

KHNPDCDRAIsPEm Resource

From: Ward, William
Sent: Friday, September 11, 2015 6:27 PM
To: 'apr1400rai@khnp.co.kr'; KHNPDCDRAIsPEm Resource; 'Chang, Harry'; jiyong.oh5@gmail.com; daegeun.ahn@gmail.com; Tyree, Christopher (christopher.tyree@aecom.com)
Cc: Ciocco, Jeff; Lee, Samuel; Stutzcage, Edward; Olson, Bruce; McCoppin, Michael
Subject: APR1400 Design Certification Application RAI 207-8247 (12.2 - Radiation Sources)
Attachments: APR1400 DC RAI 207 RPAC 8247.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 time shown below to respond to the RAI questions. We may adjust the schedule accordingly.

<u>Question</u>	<u>Time to respond</u>
12.02-15	30 days
12.02-16	45 days
12.02-17	45 days
12.02-18	30 days

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

Thank you,

William R. Ward, P.E.
Senior Project Manager
U.S. Nuclear Regulatory Commission
m/s T6-D38M
Washington, DC, 20555-0001
NRO/DNRL/Licensing Branch 2
ofc T6-D31
ofc (301) 415-7038



Hearing Identifier: KHNP_APR1400_DCD_RAI_Public
Email Number: 256

Mail Envelope Properties (be4caf1b3d0545549bc710ba1388f79a)

Subject: APR1400 Design Certification Application RAI 207-8247 (12.2 - Radiation Sources)
Sent Date: 9/11/2015 6:26:59 PM
Received Date: 9/11/2015 6:27:02 PM
From: Ward, William

Created By: William.Ward@nrc.gov

Recipients:

"Ciocco, Jeff" <Jeff.Ciocco@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Stutzcage, Edward" <Edward.Stutzcage@nrc.gov>
Tracking Status: None
"Olson, Bruce" <Bruce.Olson@nrc.gov>
Tracking Status: None
"McCoppin, Michael" <Michael.McCoppin@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
"Chang, Harry" <hyunseung.chang@gmail.com>
Tracking Status: None
"jiyong.oh5@gmail.com" <jiyong.oh5@gmail.com>
Tracking Status: None
"daegeun.ahn@gmail.com" <daegeun.ahn@gmail.com>
Tracking Status: None
"Tyree, Christopher (christopher.tyree@aecom.com)" <christopher.tyree@aecom.com>
Tracking Status: None

Post Office: HQPWMSMRS04.nrc.gov

Files	Size	Date & Time
MESSAGE	966	9/11/2015 6:27:02 PM
image001.jpg	4205	
APR1400 DC RAI 207 RPAC 8247.pdf		90457

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:



U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

REQUEST FOR ADDITIONAL INFORMATION 207-8247

Issue Date: 09/11/2015
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

QUESTIONS

12.02-15

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 FSAR should contain the methods, models, and assumptions for the sources provided within FSAR Section 12.2.

As a result of an FSAR Chapter 12 source term audit (see ML15208A492 for audit plan), the staff identified several assumptions made in the Chapter 12 source terms that should be included in the FSAR, but are not.

1. For all filters and demineralizers for which source terms are provided in FSAR Chapter 12, please include the replacement frequencies assumed in developing the source terms in FSAR Chapter 12, unless already provided (for example, the assumed replacement frequency used in developing the source terms for the steam generator blowdown pre-filter, post-filter, and demineralizer and spent pool cleaning filter and demineralizer should be included in the FSAR).
2. Please include the basic assumptions used for developing the source terms for the solid radwaste system tanks in FSAR Table 12.2-22 in the FSAR. For example, for the spent resin long-term storage tank, indicate that the spent resin long-term storage tank provided in FSAR Table 12.2-22 is based on storing ten years of CVCS system resins.

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.

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.

REQUEST FOR ADDITIONAL INFORMATION 207-8247

SRP 12.2 indicates that the applicant should provide a description of radiation sources during accident conditions in the plant which are used in shielding calculations and that the source terms should be based from NUREG_0737, Item II.B.2, or RG 1.183.

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.

