

April 4, 2016

MEMORANDUM TO: Donna Williams, Acting Chief
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

FROM: Tarun Roy, Project Manager **/RA/**
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF THE FEBRUARY 24, 2016, PUBLIC
TELECONFERENCE MEETING WITH KOREA HYDRO AND NUCLEAR
POWER CO. LTD. TO DISCUSS TOPICS RELATED TO ADVANCED
POWER REACTOR 1400 DESIGN

On February 24, 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 notice was issued and documented in the NRC Agencywide Documents Access and Management System (ADAMS) under Accession Number ML16012A369.

The purpose of the meeting was to discuss the schedule of Request for Additional Information (RAI) responses in Section 3.7 and Section 3.8. RAI responses related to the Advanced Power Reactor 1400 (APR1400) design certification application were also discussed. A list of the RAIs that were discussed, are listed below.

The List of Attendees is provided as an enclosure.

The topics discussed during the meeting are as follows:

1. KHNP is to provide dates by which revised responses will be submitted to the NRC for RAI 253-8300, Question 03.07.01-7 and RAI 182-8160, Question 03.07.01-4.

KHNP's Input:

The final response to RAI 182-8160, Question 03.07.01-4 will be provided by March 4, 2016. The draft revised response to RAI 182-8160, Question 03.07.01-4 was provided to the NRC on February 19, 2016. The final response to RAI 182-8160, Question 03.07.01-7 will be submitted by February 26, 2016.

Discussion:

The NRC staff stated that the response was nearly acceptable as-is; however, it was requested that Technical Evaluation Report (TeR) APR1400-E-S-NR-14001 be revised to state what soil profile(s) are used as DCD generic soil profiles, as has been done in TeR APR1400-E-S-NR-14004. KHNP stated that the response would be revised.

Action:

KHNP is to provide a date by which the response will be revised and provided to the NRC staff in draft form.

2. KHNP is to provide dates by which revised draft responses will be provided to the NRC for RAI 252-8299, Question 03.07.02-11 and 14.

KHNP's Input:

The final response to RAI 252-8299, Question 03.07.02-11 will be submitted by July 31, 2016.

The final response to RAI 252-8299, Question 03.07.02-14 will be provided by March 4, 2016. The draft revised response to RAI 252-8299, Question 03.07.02-14 and 15 were provided to the NRC on February 19, 2016.

KHNP will provide an overview of the response approach to RAI 252-8299, Question 03.07.02-11, in order to explain why the response cannot be produced until July 31, 2016.

Discussion:

The NRC stated that KHNP's approach to responding to RAI 151-8299, Q 03.07.02-11, as discussed during the call on February 4, 2016, was understood and that the NRC staff finds the approach to be acceptable. KHNP explained that the previous PM requested an explanation as to why the response would not be provided until July 31, 2016, so KHNP was restating the approach of providing the sensitivity study and benchmarking cases in response to that request. The NRC staff stated the reason for restating the information was understood.

The draft response to RAI 252-8299, Question 03.07.02-15 was not discussed during the call and is to be carried forward as an agenda item for the March 9, 2016, bi-weekly call. Based on a cursory review of the response to RAI 252-8299, Question 03.07.02-14, the NRC staff provided the following feedback. It was stated that the combined license application (COL) item proposed in the response to RAI 252-8299, Question 03.07.02-14 creates confusion by allowing the applicant to choose to use either the Certified Seismic Design Response Spectra (CSDRS) or the site specific ground motion. The NRC staff stated two acceptable revisions to the COL item would be to state the COL is to use the site specific ground motion, or if the choice between the two was to remain, that a statement should be made that the COL applicant is to choose the greater of the two. It was also stated that the relative displacements provided in the response

can be removed, and that DCD Tier 2, Section 3.7.2.8 should be revised to describe that relative displacements calculated by the COL applicant are not to infringe on gaps between seismic Category I and non-seismic Category I structures. KHNP indicated that feedback was understood and that the response would be revised.

Action:

KHNP is to provide a date by which the response will be revised and provided to the NRC staff in draft form.

3. The NRC is to provide feedback regarding the response approach to RAI 129-8085, Question 03.08.01-4a (two different American Society of Mechanical Engineer (ASME) Code editions and addenda).

Discussion:

It was stated that this item is to be discussed during the March 9, 2016, bi-weekly call. The NRC staff stated that in order to provide confidence that KHNP's approach of using different code editions and addenda is acceptable, KHNP might want to consider performing a comparison of the design provisions of the two ASME Section III, Subsection NE code editions/addenda in question. The NRC staff elaborated that the comparison should use a process of elimination to reduce the amount of effort required. It was stated that design provisions which are the same, or are not applicable to the APR1400, can be identified as not being pertinent to the issue. Then, where there are differences in the design provisions which apply to the APR1400, KHNP can identify what the differences are and explain how the differences in the design provisions used for the APR1400 are conservative, or negligible, or do not affect safety. KHNP stated that the NRC staff's comments were understood and further internal discussion would need to take place before any statement as to whether the comparison would be performed could be made. KHNP stated that the results of the discussions would be communicated as soon as possible.

