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LTR-NRC-11-12

March 2, 2011

Subject: Submittal of Technical Bulletin TB-11-5, "Assessment of WCAP-16406-P-A Abrasive Wear Model and Recommendations" for Information Only (Non-Proprietary)

References:

1. TB-11-5, "Assessment of WCAP-16406-P-A Abrasive Wear Model and Recommendations," March 1, 2011
2. WCAP-16406-P-A, Revision 1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191." March 2008.
3. NRC Letter, "Final Safety Evaluation for Pressurized Water Reactor Owners Group (PWROG) Topical Report (TR) WCAP-16406-P, 'Evaluation of Downstream Sump Debris Effects In Support Of GSI-191,' Revision 1 (TAC NO. MD2189)," December 20, 2007.
4. OG-08-105, "Transmittal of NRC Approved Topical Report WCAP-16406-P-A Revision 1, 'Evaluation of Downstream Sump Debris Effects in Support of GSI-191' (PA-SEE-0195)," March 28, 2008.

Enclosed is a non-proprietary copy of Technical Bulletin TB-11-5, "Assessment of WCAP-16406-P-A Abrasive Wear Model and Recommendations" (Reference 1) dated March 1, 2011, submitted to the U. S. Nuclear Regulatory Commission for information only.

The purpose of this letter is to notify you that Westinghouse issued Technical Bulletin TB-11-5, regarding WCAP-16406-P-A, Revision 1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191" (Reference 2) WCAP-16406-P, Revision 1 was submitted for USNRC review. The NRC provided a Final Safety Evaluation (SE) on this report in late 2007 (Reference 3). The approved version of the report, WCAP-16406-P-A, Revision 1, was then transmitted to the NRC in March of 2008 (Reference 4). Since that time, Westinghouse has become aware of an error in the report and in response issued the aforementioned technical bulletin.

Westinghouse has determined that the coefficients in the free flowing abrasive wear equation for the ECCS and CSS pumps (Equation F.4-1) developed in Appendix F of WCAP-16406-P-A, Revision 1 (Reference 2) are incorrect. This abrasive wear rate equation is used to forecast the total amount of wear due to debris-laden fluid passing through the ECCS and CSS pumps. In return, the estimated amount of wear is used to predict whether the ECCS and CSS pumps will remain acceptable for use with debris-laden coolant as the working fluid in post-LOCA recirculation scenarios.

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Westinghouse has evaluated this issue and has concluded that the revision to the abrasive wear model coefficients does not impact the NRC's SE for WCAP-16406-P-A, Revision 1.

Therefore, the aforementioned technical bulletin (Reference 1) is being issued to document this error. Please be advised that WCAP-16406-P-A, Revision 1 will remain as-is; the WCAP will not be revised for the purpose of correcting this error.

Correspondence with respect to this letter or technical bulletin should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

J. A. Gresham, Manager
Regulatory Compliance

Enclosure

Westinghouse

Technical Bulletin

An advisory of a recent technical development pertaining to the installation or operation of Westinghouse-supplied nuclear plant equipment. Recipients should evaluate the information and recommendation, and initiate action where appropriate.

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Subject: **Assessment of WCAP-16406-P-A Abrasive Wear Model and Recommendations**	Number: **TB-11-5**
System(s): Emergency Core Cooling System and Containment Spray System	Date: 03/01/2011
Affects Safety-Related Equipment Yes ☒ No ☐	S.O.: 205

SUMMARY

This Technical Bulletin is provided in regards to incorrect coefficients in the abrasive wear model discussed in WCAP-16406-P-A, Revision 1 (Reference 1).

Reference 1 provides a method for evaluating the downstream influence of sump debris on the performance of emergency core cooling system (ECCS) and containment spray system (CSS) pumps following a loss-of-coolant accident (LOCA) in the recirculation mode, with debris laden coolant as the working fluid. One portion of the method calculates free flowing abrasive wear due to debris laden fluid in safety related pumps. The method provided in the WCAP calculates a wear rate based on plant specific conditions, such as abrasive debris concentration and material hardness. Westinghouse has determined that the free flowing abrasive wear coefficients used for the ECCS and CSS pumps developed in Appendix F of Reference 1 are incorrect. The abrasive wear rate equation is used to predict the total amount of wear due to debris laden fluid passing through the ECCS and CSS pumps. In turn, the estimated amount of wear is used to predict whether the ECCS and CSS pump will remain acceptable for use with debris laden coolant as the working fluid in post-LOCA recirculation scenarios.

TECHNICAL EVALUATION

The error was caused by an incorrect interpretation of test data when the abrasive wear equation was originally regressed from the test data. The geometric average wear rates calculated in Reference 1 for debris concentrations of 92 PPM and 920 PPM used two unacceptable data points. The impact of the inclusion of these two data points in the calculation of the geometric average wear rates, is that the abrasive wear equation overestimates the wear rates based on the test data presented in Reference 1 for

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debris concentrations > 180 PPM. Over estimation of a forecasted wear rate shortens the forecasted length of time for a pump to reach the 2X design clearance acceptance criterion set in the WCAP.

Use with initial debris concentrations ≤ 180 PPM is non-conservative. However, for the WCAP defined mission time of 30 days, the amount of wear caused by debris laden fluid with debris concentrations ≤ 180 PPM is insufficient to cause a pump to fail the acceptance criterion of the wear ring gap, increasing by less than 2X the initial design clearance contained in Reference 1.

For all initial debris concentrations, the equation which more accurately reflects the test data presented in Reference 1 is contained in letter OG-11-70 (Reference 2) as an alternate to that established in the WCAP.

RECOMMENDED ACTIONS

From a safety analysis perspective, no actions are necessary. Westinghouse recommends the following:

1. Review potentially impacted GSI-191 evaluations to ensure no regulatory compliance issues exist.
2. For plants with initial debris concentrations ≤ 180 PPM, if actions are necessary, either add additional conservatism to the evaluation by assuming an initial debris concentration > 180 PPM, in conjunction with the original WCAP equation, or use the Reference 2 alternate equation to calculate abrasive wear in the ECCS and CSS pumps.

AFFECTED PLANTS

All Pressurized Water Reactor Owners Group (PWROG) plants utilizing WCAP-16406-P-A, Revision 1, to determine free flowing abrasive wear of the ECCS and CSS pump due to debris from the containment sump inventory.

REFERENCES

1. WCAP-16406-P-A, Revision 1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191," March 2008
2. Westinghouse letter to PWROG, OG-11-70, "Notification of Westinghouse Technical Bulletin and Transmittal of Supporting Documentation Regarding Error in Topical Report WCAP-16406-P-A, Revision 1, 'Evaluation of Downstream Sump Debris Effects in Support of GSI-191,' (PA-SEE-0195)," March 1, 2011(Proprietary)

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