose and shielding analysis include RAI 8339, Question 12.02-19 and RAI 8420, Questions 12.02-22 and 12.02-23 (note that these RAIs include some of the potentially most significant source issues. However, any other changes that could impact the radiological analysis, as a result of other RAIs or corrections should also be fully considered.).

Considering this, staff requests the following;

1. The mission dose rates to vital areas will likely increase as a result of result of resolving the source term issues described above and the dose values for accessing and performing activities in the Remote Control Console Room and the Remote Shutdown Room were already near the 5 rem limit. Therefore, the applicant must ensure that the methods, models, and assumptions, used for calculating the mission doses, for those mission doses near the 5 rem limit, are appropriately conservative, contain sufficient margin, and are appropriately detailed to ensure that the mission doses will be below 5 rem limit, or make appropriate changes. Specifically, the applicant should ensure that the calculations contain sufficient conservatism to account for limitations in the computer programs used to perform the calculations. The MicroShield computer code does not allow for modeling complex geometries and does not have the accuracy of MCNP computer code, but is being relied on for much of the post-accident mission dose, shielding analysis, including for areas near the 5 rem limit. Therefore, for areas near the 5 rem limit, the applicant is requested to provide additional information demonstrating that the calculations contain sufficient conservatism to ensure mission dose rates will remain below the 5 rem limit.

## **REQUEST FOR ADDITIONAL INFORMATION 490-8599**

2. Considering all of the above, please describe the cumulative impacts of all of the source term changes on the radiation shielding, zoning, mission dose, and equipment qualification design and provide general information demonstrating that the radiation shielding design is adequate. Ensure that if shielding changes are required that it does not impact other areas of the design (for example, the structural design).