Action:

KHNP is to decide if the comparison of the NE code editions and addenda will be performed and communicate the outcome with the NRC.

4. Status update for revised draft response to RAI 226-8235, Question 03.07.02-5 (draft to be provided to the NRC by February 26, 2016).

KHNP's Input:

For RCS mass consideration, the component forces are being compared between SSI and structural analysis. For hydro-dynamic effect consideration, the procedures and methods of local structural assessment are being prepared. The draft revised response to RAI 226-8235, Question 03.07.02-5 will be provided by February 26, 2016.

Discussion:

KHNP stated that the draft revised response will be provided to the NRC on March 2, 2016, not on February 26, 2016, as previously communicated.

Action:

KHNP is to provide the revised draft response to the NRC no later than March 2, 2016.

5. Discuss the draft response approach to RAI 226-8235, Question 03.07.02-6. (This question has a due date of October 7, 2016).

KHNP's Input:

During the October 2015, meeting regarding DCD Section 3.7, it was discussed that the structure-soil structure interaction (SSSI) analysis should use a representative partial model since Advanced Computational Software Soil-Structure Interaction (ACS SASSI) code size limitations are not a suitable justification for assuming structures are surface mounted for SSSI analysis. In its response to the comments made during the meeting, KHNP has plans to re-perform SSSI analysis of the nuclear island emergency diesel generator building (NI-EDGB) using the direct embedded option and confirm the current results of the SSI analysis, since the results of the SSSI analysis using the surface mounted option results in the emergency diesel generator building (EDGB) being affected by the SSSI analysis.

Discussion:

The NRC stated that the overview of the response approach was understood, and asked KHNP to confirm that wall pressures would be accounted for in the analysis. KHNP responded by stating that the wall pressures would be obtained and the design of structures reviewed in light of the results. Since an SSSI analysis considering embedment, between the NI and the adjacent seismic Category II structures are not performed, the NRC staff stated that a COL item should be added to the DCD to state the COL applicant is to compare the pressures obtained in the site specific SSSI analysis to allowable values for the NI. KHNP stated such a COL item would be supplied.

KHNP asked the NRC staff if it was believed that this RAI 226-8235, Question 03.07.02-6 could be carried forward as an open item (OI) in order to not cause a delay in the project's scheduled Phase 2 completion date (committed RAI response date is October 7, 2016, while the Phase 2 completion date is August 19, 2016, and the safety evaluation report (SER) with OI completion date is October 19, 2016). The NRC staff stated that at the time of the call it was believed that there is a clear path to resolution; however, the ability of the NRC staff to make the issue an open item in the SER would be contingent on the results of the re-analysis. KHNP asked when the results of the analysis (assuming the results are favorable) would need to be provided to the NRC staff such that they would have sufficient time to write the SER to include the issue as an OI. The NRC staff responded that the results should be communicated as soon as possible, and that it is difficult to determine an exact date by which the results would need to be communicated. The NRC staff stated that if favorable results can be communicated by

the end of June 2016, or early July 2016, it is possible that the SER could be written to include the issue as an OI without having the schedule slip.

Action:

KHNP is to examine the possibility of expediting the schedule of the response, and consider providing preliminary results to the staff ahead of the draft response.

Note: One item not covered during the discussion is whether the reference to EDGB in this item is intended to also include the Diesel Fuel Oil Tank (DFOT) room.

The NRC staff noted that the DFOT room is a seismic Category I structure adjacent to the NI that is within the scope of the design certification and therefore must be part of this analysis. The staff requested that KHNP confirm that the DFOT room is included in this analysis.

6. The NRC staff has asked that KHNP describe why the SSSI and HRHF reanalysis will not be completed until September 30, 2016. (Due date of October 7, 2016).

KHNP's Input:

For SSSI, the schedule could be changed depending on discussions of item #5 of this agenda.

For HRHF, KHNP's plans for additional analysis are as follows:

RAI 183-8197, Question 03.07.02-1.a (Exceeding reduction limit of SRP 3.7.2.II.4): The parametric study is intended to use a LSM for a generic containment structure (not APR1400 NI structures) with a circular basemat, such as that used in the EPRI Report TR-102631 2225 by Tseng, W.S. and K.I. Lilhanand (1997), "Soil-Structure Interaction Analysis Incorporating Spatial Incoherence of Ground Motions", Electric Power Research Institute, Palo Alto, CA, November 1997. The variation of the basemat size is controlled by a single parameter, which is the radius of the basemat. This parametric study will show that the larger the basemat size, the larger the calculated reductions in the incoherency analysis.

