

September 7, 2016

MEMORANDUM TO: William Ward, Acting Chief
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

FROM: Alina Schiller, Project Manager /RA/
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF THE JULY 27, 2016, PUBLIC TELECONFERENCE
WITH KOREA HYDRO AND NUCLEAR POWER CO. LTD. TO DISCUSS
CHAPTER 12 TOPICS RELATED TO ADVANCED POWER REACTOR
1400 DESIGN

On July 27, 2016, a Category 1 public teleconference was held between the U.S. Nuclear Regulatory Commission (NRC) staff and Korea Hydro and Nuclear Power Co. Ltd. (KHNP). The meeting was open to the public. The meeting notice was issued on July 15, 2016, and was documented in the NRC Agencywide Documents Access and Management System (ADAMS) under Accession Number ML16197A424. The notice included the meeting agenda.

The purpose of the meeting was to discuss two topics of the Advanced Power Reactor 1400 (APR1400) related to radiation protection described in APR1400 design control document, Chapter 12, namely the tank volume and daughter nuclides issues. KHNP requested this meeting at the July 13, 2016, public meeting in order to describe what they will do and what information they will submit to respond to Request for Additional Information (RAI) 8420, Questions 12.02-22, 12.02-23, and 12.02-25.

A List of Attendees is provided as an enclosure (ML16216A077).

After introductory remarks regarding KHNP's understanding of the staff's need of additional information in order to write the Safety Evaluation Report (SER) with Open Items (OIs), the RPAC's Branch Chief emphasized the fact that the project is late in Phase 2 and the August 19, 2016, deadline will not be met, adding that KHNP needs to provide support documentation for the two topics. He mentioned that KHNP provided a draft response to RAI 8420, Question 12.02-22 in the Electronic Reading Room (ERR) only hours before the meeting, and that such a short notice before the start of the meeting did not provide the staff adequate time to review the material. It would be more helpful for the staff, if the applicant provided information a minimum of at least a few days in advance of the meeting to allow the staff adequate time to do a review of the information prior to the teleconference.

The daughter progeny issue (RAI 8420, Questions 12.02-23 and 12.02-25) was discussed first. For this topic, KHNP had not provided any supporting documentation before the meeting.

The technical staff reiterated that KHNP needs to provide justification of why the DAMSAM Code is conservative enough. KHNP explained that it would do a benchmark calculation to evaluate the effects of the Shield-APR Code not considering the buildup of the daughter progeny in the radioactive decay process. The DAMSAM Code was used to calculate the radionuclide inventory in the reactor core and the subsequent release of radionuclides from the core from assumed failed fuel into the reactor coolant system (Chapter 12 of the SRP specifies that a failed fuel fraction of 0.25 percent should be assumed). The Shield-APR Code is used to calculate the radionuclide inventory of components downstream of the RCS. The applicant plans to do a benchmark calculation comparing the results of the DAMSAM Code (used in the APR 1400 design application), to the ORIGEN code and FIPCO Code used in the AP1000 design application and other Westinghouse design applications. The applicant believed that the ORIGEN code may provide sufficient conservatism, compared to the ORIGEN and FIPCO codes, that consideration of daughter product buildup downstream of the RCS need not be considered. In addition, the applicant may compare Shield-APR Code results to a similar code used by Westinghouse plants, to determine if there may be conservatism in the Shield-APR Code.

The RPAC's Branch Chief asked about the timeframe that KHNP is looking at for delivering the results since the January 2017, expected final closure date from the closure plan is not acceptable, which will lead to extending the schedule for Phase 2. KHNP responded stating that it would take some time and would be late this year, and that KHNP would get back to the Lead PM and LB2's Branch Chief to see what options KHNP will have. KHNP mentioned that it understood that the schedule is important.

The technical staff mentioned that a management meeting on the Chapter 12 issues had been held a day before. He suggested that if the applicant is unable to provide justification that the codes were sufficiently conservative, that an alternative approach could be that KHNP revise Tier 1, Section 2.8, "Radiation Protection" to include a failed fuel fraction limit of 0.125 percent and add a COL item to Tier 2, Chapter 12, that would require the COL applicant to specify the procedures to ensure the failed fuel percentage is limited to 0.125 percent. Limiting the failed fuel percentage to 0.125 percent would provide sufficient conservatism to cover the buildup of daughter progeny.

