January 7, 2016

MEMORANDUM TO: Samuel Lee, Chief
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

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

SUBJECT: SUMMARY OF THE DECEMBER 7 - 8, 2015, PUBLIC MEETING WITH KOREA HYDRO AND NUCLEAR POWER CO. LTD. TO DISCUSS TOPICS RELATED TO ADVANCED POWER REACTOR 1400 DESIGN

On December 7 and 8, 2015, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff and Korea Hydro and Nuclear Power Co. Ltd. (KHNP) at the NRC offices in Rockville, Maryland. On the morning of December 7, 2015, proprietary materials were discussed and was closed to the public. However, the remainder of the meeting was open to the public. The meeting notice was issued and documented in the NRC Agencywide Documents Access and Management System (ADAMS) under Accession Number ML15334A118. The notice included the final meeting agenda.

The purpose of the meeting was to discuss various proprietary and non-proprietary topics related to the Advanced Power Reactor 1400 (APR1400) design certification application draft responses to Request for Additional Information (RAI) 8085 Questions 1, 2, 4, 5 and 6; RAI 8223 Questions 8, 10, 11 and 14; RAI 8323 Question 15; RAI 8295 Question 1; and RAI 8285 Questions 3, 4, 5, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17 and 18. Presentation materials on the Overview of Seismic Analysis on Spent Fuel Storage Rack and Overview of Structural Analysis and Design presented by KHNP were also discussed. The table below lists the location of these documents in ADAMS.

Publicly Available Materials	Submitted by KHNP	Accession Number
Presentation Materials Package	December 3, 2015	ML15337A466
Presentation on Overviews of Spent Fuel Pool Design	December 7, 2015	ML15337A469
Presentation on DCD Section 9.1.2: Overview of Seismic Analysis for the APR1400 New and Spent Fuel Racks	December 7, 2015	ML15337A471
Presentation on DCD Section 3.8: Overview of Structural Analysis and Design for the APR1400	December 7, 2015	ML15337A473
RAI 8085 Questions 1 and 2		ML15337A474
RAI 8085 Questions 4 and 6	September 17, 2015	ML15260B254
RAI 8085 Question 5	November 24, 2015	ML15328A340
RAI 8223 Questions 8, 10, 11 and 14		ML15337A474
RAI 8323 Question 15		ML15337A474

RAI 8295 Question 1		ML15337A474
RAI 8285 Questions 3, 4, 5, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17 and 18		ML15337A474

The List of Attendees is provided as an enclosure.

A summary of the topics discussed is shown below:

Presentation on Overviews of Spent Fuel Pool Design, Overview of Seismic Analysis on New and Spent Fuel Racks and Overview Structural Analysis and Design

KHNP provided proprietary presentations on the topics above. The focus was to provide the NRC staff with better knowledge of the APR 1400 design. The presentations were not tied to responses to the RAIs under those topics. However, discussions were held between KHNP and the NRC staff members regarding those topics.

RAIs:

Prior to the meeting, the NRC staff were provided with KHNP's draft responses for the RAIs mentioned above. A resolution and path forward are summarized below.

RAI 8085 Question 1:

KHNP will update some load combinations to include live loads. It is agreed in areas where it is not included, KHNP will justify. KHNP will also revise the DCD to have consistent use of loads and load combinations. The load title, "Severe accident pressure," is agreed to change to a term that is more descriptive.

RAI 8085 Question 2:

KHNP agreed to fix the typos in its response.

RAI 8085 Question 4:

KHNP used different versions of the ASME code (Year 2003 and Year 2008) to respond. The NRC staff explained that rationale and conservatism need to be shown. KHNP agreed to consider the NRC staff's comments.

RAI 8085 Question 5:

KHNP added a new Combined Operating License (COL) Item (3-11 COL) in the RAI response, in which the detailed design of the penetration into the containment structure, is deferred to the COL applicant. The NRC staff requested KHNP to further explain the rationale. Also, the NRC staff explained that ultimate pressure capacity may be reduced when other concrete failure criteria are included, such as concrete in tension. KHNP agreed to consider the NRC staff's comments.

RAI 8085 Question 6:

The NRC generally accepted KHNP's response, pending confirmatory action on the next revision of the DCD.

RAI 8223 Question 8:

KHNP agreed to revise its response to be more consistent, similar to RAI 8085 Question 1.

RAI 8223 Question 10:

The NRC staff recommends that this response be referred to Section 19.2 as it relates to Severe Accident. KHNP agreed.

RAI 8223 Question 11:

The NRC staff explained that some rebars are bent outward at the base of the Reactor Containment Building (RCB). Therefore, there are some overlaps between the RCB and the Auxiliary Building (AB). Since the basemat of these two structures are designed based on different code criteria, the NRC and KHNP discussed the overlaps. KHNP agreed to look into the Code of Interpretation. Also, KHNP agreed to look into whether the load combinations for the RCB and the AB are similar.

RAI 8223 Question 14:

The NRC staff explained that a more elaborate response is needed, such as Design Basis Accident, for different seasons and ambient temperature. Justification needs to be shown if the response is considered to be worse case. KHNP responded that different cases are considered. KHNP agreed to revise its response.

RAI 8323 Question 15:

KHNP explained an in-house code (LBAP) is used to perform static analysis. KHNP agreed to provide justification on the usage of LBAP and how it meets the criteria in Section 3.8.1. Also, KHNP agreed to revise Table 1 in its response to be more descriptive.