RAI 183-8197, Question 03.07.02-1.b (Mode expansion for HRHF incoherency analysis): Previous HRHF incoherency analyses, which included seven modes (in-house software used), took eight months to complete. It is expected that approximately the same amount of time will be required for the mode expansion up to 15 modes and comparing the results of the new analysis with the old.

Discussion:

The NRC staff communicated a desire to discuss this item during the next bi-weekly call (March 9, 2016). KHNP accommodated the request. The NRC staff stated that this item would be the highest priority item during the next call.

7. The NRC will provide feedback regarding RAI 252-8299, Question 03.07.02-12.

Discussion:

It was stated that the Emergency Diesel Generator Building (EDGB) ratio value (static to dynamic results) presented in Table 2 of the response was lower, when compared to the other ratios presented, than what the staff would expect. It was requested that KHNP revise the response to describe why the value was so low. KHNP indicated that the response would be revised to describe why the ratio presented in Table 2 of the response was comparatively low. It was stated that Table 1 of the response contains information extracted from DCD Tier 2, Table 3.7-22, but the response only contains one line item for the 195 ft elevation while the DCD table contains two line items for the 195 ft elevation.

It was requested that KHNP revise the response and the DCD to clearly describe what is being compared and what is physically being represented, respectively. The staff pointed out that TeR APR1400-E-S-NR-14003 distinguishes east and west results at the 195 ft elevation (for example Table B-2, Item 31 is "AB-EAST: CUT AT EL. 195"). KHNP stated the feedback was understood and changes would be made to the response. The NRC stated that the scheduling of responses and communicating due dates is critical to the staff's ability to efficiently complete the design certification review of the APR1400. KHNP acknowledged that there is a continued need to communicate due dates with the NRC staff.

Action:

KHNP is to provide a date by which the response will be revised and provided to the NRC staff in draft form.

8. The NRC will provide feedback regarding RAI 183-8197, Question 03.07.02-4.

Discussion:

The NRC staff asked KHNP to clarify if the static analysis discussed in the response is the analysis described in APR1400-E-S-NR-14006. Specifically, the NRC staff indicated that the loads for the static analysis described in the response to RAI 183-8197, Question 03.07.02-4 were different than those described in APR1400-E-S-NR-14006. KHNP indicated that they did not have the report available during this call and could not confirm it at this time. The NRC staff stated that KHNP has not provided sufficient justification to show that the approach taken by KHNP is conservative. Issues with the response and associated DCA documentation which the NRC staff cited are the following:

- 1) The System for Analysis of Soil Structure Interaction (SASSI) and static analysis displacements are determined using two different reference frames, one being relative to the free field, and the other being the bedrock. It's not evident that these relative displacements can be used to determine the contact ratio immediately beneath the concrete basemat.
- 2) That there is insufficient information regarding the Link 180 element, whether it is used as a contact element or represents the entire soil column.

- 3) That the legend provided in TeR APR1400-E-S-NR-14006 does not define Lh (it was stated that the load is defined in other documentation, but not in the TeR).
- 4) That it is not clear if 100 percent of live load is used, and if so why it is appropriate to use that value instead of the 25 percent suggested by the SRP.

The NRC staff stated that SRP 3.7.2 specified that only gravity loads are to be considered. That includes, dead load, the percent of the live load used in the seismic SSI analysis, and buoyancy. The NRC staff stated that the intent of the SRP is for the applicant to determine the contact ratio based on the contact pressure (tension/compression) between the basemat and the soil immediately beneath the basemat. It was stated that if KHNP applies the SRP methodology using the SSI analysis results, issues regarding modal combination and the 100-40-40 rule would no longer be applicable related to the calculation of the contact ratio. KHNP stated that the NRC staff's feedback was understood.

Action:

KHNP is to provide a date by which the response will be revised and provided to the NRC staff in draft form.

Issues which KHNP added on February 19, 2016:

1. RAI 252-8299 Question 03.07.02-7, was submitted by KHNP on February 19, 2016. In its response to sub-question e. (Poisson's Ratio Used in SSI Analyses), KHNP responded that in the SSI analysis of the APR1400, the dynamic Poisson's ratio of the soil is limited to not greater than 0.48 in order to avoid numerical sensitivity problems. To demonstrate that the Poisson's ratio values used do not produce numerical instabilities in the SSI results, a sensitivity study will be performed using the S1 and S2 soil profiles, and the results will be provided by September 30, 2016. KHNP would like to confirm this approach could be accepted by the NRC.

Discussion:

The NRC staff stated that the proposed response approach is reasonable. It was stated that the NRC staff's ability to carry the issue forward as an SER OI is contingent on communications of sensitivity results in a timely manner, as discussed for RAI 226-8235, Question 03.07.02-6 (Item 5 above).

