

June 7, 2016'

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

FROM: John Vera, Project Manager **/RAI/**
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF THE APRIL 26, 2016, PUBLIC TELECONFERENCE
MEETING WITH KOREA HYDRO AND NUCLEAR POWER CO. LTD. TO
DISCUSS TOPICS RELATED TO ADVANCED POWER REACTOR 1400
DESIGN

On April 26, 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 ML16105A450.

The purpose of the meeting was to discuss the content of responses to the NRC staff's Request for Additional Information (RAI) 8278 (ADAMS Accession No. ML15320A349), Questions 3.12-4, 3.12-6, 3.12-8 and 3.12-9. A list of attendees is included as an enclosure. The NRC staff's talking points, including the applicant's draft responses, which were provided immediately before the teleconference, are available in ADAMS under Accession Number ML16145A032.

Regarding RAI 3.12-4, KHNP stated that it understood the staff's concern when seismic anchor motions (SAMs) and thermal anchor movements (TAMs) are excluded in the piping analysis and it will revise its response.

Regarding RAI 3.12-6, the NRC staff reviewed KHNP's draft responses and found them to be acceptable with the exception that in order to use the welding research council bulletin (WRC BL) 300 decoupling criterion (based on the moment of inertia ratio), the exceptions/conditions listed in WRC BL 300 (and also mentioned in part 3 of the RAI) should be applied. This is the NRC staff's expectation when the decoupling criteria of WRC BL 300 are applicable. The NRC staff noted that the WRC BL 300 decoupling criterion conditions are partially mentioned in the design control document (DCD) Subsection 3.12.4.4 markup, which was included with the original response to RAI 8278 (ADAMS Accession Number ML16020A507). The NRC staff stated that the WRC BL 300 decoupling criterion conditions should be listed both in the response and in DCD Subsection 3.12.4.4. In addition, DCD Subsection 3.12.4.4 also should show when the DCD Subsection 3.7.2.3.2 decoupling criteria will be used and when the WRC BL 300 decoupling criterion (and conditions) will be used.

Regarding RAI 3.12-8, the NRC staff stated that for floor response spectrum piping analysis, Regulatory Guide (RG) 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Revision 1 (ADAMS Accession Number ML070260029), shows (as an alternative to constant modal damping) frequency dependent damping values in Figure 1 that can be used with specific restrictions. The NRC staff stated that this figure is the same as in code case N-411-1. The NRC staff stated they believed that setting options equal to SU=C or D in the SU field of the RCAS card in the PIPESTRESS program conforms to RG 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Revision 2 (ADAMS Accession Number ML053250475) and Revision 3 (ADAMS Accession Number ML12220A043) Section C.1.1.3 (complete quadratic combination (CQC) with Der Kiureghian correlation with modal damping ratios from N-411-1 or RG 1.61 Revision 1). The NRC staff stated that it is KHNP's responsibility to ensure that this is the case. It is recommended that the restrictions shown in RG 1.61 Revision 1, for using the frequency dependent damping values, be followed. Using the CQC of RG 1.92 Revision 2 or Revision 3 with the Der Kiureghian correlation of Section C.1.1.3 and the frequency dependent damping values shown in Figure 1 of RG 1.61 Revision 1 and the specified restrictions in RG 1.61 Revision 1 is acceptable.

The NRC staff reiterated the recommendation of NUREG/CR-6645, "Reevaluation of Regulatory Guidance on Modal Response Combination Methods for Seismic Response Spectrum Analysis," (ADAMS Accession Number ML003724092) that in order to use the NRC Grouping method of RG 1.92 Revision 1 (ADAMS Accession Number ML003740290) with its closely spaced modes definition of 10 percent, the maximum damping ratio should be limited to 2 percent. The NRC staff noted that in N-411-1, 2 percent damping is only for frequencies above 20 Hz, however, below 20 Hz, where the majority of the critical modes will be, damping is greater than 2 percent and, therefore, the grouping method is not applicable there.

The NRC staff stated part (3) of RAI 3.12-8 was adequately addressed in the draft response.

Regarding RAI 3.12-9, KHNP stated that its response will be revised. KHNP mentioned, in the public meeting, that the hard rock high frequency (HRHF) piping evaluations will be ready and available for the NRC staff's review in mid-July.

