

## KHNPDCDRAIsPEm Resource

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**From:** Ciocco, Jeff  
**Sent:** Tuesday, February 02, 2016 5:29 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:** RE: APR1400 Design Certification Application RAI 390-8479 (12.02 - Radiation Sources)  
**Attachments:** APR1400 DC RAI 390 RPAC 8479.pdf

With the attachment.

Thanks,

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**From:** Ciocco, Jeff  
**Sent:** Monday, February 01, 2016 12:55 PM  
**To:** apr1400rai@khnp.co.kr; KHNPDCDRAIsPEm Resource <KHNPDCDRAIsPEm.Resource@nrc.gov>; Harry (Hyun Seung) Chang <hyunseung.chang@gmail.com>; Andy Jiyong Oh <jiyong.oh5@gmail.com>; Christopher Tyree <Christopher.tyree@aecom.com>  
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**Subject:** APR1400 Design Certification Application RAI 390-8479 (12.02 - Radiation Sources)

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

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

Thank you,

Jeff Ciocco  
New Nuclear Reactor Licensing  
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**Hearing Identifier:** KHNP\_APR1400\_DCD\_RAI\_Public  
**Email Number:** 441

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**Subject:** RE: APR1400 Design Certification Application RAI 390-8479 (12.02 - Radiation Sources)  
**Sent Date:** 2/2/2016 5:28:33 AM  
**Received Date:** 2/2/2016 5:28:35 AM  
**From:** Ciocco, Jeff

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

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MESSAGE	1263	2/2/2016 5:28:35 AM
APR1400 DC RAI 390 RPAC 8479.pdf		97157
image001.jpg	5040	

**Options**

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**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

# REQUEST FOR ADDITIONAL INFORMATION 390-8479

Issue Date: 02/01/2016  
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 and others

## QUESTIONS

12.02-26

This is a follow-up to RAI 8247, Question 12.02-16.

### REGULATIONS AND GUIDANCE

10 CFR 52.47(a)(8) requires that the FSAR contain, the information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs (f)(1)(xii), (f)(2)(ix), and (f)(3)(v).

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, GDC 19 requires that radiation exposure for the duration of an accident does not exceed 5 rem whole body, or its equivalent to any part of the body.

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.

### INFORMATION NEEDED

In the response to RAI 8247, Question 12.02-16, the applicant provided a calculation for the dose in the control room envelope (CRE) from the MCR emergency filters and provides other information on accident source terms and the dose inside the CRE. Based on the response, staff has the following questions.

1. NUREG-0737, Section II.B.2 indicates that the systems that should contain high levels of radioactivity in post-accident situation should include, the chemical and volume control system, sample lines, gaseous radwaste systems, and standby gas treatment systems, along with any others and that if any of these systems were excluded, the applicant should explain why such systems were excluded.

However, the applicant did not provide a post-accident source term for the above systems or provide any justification for why the post-accident source terms for the above systems were not included. Likewise, it does not appear that the possible post-accident source terms of the above systems were included in the dose analysis for post-accident access to vital areas.

Please provide the potential post-accident source term for the systems listed above and any other applicable systems that may contain post-accident source term, considering all possible design basis accidents, and consider the dose rate from these areas in the vital area access analysis. If it is not necessary to include the post-accident source term for any of these systems, please provide justification for why a post-accident source term and analysis is not needed for these systems.

2. In the response, the applicant models the dose calculation from the MCR emergency filters to the CRE. However, neither the application nor the response provide the density of concrete that was assumed for calculating the accident dose inside the CRE. In addition, the assumed density of concrete was not provided in the application for any of the concrete walls used for radiation shielding. Please specify the density of concrete that was assumed in the radiation shielding calculations, including shielding for the CRE and all other radiation shields and update the FSAR to provide this information.

## REQUEST FOR ADDITIONAL INFORMATION 390-8479

3. In the response, the applicant provides information indicating that containment penetrations will not be a significant dose contribution to CRE dose. Please specify if the design is such that it prevents a direct radiation streaming path or near direct radiation streaming path from the emergency filters (located above the main control room.) into the CRE through the ventilation ducting openings or other penetrations into the CRE.

### 12.02-27

This is a follow-up to RAI 8247, Question 12.02-18.

#### REQUIREMENT 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.

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.

#### INFORMATION NEEDED

In the response to RAI 8247, Question 12.02-18, the applicant indicated that editorial errors were found in FSAR Table 12.2-26 and they correct them in the proposed FSAR markup. Staff has the following questions as a result of the staff's review of these changes:

1. While the applicant indicates that the errors are editorial, many of the changes provide different inputs to the calculations for minimum required ventilation flow rates and airborne activity concentrations than what was used in calculation packages 11E47-I-035-N377-013 and 11E47-I-035-N377-014, which were reviewed in the source term audit (see ML15208A492 for audit plan). It would appear that the changes would require the calculations to be revised and could result in more minimum required ventilation flow rate changes than those shown and could result in many different calculated DAC fractions and airborne activity concentrations than what are provided in FSAR Table 12.2-23. However, the applicant didn't provide any information regarding changes to the calculations or make any changes to FSAR Table 12.2-23 in the response. Please ensure that all calculations and FSAR values are updated and accurate and provide revised calculations 11E47-I-035-N377-013 and 11E47-I-035-N377-014 for staff review or provide a detailed explanation for why revisions are not necessary.
2. In performing confirmatory calculations to attempt to verify if the results provided in the FSAR were still adequate (with the changes), the staff noticed that the water volume assumed for the IRWST in 11E47-I-035-N377-013, used for calculating airborne activity from leaked IRWST fluids, was inconsistent with the normal water volume of the IRWST provided in FSAR Chapter 6, Table 6.8-1. In addition, the IRWST volume provided in the response to RAI 7856, Question 12.02-2 is also different. Please explain these discrepancies in IRWST water volume and ensure that the Chapter 12 source term information and estimated airborne activity concentrations associated with the IRWST are based on the normal operating water volume and concentrations, provided in FSAR Table 6.8-1 (with an estimated 0.25% fuel failure percentage), or are more conservative. Provide all revisions to the calculations and FSAR that are appropriate.



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