RESPONSE TO AUDIT ISSUES

APR1400 Topical Reports

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. PROJ0782

Review 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**
Issue Date	**08/13/2015**

Audit Issues No. 88

The guidance in RG 1.157, Section 3.16.2 establishes acceptable controls for the data comparisons necessary to justify the applicability of the best estimate models. Differences are noted in the details of the total, liquid and therefore, gas volume for each SIT- FD between the RELAP5 base input model and the VAPER facility. [

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a. Provide the technical specification values for the total volume, the initial volume of liquid and the liquid volume below the standpipe and the gas volume of a single SIT-FD.

b. Justify the use of the volumes cited in the VAPER facility and the applicability of the corresponding data to the APR1400 plant.

Response

a)

The design data of APR1400 SIT-FD are slightly different with those of VAPER facility. The design data of APR1400 SIT-FD, VAPER, and RELAP5 Input of the topical report are summarized in Table 1.

SIT-FD for the APR1400

SIT-FD geometry data and nominal data of initial conditions for APR1400 are as follows.

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As mentioned above, internal volume does not consider any structures installed in the tank. If internal structure is considered and calculate inside volume as three parts (top elliptical, cylinder above fluidic upper plat, and bottom elliptical below fluidic device upper plate) separately, free volumes for three parts are below.

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Bottom elliptical below fluidic device upper plate is assumed as dead volume which means that liquid volume in the dead volume is not available. Therefore, total available free volume can be calculated as below.

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Since it is assumed that mass flow rate of SIT-FD is changed when liquid level of the SIT-FD decreases below the top of the standpipe, liquid volume below the standpipe can be calculated by sum of standpipe inner, standpipe outside, and fluidic device inside volumes as follow.

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Since SIT-FD is modeled using two valves in RELAP5 as described in Appendix H, the operation of valves require overlap region for stability of code calculation. Thus, following values to close or open the valve are used.

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Since nominal liquid volume means available liquid volume, gas volume in the SIT-FD can be calculated using total free volume and nominal liquid volume.

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SIT-FD for the VAPER Test

Total water in the SIT-FD of Table 1-2 in Appendix H is reference condition and water volume inside of fluidic device is not considered. Initial conditions for the VAPER test were calculated as follows.

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Above total water volume includes dead zone water volume, specifically water volume below the top of FD (a) includes dead zone water volume. [

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]TS The longer stand pipe height in APR1400 is designed to extend small flow injection period and is advantageous for safety in comparison to the VAPER test. The difference of stand pipe height causes the difference of water volume below top of stand pipe.

On the other hand, the effects of stand pipe height were investigated by the VAPER test facility, and the results show that the effects of stand pipe height on the pressure loss coefficient of SIT-FD are insignificant as described in reference [5].

b)

As mentioned previous response a), available water volume difference between VAPER tests and APR1400 is caused by stand pipe height. And the effects of stand pipe height to the pressure loss coefficient of SIT-FD are insignificant as described in reference [5]. Therefore, it is concluded that the VAPER test data are applicable to the APR1400 analysis.

Table 1. The Design Data of SIT-FD and RELAP5 Input Values TS

Reference

[1] “APR1400 Design Control Document Tier 2: Chapter 6 Engineered Safety Features,” APR1400-K-X-FS-14002-NP, Rev 0, KEPCO & KHNP, December 2014.

[2] “Fluid System and Component Engineering Design Data for Plant Safety, Containment and Performance Analyses,” 11A60-FS-DD012, Rev 2, KEPCO E&C, November 2014.

[3] “Input Modifications for APR1400,” APR1400-F-A-TM-12030-P, Rev 0, KNF, December 2012.

[4] KAERI, “Fluidic Device Performance Test Using the VAPER Test Facility,” VAPER-QLR-005-rev01, July 2004.

[5] KHNP, “Fluidic Device Design for the APR1400,” APR1400-Z-M-TR-12003-P Rev. 0, 2012.

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 Report

There is no impact on any Technical, Topical, or Environmental Report.