Docket No.: 52-046

Enclosure:
As stated

cc w/enclos: See next page

Regarding RAI 3.12-8, the NRC staff stated that for floor response spectrum piping analysis, Regulatory Guide (RG) 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Revision 1 (ADAMS Accession Number ML070260029), shows (as an alternative to constant modal damping) frequency dependent damping values in Figure 1 that can be used with specific restrictions. The NRC staff stated that this figure is the same as in code case N-411-1. The NRC staff stated they believed that setting options equal to SU=C or D in the SU field of the RCAS card in the PIPESTRESS program conforms to RG 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Revision 2 (ADAMS Accession Number ML053250475) and Revision 3 (ADAMS Accession Number ML12220A043) Section C.1.1.3 (complete quadratic combination (CQC) with Der Kiureghian correlation with modal damping ratios from N-411-1 or RG 1.61 Revision 1). The NRC staff stated that it is KHNP's responsibility to ensure that this is the case. It is recommended that the restrictions shown in RG 1.61 Revision 1, for using the frequency dependent damping values, be followed. Using the CQC of RG 1.92 Revision 2 or Revision 3 with the Der Kiureghian correlation of Section C.1.1.3 and the frequency dependent damping values shown in Figure 1 of RG 1.61 Revision 1 and the specified restrictions in RG 1.61 Revision 1 is acceptable.

The NRC staff reiterated the recommendation of NUREG/CR-6645, "Reevaluation of Regulatory Guidance on Modal Response Combination Methods for Seismic Response Spectrum Analysis," (ADAMS Accession Number ML003724092) that in order to use the NRC Grouping method of RG 1.92 Revision 1 (ADAMS Accession Number ML003740290) with its closely spaced modes definition of 10 percent, the maximum damping ratio should be limited to 2 percent. The NRC staff noted that in N-411-1, 2 percent damping is only for frequencies above 20 Hz, however, below 20 Hz, where the majority of the critical modes will be, damping is greater than 2 percent and, therefore, the grouping method is not applicable there.

The NRC staff stated part (3) of RAI 3.12-8 was adequately addressed in the draft response.

Regarding RAI 3.12-9, KHNP stated that its response will be revised. KHNP mentioned, in the public meeting, that the hard rock high frequency (HRHF) piping evaluations will be ready and available for the NRC staff's review in mid-July.

Docket No.: 52-046

Enclosure:
As stated

cc w/enclos: See next page

DISTRIBUTION:

PUBLIC	RidsAcrsAcnwMailCenter	RidsNroLACSmith	SLee, NRO
LB2 R/F	RidsOgcMailCenter	RidsOpaMailCenter	TLupold, NRO
D101	RidsNroDnrlLB2	RidsNroDnrl	JCiocco, NRO
ATsirigotis, NRO	DWilliams, NRO		

ADAMS Accession No: ML16145A028

NRC-001

OFFICE	DNRL/LB2: PM	DNRL/LB2: LA	DNRL/LB2: PM	DNRL/LB2: PM
NAME	JVera	CSmith	JCiocco	JVera (signed)
DATE	05/23/2016	06/06/2016	06/07/2016	06/07/2016

OFFICIAL RECORD COPY

KHNP Mailing List

9/22/2015

Daegeun Tony Ahn
Director
KHNP Washington DC Center
8100 Boone Blvd, Suite 620
Vienna, VA 22182

Email

leejaeyong@khnp.co.kr [Jae Yong Lee]
hansang.kim@khnp.co.kr [Hansang Kim]
dohwan.lee@khnp.co.kr [Do-Hwan Lee]
hs.chang@khnp.co.kr; hyunseung.chang@gmail.com [Harry (Hyun Seung) Chang]
junghokim@khnp.co.kr [Jung-Ho Kim]
yunho.kim@khnp.co.kr; yshh8226@gmail.com [Yun Ho Kim]
jiyong.oh@khnp.co.kr; jiyong.oh5@gmail.com
[Jiyong Andy Oh]ahn.daegeun@khnp.co.kr
daegeun.ahn@gmail.com [Daegeun Tony Ahn]
limhs@kepco.co.kr [Hyun Seung Lim]
beraka@kepco.co.kr [Seong Key Cho]
puritys@kepco.co.kr [Byeong Soo Kwon]
joys@kepco.co.kr [Young Sun Cho]