Action:

KHNP is to examine the possibility of expediting the schedule of the response, and consider providing preliminary results to the staff ahead of the draft response.

2. RAI 129-8085 Question 03.08.01-1:

The revised draft response, which incorporated comments provided by the staff during the 3.8 public meeting, was provided to the NRC on February 19, 2016. KHNP would like to hear any feedback that the NRC staff can provide.

Discussion:

This item was not discussed during the call and is to be carried forward as an agenda item for the March 9, 2016, bi-weekly call.

3. RAI 199-8223 Question 03.08.01-9:

KHNP would like to confirm to NRC for the draft response about inservice inspection requirements for tendon in post-tensioning system. KHNP will submit the draft response by 22 Feb. 2016.

Discussion:

This item was not discussed during the call and is to be carried forward as an agenda item for the March 9, 2016, bi-weekly call 4.

4. RAI 199-8223 Question 03.08.01-11:

The NRC concluded that additional information is needed to ensure that the jurisdictional boundary of the containment design approach is consistent with the ASME Code. KHNP will be prepared to discuss the jurisdictional boundary of the containment design with the NRC staff.

Discussion:

This item was not discussed during the call and is to be carried forward as an agenda item for the March 9, 2016, bi-weekly call.

5. RAI 199-8223 Question 03.08.01-13:

KHNP would like to discuss with the NRC the feedbacks regarding the prestressing system used in the APR1400.

Discussion:

This item was not discussed during the call and is to be carried forward as an agenda item for the March 9, 2016, bi-weekly call.

6. Other Issues:

KHNP will provide the revised draft responses as follows:

RAI 200-8225 Q03.08.02-2: 2016-02-29 (EQ DOR).

RAI 227-8274 Q03.08.04-1,3,4,9: 2016-02-29.

If the NRC determines there are any issues with the drafts, KHNP would like to discuss those issues during the next call.

Discussion:

This item was not discussed during the call.

Action:

KHNP is to provide the draft responses to the NRC by February 29, 2016.

Items to be discussed during the next call:

1. RAI 199-8223 Question 03.08.01-8:

Revised draft response will be provided by March 4, 2016. KHNP would like to listen to the NRC's feedback for the revised draft response.

2. RAI 199-8223 Question 03.08.01-10:

Revised draft response will be provided by March 4, 2016. KHNP would like to listen to the NRC's feedback for the revised draft response.

Action:

KHNP is to provide the draft responses to the NRC by March 4, 2016.

Future Interactions:

At the conclusion of the meeting, KHNP committed to consider all of the feedback from the NRC staff and engage with the NRC to finalize the path forward to resolve the issues discussed. Please direct any inquiries to Tarun Roy at 301-415-0493 or via e-mail to Tarun.Roy@nrc.gov.

Docket No.: 52-046

Enclosure:
List of Attendees

cc w/enclosure: See next page

This item was not discussed during the call.

Action:

KHNP is to provide the draft responses to the NRC by February 29, 2016.

Items to be discussed during the next call:

- 3. RAI 199-8223 Question 03.08.01-8:

Revised draft response will be provided by March 4, 2016. KHNP would like to listen to the NRC's feedback for the revised draft response.

- 4. RAI 199-8223 Question 03.08.01-10:

Revised draft response will be provided by March 4, 2016. KHNP would like to listen to the NRC's feedback for the revised draft response.

Action:

KHNP is to provide the draft responses to the NRC by March 4, 2016.

Future Interactions:

At the conclusion of the meeting, KHNP committed to consider all of the feedback from the NRC staff and engage with the NRC to finalize the path forward to resolve the issues discussed. Please direct any inquiries to Tarun Roy at 301-415-0493 or via e-mail to Tarun.Roy@nrc.gov.

Docket No.: 52-046

Enclosure:

List of Attendees

cc w/enclosure: See next page

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NRO-002

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List of Attendee's KHNP APR1400 Design Meeting – Held on February 24, 2016

Name	Organization
Tarun Roy	NRC
Robert Roche	NRC
Jinsuo Nie	NRC
Ata Istar	NRC
Joseph Braverman	NRC
Richard Morante	NRC
Carl Constantino	NRC
Erin Wisler	KHNP
Jongbo Lee	KHNP
Sunguk Kwon	KHNP
Seokhwan Hur	KHNP
Jaewan Park	KEPCO
Yoonho Nam	KEPCO
Youngsun Lee	KEPCO
Doyeon Kim	KEPCO
Donghyun Yoo	KEPCO
Hoonin Cho	KEPCO
Joohyung Kang	KEPCO
Changkyu Lee	KEPCO
Bongrae Kim	KEPCO
Wen S. Tseng	KEPCO
Jungbum Jang	KEPCO
Wen s Tseng	KEPCO