KHNP concluded that its action items for the daughter nuclides issue would be to provide a response with respect to the schedule and to proceed with the plan, as KHNP described.

A discussion regarding the tank volume issue (RAI 8420, Question 12.02-22) followed.

The staff mentioned that since KHNP provided its document in ERR only a few hours before the meeting, it cannot provide any final comments. For future meetings, it was requested that KHNP provide supporting documents a few days in advance in order to have efficient meetings.

KHNP provided a high level summary of the approach, as described in the ERR document. KHNP indicated that although the source terms for the tanks used in the shielding analysis were not based on tank volumes filled to their full liquid capacity, some of the tank activity levels were actually based on a larger volume than what was modeled in the shielding analysis. This is a slightly conservative assumption (compared to the volumes the applicant indicated), because condensing the source results in higher dose rates near the source. In addition, the holdup

tank, equipment drain tank, reactor drain tank, and reactor makeup water tank were modeled based on an overly conservative noble gas source term (the noble gasses were considered to nearly fill these tanks even though much of the tank volume would actually be filled with liquid). So the total liquid and gaseous source term calculations would actually exceed the actual total volume of these tanks, which is a conservative assumption, especially since for these tanks, the noble gas source term estimated was significantly larger than the source term of radionuclides in the liquids. However, although the applicant's noble gas concentrations were high, the staff was unable to duplicate the applicant's noble gas values. Therefore, the staff asked the applicant to provide additional information showing how the noble gas concentrations for these tanks were calculated. KHNP stated that it would get back to the NRC staff regarding the calculation of the noble gases as soon as possible. *Note: KHNP sent an e-mail with the description of the noble gas activity calculation for tanks (draft) on August 1, 2016.*

KHNP described the two tanks which did not include significant noble gas source terms and which had source terms that were not based on the full level of the tanks. KHNP indicated that these two tanks are the boric acid storing tank (BAST) and the in containment refueling water storage tank (IRWST). The source terms for these tanks were essentially based on the midpoint between the high level and low level of the tanks. The staff mentioned that the NRC cannot accept the 67.5 percent fraction for the BAST and that the tank source term should be based on the tank filled to its high level fraction of 95 percent capacity. KHNP responded that it needs to discuss with the team in Korea and would get back to the staff as soon as possible.

With respect to the IRWST, the staff mentioned that there was not significant time to review the document in the ERR and could not comment on it.

It was agreed that KHNP would update the draft RAI in ERR with the calculation on noble gases, and KHNP would discuss with his team and communicate when this would occur. KHNP added that by the end of the week, it would provide some answers related to his action items. *Note: During the July 28, 2016, DNRL – RPAC management meeting, Donna Williams communicated that during a teleconference with KHNP, it was mentioned that it would provide responses regarding the schedule by August 3, 2016.*

At the end of the meeting, the staff reminded KHNP that RAI 8339, Question 12.2-19 and RAI 8353, Question 12.2-21 also needed to be resolved in order to completely resolve the holdup tank and boric acid storage tank source terms. This included discussion regarding the decontamination factors question which the NRC had asked KHNP in June 2016, on where the total waste per one cycle of 1,100,000 gallons comes from in the calculation that KHNP had placed in the ERR. The staff reiterated that KHNP needed to provide additional clarification. *Note: The staff also raised this subject at the July 13, 2016, planning meeting. KHNP agreed to add this piece of information to the RAI response and add it as a bullet in the closure plan.*

W. Ward

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Future Interactions

At the conclusion of the teleconference, KHNP and the NRC staff committed to consider all of the feedback from the meeting and engage to finalize the path forward to resolve the issues discussed.

Please direct any inquiries to Alina Schiller at 301-415-8177 or via e-mail to alina.schiller@nrc.gov.

Docket No.: 52-046

Enclosure:
List of Attendees

cc w/enclosure: See next page

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