November 16, 2010

Document Control Desk U.S. Nuclear Regulatory Commission Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021 MHI Ref: UAP-HF-10312

Subject: Reporting of Corrections in ECCS Evaluation Model for the US-APWR Large Break LOCA Analysis

In compliance with 10CFR50.46, Mitsubishi Heavy Industries, Ltd. ("MHI") is submitting the attached preliminary report on the corrections implemented in the US-APWR ECCS Evaluation Model ("EM") for the large break LOCA Analysis documented in Chapter 15.6.5 of the US-APWR Design Control Document ("DCD") Revision 2. The report is provided to explain, in general, the description of the changes and the impact to the peak cladding temperature ("PCT"). The impact of the corrections is negligible, and the result of re-analysis will be submitted to the NRC in the next revision of DCD.

This report discusses the following correction to the PCT for the large break LOCA analysis:
Correction to the PCT Calculation for the Best-Estimate Large Break LOCA Evaluation

Questions or requests for additional information related to this preliminary report should be directed to Dr. Keith Paulson. Thank you for your attention.

Sincerely,

Yoshiki Ogata.

General Manager - APWR Promoting Department

Mitsubishi Heavy Industries, LTD.

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Enclosures:

1. Reporting of Corrections in ECCS Evaluation Model for the US-APWR Large Break LOCA Analysis (Non-proprietary)

CC: J. A. Ciocco C. K. Paulson

Contact Information

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Enclosure 1

Reporting of Corrections in ECCS Evaluation Model for the US-APWR Large Break LOCA Analysis [1]

Correction to the PCT Calculation for the Best-Estimate Large Break LOCA Evaluation

1 BACKGROUND

MHI has utilized the HOTSPOT code to perform the best-estimate large break loss-of-coolant accident (LBLOCA) analysis [2] reported in Chapter 15.6.5 of the Design Control Document (DCD) Revision 2 for the US-APWR [3].

MHI found that some minor corrections to the code used for the US-APWR LBLOCA analysis were required. The corrections to be made are expected to give only insignificant impact to the previously reported analysis result. MHI has been performing the evaluation to determine the impact using the corrected code. MHI reports the impacts of the corrections to the code in this report.

2 HOTSPOT Gap Heat Transfer Logic Corrections

The HOTSPOT code was updated to incorporate the following corrections to the gap heat transfer calculation logic:

- (i) Change the rod gap temperature from the fuel pellet average temperature to the average temperature between the fuel pellet outer surface and cladding inner surface temperatures;
- (ii) Correct the calculation of the fuel pellet surface emissivity to use a temperature in °R instead of °F; and
- (iii) Revise the calculation of the gap radiation heat transfer coefficient.

Evaluation

The differences caused by the corrections of above three(3) items are small. Therefore, each correction is expected to cause negligible effect to the LBLOCA analysis.

3 MARGIN TO SAFETY LIMIT

For the best-estimate LBLOCA analysis, the limiting PCT is determined by ASTRUM, a statistical methodology to calculate the PCT, maximum local oxidation and core-wide oxidation with the 95/95 confidence level through 124 runs of the random sampling [2]. As described in the previous section, it can be estimated that the PCT impact due to the HOTSPOT code corrections is negligible. Therefore, the inputs providing PCTs within 100°F from the limiting case in the US-APWR DCD revision 2 [3] are used to evaluate the impact on PCT.

Consequently, the corrections to the HOTSPOT code have resulted in a new PCT of 1757°F, which is only a -1°F change from the value reported in the DCD revision 2. The value is still significantly below the 10 CFR 50.46(b)(1) acceptance criterion of 2200°F [4].

Table-1 Updated PCT for US-APWR Best-Estimate LBLOCA

	Cladding Temperature (°F)
Analysis of Record PCT	1758
Updated Analysis of Record PCT + PCT Assessment	1757

4 JUSTIFICATION THAT THE ERROR IS INSIGNIFICANT

The corrections to the HOTSPOT code do not result in any significant impact on the cladding temperature. In the case of limiting PCT, the best-estimate analysis of the LBLOCA demonstrates that the acceptance criteria set forth in 10 CFR 50.46 are satisfied.

5 SCHEDULE OF RE-ANALYSIS

MHI has been performing the re-analysis for the US-APWR LBLOCA using the corrected HOTSPOT code. Re-analysis result is to be reported to the NRC in the next revision of DCD.

6. References

- 1. NRC Information Notice 97-15, Supplement 1: Reporting of Errors and Changes in Large-Break/Small-Break Loss-of-Coolant Evaluation Models of Fuel Vendors and Compliance with 10 CFR 50.46(a)(3), April 23, 1999.
- 2. <u>Large Break LOCA Code Applicability Report for US-APWR</u>, MUAP-07011-P (Proprietary) and MUAP-07011-NP (Non-Proprietary), July 2007.
- 3. <u>US-APWR DCD Chapter 15, Transient and Accident Analyses, MUAP-DC015, Rev. 2, October 2009.</u>
- 4. 10 CFR 50.46, <u>Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors</u>, November 1997.