

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 **/RAI/**
Licensing Branch 2
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF THE FEBRUARY 23, 2016, PUBLIC
TELECONFERENCE MEETING WITH KOREA HYDRO AND NUCLEAR
POWER CO. LTD. TO DISCUSS TOPICS RELATED TO ADVANCED
POWER REACTOR 1400 DESIGN

On February 23, 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 ML16042A072.

The purpose of the meeting was to discuss the schedule of Request for Additional Information (RAI) responses for RAI 114-8041 in Section 3.04 responses related to the Advanced Power Reactor 1400 (APR1400) design certification application were also discussed. A List of Attendees is provided as an enclosure.

These are the topics of discussion during the meeting:

RAI No.	Evaluation Status	Comments
03.04.01-3 (27210)	Open	Not acceptable – Insufficient information was provided to address Parts (b) & (c) of the question. In addition, a typo in the response for Part (b) - Subsection 3.5.1.5.1 does not exist.
03.04.01-4 (27211)	Open	Not acceptable - Insufficient justification on using the equations was provided. The referenced ANS standard, containing the referenced equations, has been withdrawn by the ANS standard committee. The referenced fluid mechanics book does not demonstrate the applicability of the broad-crest weirs equation for the floor opening flow.
03.04.01-6 (27213)	Open	Response on Part (a) is not acceptable (see RAI 03.04.01-4 comments above), and the proposed COL 3.4(5) number in Part (f) for drainage programmatic controls has been used repeatedly. The number of COL 3.4(5) is also used for a periodic inspection of watertight doors and sealed penetrations to ensure their functionality.

Follow-up to RAI 03.04.01-3:

- 1) In its response to Part (b) of this RAI, the applicant stated that “after 50 seconds, the outflow rate of water is greater than the inflow rate such that 2 ft is the maximum flood level height.”

The applicant is requested to demonstrate the validity of this statement. Part (b) of this question is pending the resolution of RAI 03.04.01-4.

- 2) In its response to Part (b) of this RAI, the applicant stated that “DCD Tier 2 Subsection 3.5.1.5.1 will be revised....”

The applicant is requested to correct the number since Subsection 3.5.1.5.1 does not exist in the DCD.

- 3) In its response to Part (c) of this RAI, the applicant stated that “Outflow rate to the HVT at 2 ft water level is about 136 ft³/sec.”

The applicant is requested to explain how the flow rate of 136 ft³/sec is obtained and demonstrate the validity of the calculation. Part (c) of this question is pending the resolution of RAI 03.04.01-4.

- 4) In its response to Part (c) of this RAI, the applicant stated that “An AF line break downstream of the check valve is bounded by FW break case.”

The applicant is requested to explain the basis for the above statement.

Follow-up to RAI 03.04.01-4:

APR1400 DCD states that the containment flood level for APR1400 is determined by a LOCA blowdown for a duration of 50 seconds. The staff questioned the applicant in the audit and RAIs concerning the basis for the 50 seconds. The applicant responded by stating that for a pipe break, the blowdown decreases with time and the floor opening flow increases with the flood level. At 50 seconds, the blowdown inflow equals the floor drain outflow and the flood level in containment is determined to be 2 ft. After 50 seconds, the outflow rate of water is greater than the inflow rate; therefore 2 ft is the maximum flood level.

In its response to RAI 3.4.1-6 (a), the applicant stated that the outflow is estimated using the broad-crest weir equation, which is referenced in DCD as being taken from ANSI 56.11 and is referenced from a fluid mechanics book.

The staff found that ANSI 56.11 has not been endorsed or reviewed by the NRC. Moreover, ANSI 56.11 has been withdrawn by the ANS standard committee. In RAI 03.04.01-4, the staff requested that the applicant provide sufficient information to demonstrate the acceptability and applicability of the broad-crest weir equation for the AP1400 application. In its response, the applicant provided additional information by referencing the broad-crest weir equation in a fluid mechanics book.

The staff found that the applicability of the broad-crest weir equation for the floor drain flow configuration in the referenced fluid mechanics book is not demonstrated, and the floor opening area is not factored into the equation. Further, based on the literature review, the staff found that the broad-crested weir flow formula is used for an open channel flow, which is different from the configuration of floor opening flow. Moreover, the staff found that other new reactor applicants' approach conservatively do not take the credit of the outflow from the containment to calculate the flood level in containment.

Therefore, the question in RAI 03.04.01-4 regarding applicability, was not adequately responded to by the applicant. The applicant is requested to explain why the formula is applicable for the floor opening flow and how the floor opening area, loss coefficient, and containment floor configuration are factored into the formula. Show the detailed calculation to obtain the calculated outflow rate of 136 ft³/sec and identify all the parameters in the floor opening of APR1400 containment that affect the flow.

It should be noted that the resolution of RAI 03.04.01-4 affects the acceptability of RAI 03.04.01-3 (b) and (c), RAI 03.04.01-6 (a), and AL 3-49.9 relating to the flood level of 2 ft and the worst case blowdown of LOCA duration of 50 seconds.

Follow-up to RAI 03.04.01-6:

In its response to Part (f) of this question, the applicant provided COL item COL 3.4(5) to address the procedure and programmatic controls. However, the number in COL 3.4(5) is previously used in the response to an audit item AL 3-49.4 (see the letter in ADAMS No. ML15174A408) for a periodic inspection of watertight doors and sealed penetrations to ensure its functionality. The applicant is requested to re-number this COL item. Part (a) of this question is pending on the resolution of RAI 03.04.01-4.

KHNP is to provide dates by which revised responses will be submitted to the NRC for RAI 114-8041; Question 03.04.01-3, Question 03.04.01-4 and Question 03.04.01-6.

During the teleconference, the staff clarified its concern to the applicant, but the concern was not resolved in the teleconference. The staff's main concern was that the methodology being used by the applicant in its RAI responses for the containment flood level calculation, had not been found acceptable for this specific application. Although the applicant agreed to revise the RAI response (but not the methodology) to address the concern, so far, the NRC doesn't have any dates for when and how the staff's concern will be adequately addressed.

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

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List of Attendees

KHNP APR1400 Design Meeting – Held on February 23, 2016

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Antonio Dias	NRC
Chang Li	NRC
Angelo Stubbs	NRC
Steve Mannon	KHNP
Jungho Kim	KHNP
Sunguk Kwon	KHNP
Seokhwan Hur	KHNP
Kyubok Lee	KEPCO
Jinkyoo Yoon	KEPCO
Sanggyu Lee	KEPCO

Enclosure