ISSUE

While the applicant provided assumptions for developing source post-accident source terms in FSAR Table 12.2-24, consistent with RG 1.183, the applicant does not provide source term information for major post-accident sources (while Table 12.2-24 provides post-accident gap release and early in-vessel release to containment sump water and atmosphere, which are used as an assumption in developing sources, it does not provide the source terms of major systems or components in radionuclide concentrations or gamma energies).

To develop post-accident source terms in recirculating fluids, the information in Table 12.2-24 is needed, however, source terms are based on the volume of recirculating fluids, size of components, time after the release, and other factors. Therefore, the post-accident source term information currently provided in the FSAR is insufficient to meet the SRP.

In addition to recirculating fluids, the applicant does not provide any source term information for post-accident control room ventilation filters. The assumptions and source terms for these filters are required to ensure that doses do not exceed 5 rem in accordance with GDC 19.

In addition, the applicant does not provide shielding information for the main control room or technical support center.

Therefore, the staff requests the following information:

INFORMATION NEEDED

1. Please update the FSAR to provide source term information for systems that recirculate post-accident fluids outside containment (such as the shutdown cooling system, safety-injection system or other systems containing radioactive fluid), with time intervals showing how the source term changes during the duration of the accident. Also in the FSAR, indicate which systems are included in the source terms provided and provide the total volume of recirculating fluid (or in the response, point to information elsewhere in the FSAR where this information can be found). In the response, provide the basis for the volume of recirculating fluid used in developing the source term.
2. Update the FSAR to provide maximum post-accident source term information for all control room and technical support center emergency ventilation filters using appropriate assumptions for post-accident filter loading (for example, using assumptions for radioactive material entering the control room ventilation system, equivalent to material assumed in the Chapter 15 control room dose analysis).
3. Update the FSAR to provide radioactive source dimensions and parameters for major post-accident source term components such as the shutdown cooling pumps and post-

REQUEST FOR ADDITIONAL INFORMATION 207-8247

accident emergency control room ventilation filters and identify the locations of these components.

4. Indicate if there are any filters (either normal operation or accident) physically within the main control room or technical support center areas (those areas requiring continuous access). If so, discuss shielding of these filters and the dose from these components during design basis accidents.
5. Indicate radiation shielding thicknesses for the main control room and technical support center in the FSAR and indicate how the design ensures that there are not radiation streaming paths that could affect doses to these areas.
6. Ensure that in responding to the above questions, that information in FSAR Chapter 15 is still valid (for example, ensure that emergency ventilation filter shine dose rates provided in Chapter 15 are still accurate). If not, please update the FSAR, as appropriate.

12.02-17

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 source terms used for plant shielding are to be based on an assumed 0.25% failed fuel fraction.

A review of the FSAR and audit material (see ML15208A492 for the audit plan) reveals that the source terms for the liquid waste management system are based on inputs of liquid waste from various sources. The average RCS concentration of the sources used in the calculation is 44% of the 0.25% failed fuel RCS source term. This is acceptable for calculating activity concentrations for buildup in the liquid waste management system demineralizers and reverse osmosis packages because activity in those components builds up over time and it is reasonable to assume that some of the input pathways are less than full RCS concentration and the average concentration of 44% is reasonable. However, for the monitor tanks, the source term would be based on the concentrations recently processed by the liquid waste management system. It is reasonable to assume that on a given day a monitor tank could be filled with fluid that initially contained a source term concentration equivalent to RCS fluid concentrations.

1. Please increase the design basis monitor tank source term in the FSAR to account for the monitor tank being filled with fluid that was initially at the 0.25% failed fuel RCS concentration and was processed through the liquid waste management system.
2. Please update the FSAR Chapter 12 to include general assumptions that were used for liquid waste management system source terms, such as that the demineralizers and reverse osmosis package are based on processing an average liquid concentration of 44% the RCS source term over the given time period and that the monitor tanks are based on processing 100% of the RCS source term through the RCS over the given time period.

REQUEST FOR ADDITIONAL INFORMATION 207-8247

12.02-18

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.

As discussed during the source term audit (see ML15208A492 for audit plan) the application is unclear if the ventilation flow rates provided in FSAR Table 12.2-26 are minimum ventilation flow rates for each of the rooms and cubicles provided in that table. The applicant indicated during the audit that the FSAR will be updated to clarify that the ventilation flowrates provided are minimum flow rates. Please update the FSAR to provide this information.