REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Topical Reports

Korea Hydro & Nuclear Power Co., LTD

Docket No. PROJ 0782

RAI No.:	**7-8567**
SRP Section:	**TR Realistic Evaluation Methodology for LBLOCA of the APR1400**
Application Section:	**Topical Report APR1400-F-A-TR-12004 Realistic Evaluation Methodology for Large-Break LOCA of the APR1400**
Date of RAI Issue:	**04/07/2016**

Question No. APR1400-4

10 CFR 50.46(a) states that the evaluation model for calculating the emergency core cooling system performance must adequately account for uncertainty in the calculated results. Section 15.0.2 of the standard review plan (NUREG-0800) states the uncertainty analysis must address all important sources of code uncertainty, including the mathematical models in the code and user modeling.

The phenomena identification and ranking table for the APR1400 large break loss of coolant accident identifies the cold leg to containment flow path as being a significant parameter during the refill and reflood phases. The friction and form losses associated with the cold leg to containment flow path are not included in the uncertainty parameters. This has caused NRC staff to question whether the treatment of uncertainty of these significant parameters is suitably conservative. NRC staff requests that KHNP justify their treatment of uncertainty associated with the cold leg to containment flow path in the refill and reflood phases.

10 CFR 50.46(a) states that the evaluation model for calculating the emergency core cooling system performance must adequately account for uncertainty in the calculated results. Section 15.0.2 of the standard review plan (NUREG-0800) states that the major sources of uncertainty must be addressed consistent with the results of the accident sequence identification process. In the development of the phenomena identification and ranking table (PIRT) for analysis of the APR1400 large break loss of coolant accident, [ ]^{TS} phenomena or processes were ranked as important. The topical report identifies [ ]^{TS} uncertainty parameters to be sampled. NRC staff is questioning whether the selection of uncertainty parameters adequately addresses the important phenomena identified in the PIRT. NRC staff requests the following additional information:

1. Explain how the sampled uncertainty parameters (identified in Table 5-1 of the topical report) were selected.

2. Explain how all the important phenomena identified in the PIRT are covered by the selected uncertainty parameters.

Response – (Rev.1)

1)

The entire process to determine the uncertainty parameters out of the selected phenomena/processes derived from the APR1400 PIRT were described in Attachment 1 of response to Audit Issue number 15 (Rev.1, ML17345A961). As described in the material, the phenomena already considered by [ ]TS, are not considered as uncertainty parameters. The APR1400 PIRT in the topical report contains some errors mostly related to the definition of time periods and will be revised.

2)

The explanation and justification of the parameters are described in the topical report and these are summarized in Table 1below. Among the [ ]TS phenomena/processes in the APR1400 PIRT, two phenomena are not mentioned in the topical report. One is the [ ]TS The [ ]TS It has been found that the APR1400 PIRT contains errors as to the time period definitions, and the revision to the APR1400 PIRT was submitted in Attachment 2 of response to Audit Issue number 15. The missing or insufficient rationale of the PIRT is reinforced in accordance with the revised PIRT. As described in the response to Question 1 above), the phenomena [ ]TS are not considered as uncertainty parameters.

(1) Phenomena treated by other uncertainty parameters

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Table 1. Description of each process/phenomena in the topical report (1/3)

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Table 1. Description of each process/phenomena in the topical report (2/3)

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Table 1. Description of each process/phenomena in the topical report (3/3)

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Table 2. Phenomena treated conservatively in CAREM

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Table 3. Modified APR1400 PIRT treated by biases

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Figure 1. The conventional noding diagram of UGS [ ]TS

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Figure 2. The most conservative noding diagram of UGS [ ]TS

Figure 3. The effect of the noding sensitivity

Figure 4. The effect of radiation heat transfer to surfaces on PCT

Reference

[1] "Korea Hydro & Nuclear Power Co., Ltd – Submittal of Revised Response to LBLOCA Audit Issues", Attachment 1 of Response to Audit Issue Number 15, Rev.1, ML17345A961, December 19 2017.

[2] "Korea Hydro & Nuclear Power Co., Ltd – Submittal of Revised Response to LBLOCA Audit Issues", Attachment 2 of Response to Audit Issue Number 15, Rev.1, ML17345A961, December 19 2017.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

Topical report (APR1400-F-A-TR-12004) was revised and submitted (ML17240A221) based on the Attachments 1 and 2 of response to Audit Issue number 15.

There is no impact on Technical or Environment Report.