

May 9, 2012

**US-APWR TOPICAL REPORT MUAP-07009
AUDIT PLAN FOR US-APWR COMPUTER CODE VIPRE-01M**

May 16 - 17, 2012

**US-APWR DESIGN CERTIFICATION
Mitsubishi Heavy Industries, Ltd.
Docket No. 52-021**

Location: Mitsubishi Nuclear Energy Systems
1001 19th Street North, 7th Floor
Arlington, VA 22209

Purpose:

The purpose of this regulatory audit is to follow-up with Mitsubishi Heavy Industries, Ltd. (MHI) regarding the response to request for additional information (RAI), Questions 4.3 through 4.6 which were documented in document UAP-HF-10267, dated October 2010. The staff will review Chapter 15.3.3, "Pump Rotor Seizure Accident," specifically the VIPRE-01M input, output and guidance documents to determine if adequate direction is given to the analyst when performing a licensing basis analysis. The review will examine the VIPRE-01M Pump Rotor Seizure options chosen, the basis for those options and any code tuning factors which are applied. The staff will also discuss information related to MHI's response to RAI Question 5.2, documented in UAP-HF-10338 dated December 2010, the code warning messages and non-fatal code errors have not been reviewed.

This audit will provide information to allow the U.S. Nuclear Regulatory Commission (NRC) staff to confirm the United States - Advanced Pressurized Water Reactor (US-APWR) design compliance with applicable NRC requirements.

Background:

By letter dated May 25, 2007, MHI submitted Topical Report MUAP-07009-P, Revision 0, "Thermal Design Methodology," (Reference 1) for the NRC staff to review and approval. This topical report describes the MHI thermal design methodology for analyzing the thermal-hydraulic conditions in MHI-designed pressurized water reactor cores. The topical report supports US-APWR Design Control Document (DCD) Section 4.4, "Thermal-Hydraulic Design," (Reference 2).

This audit is a follow-up to the October 2010 audit and will examine specific input and output from the VIPRE-01M code related to RAI Questions 4.3 through 4.6 and 5.2. Closure of Questions 4.3 through 4.6 and 5.2 are necessary to complete the MUAP-07009-P, Revision 0 Topical Report Safety Evaluation.

Regulatory Audit Basis:

Review of Topical Report MUAP-07009-P is being conducted in accordance with Section 15.0.2, "Review of Transient and Accident Analysis Methods," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (Standard Review Plan (SRP) 15.0.2).

SRP 15.0.2 directs the NRC staff to review the complete code documentation including, but not limited to: (a) the evaluation model, (b) the accident scenario identification process, (c) the code assessment, (d) the uncertainty analysis, (e) a theory manual, (f) a user manual, and (g) the quality assurance program.

SRP 15.0.2, Section III.3.f "Quality Assurance Plan" states:

The reviewers should confirm that the evaluation model was developed and maintained under a quality assurance program that meets the requirements of 10 CFR Part 50, Appendix B. As a minimum, the program must address design control, document control, software configuration control and testing, and corrective actions. The reviewers should confirm that the quality assurance program documentation includes procedures that address all of these areas. The reviewers may conduct an audit of the implementation of the code developer's quality assurance program. The reviewers should confirm that independent peer reviews were performed at key steps in the evaluation model development process. The peer review team should include programmers, developers, end users, and independent members with recognized expertise in relevant engineering and science disciplines, code numerics, and computer programming. Expert peer review team members, who were not directly involved in the evaluation model development and assessment, can enhance the robustness of the evaluation models. Further, they can be of value in identifying deficiencies that are common to large system analysis codes.

Regulatory Audit Scope:

The audit will consist of the following elements:

1. Review of the VIPRE-01M input, output and guidance documents for the Chapter 15.3.3, "Pump Rotor Seizure Accident Analysis." The review will examine the VIPRE-01M Pump Rotor Seizure options chosen, the basis for those options and any code tuning factors which are applied.
2. All VIPRE-01M output files associated with: 1) any sensitivity analysis used to support the topical report, 2) the validation of the WRB-1 and WRB-2 DNBR correlations and 3) the Chapter 15 licensing analyses. The outputs will be reviewed to determine if warning and/or non-fatal error messages exist and if so, were evaluated as part of the review process.

Team Assignments:

Jeffrey Schmidt - Lead Auditor
Joshua Kaizer - Team Member
Ruth Reyes - Project Manager

Logistics:

The audit is scheduled for May 16 - 17, 2012 at the Mitsubishi Nuclear Energy Systems offices located in Arlington, Virginia.

Special Requests:

The NRC staff requests that MHI provide the requested information, workspace for the NRC staff to review the documents, and a telephone for contacting NRC headquarter staff (if necessary) as coordinated through the project manager. The NRC staff shall appropriately handle and protect proprietary information throughout the audit.

Deliverables:

Within 90 days of the closing meeting, the NRC staff will generate an audit summary report. The report will describe the outcome of the audit and summarize any open items resulting from the audit, including potential Requests for Additional Information.

References:

1. Topical Report MUAP-07009-P, Revision 0, "Thermal Design Methodology," issued May 2007.
2. US-APWR DCD, Revision 3.

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