RAI 8295 Question 1:

The NRC staff explained that more critical sections are needed and KHNP agreed.

RAI 8285 Question 3:

KHNP agreed to provide more description regarding the modeling, analysis and design of the shear keys.

RAI 8285 Question 4:

KHNP agreed to investigate whether the design of the foundation incorporates waterproofing. Also, KHNP agreed to list admixtures used in order for the NRC staff to evaluate the possible degradation of re-bars inside the concrete.

RAI 8285 Question 5:

KHNP and the NRC staff agreed to defer the response to RAI 8223 Question 11.

RAI 8285 Question 7:

The NRC staff explained the need to consider construction sequence as part of the load combination analysis for the design of the superstructure. Also, short term and long term settlements need to be considered. KHNP agreed to consider the NRC staff's comments.

RAI 8285 Question 8:

The NRC staff explained that the 100-40-40 method to consider the effect of the directional seismic excitation is not typical industry standard. Justification is needed. Also, the NRC staff explained that bending moment in addition to shear force analysis are needed. Finally, the NRC staff explained that SSI analysis is needed to calculate phasing. KHNP agreed to consider the NRC staff's comments.

RAI 8285 Question 9:

The NRC staff referred KHNP to other applicant's design application on their approach to Standard Review Plan (SRP) 3.8.5.11.4.G to address stiff and soft spots in the ground. Also, NRC recommends applicant's COL 3.8(11) to address degradation of mud mat. KHNP agreed to consider NRC's comments.

RAI 8285 Question 11:

The NRC staff explained "other significant loads" such as crane should be included. KHNP agreed and will revise the analysis to include "other significant loads." KHNP explained that the basemat analysis is modelled by solid-elements (SOLID 180). Basemat were modelled as nodes. The nodes were changed to hinges to remove moment. The NRC staff explained that the approach is not typical but not incorrect either. Justification is needed. KHNP agreed to consider the NRC staff's comments.

RAI 8285 Question 12:

KHNP agreed to look into Regulatory Guidance (RG) 1.92 to revise its response.

RAI 8285 Question 13:

The NRC staff explained that the question is related to RAI 8223 Question 11, and RAI 8285 Question 5. Also, the NRC staff explained that Table 1 in the response lacks consistency with the DCD. Justification is needed if it is intentional. KHNP agreed to consider NRC's comments.

RAI 8285 Question 14:

The NRC staff explained that further response is needed to justify the use of 0.7 coefficient of friction between the basemat and soil. KHNP agreed to consider the NRC staff's comments. Also, KHNP agreed to look into whether a new COL item is needed as well as an analysis on the vertical load.

RAI 8285 Question 15:

The NRC staff and KHNP agreed to defer the response to RAI 8285 Question 14.

RAI 8285 Question 16:

The NRC staff explained that the use of SPT blow count to determine Elastic Modulus of Soil Sites is not industry standard. Further explanation and analysis is needed to determine that this method is more conservative. KHNP agreed to consider the NRC staff's comments.

RAI 8285 Question 17:

The NRC staff explained the need to analyze relative displacement between adjacent loads. Also, the NRC staff explained the need to provide relative displacement analysis between nodes in time. KHNP agreed and will revise its response.

RAI 8285 Question 18:

The NRC staff explained the need for analysis in addition to "engineering judgement." Further explanation is needed for the use of soil profile S1 to analyze settlement. KHNP agreed to consider the NRC staff's comments.

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 if issues needed to be further discussed.

Please direct any inquiries to Ronnie Ng at 301-415-0023 or via e-mail to Ronnie.Ng@nrc.gov

Project No.: 52-046

Enclosure:
List of Attendees

cc w/enclosure: See next page

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NAME	RNg	CSmith	JCiocco	RNg
DATE	01/06/2016	01/06/2016	01/07/2016	01/06/2016

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LIST OF ATTENDEES

KHNP APR1400 Design Topics Meeting – Held on December 7–8, 2015

Representing	Name	7-Dec	8-Dec
BNL	Joseph Braverman	✓	✓
Doosan	Chang In Lim	✓	✓
Doosan	Joowan Kang	✓	✓
Westinghouse	Rob Sisk	✓	✓
AECOM	Chris Tyree	✓	✓
KHNP	Sun Guk Kwon	✓	✓
KHNP	Erin Wisler	✓	✓
KHNP	Harry Chang	✓	✓
KHNP	Tony Ahn	✓	✓
KEPCO E&C	Hoonin Cho	✓	✓
KEPCO E&C	Seokhwan Hur	✓	✓
KEPCO E&C	Hyeok Jeong	✓	✓
KEPCO E&C	Daejoong Kim	✓	✓
KEPCO E&C	Tae Han Kim	✓	✓
KEPCO E&C	Bong Rae Kim	✓	✓
KEPCO E&C	Jae Wan Park	✓	✓
KEPCO E&C	Young Chul Kwon	✓	✓
Public	Marvin Lewis	✓	✓
Public	Donna Gilmore	✓	
NRC	Ronnie Ng	✓	✓
NRC	Vaughn Thomas	✓	✓
NRC	Jim Xu	✓	
NRC	Marieliz Vera	✓	✓
NRC	John Ma	✓	
NRC	Tze-Jer Chuang	✓	✓
NRC	Sunwoo Park	✓	
NRC	Bhagwat Jain	✓	
NRC	Robert Roche	✓	
NRC	Pravin Patel	✓	
NRC	Samuel Lee	✓	
NRC	Jeff Ciocco		✓

Enclosure

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