January 9, 2009

MEMORANDUM TO: Allen L. Hiser, Jr., Chief
Steam Generator Tube Integrity and
Chemical Engineering Branch
Division of Component Integrity
Office of Nuclear Reactor Regulation

FROM: Andrew B. Johnson **/RA/**
Steam Generator Tube Integrity and
Chemical Engineering Branch
Division of Component Integrity
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE DECEMBER 17, 2008 CATEGORY 2 PUBLIC MEETING WITH THE NUCLEAR ENERGY INSTITUTE (NEI) AND INDUSTRY TO DISCUSS MODELING ISSUES PERTAINING TO THE STEAM GENERATOR TUBE-TO-TUBESHEET JOINTS

The U.S. Nuclear Regulatory Commission's (NRC) staff met with the Nuclear Energy Institute, Westinghouse, and licensees on December 17, 2008, at Westinghouse's Waltz Mill Site in Madison, Pennsylvania. The purpose of the meeting was to compare the results of Westinghouse and Argonne National Laboratory (ANL) steam generator (SG) tube-to-tubesheet joint models, to assess the consistency of the model predictions for design basis conditions, and to reconcile any differences. The Enclosure provides a list of those in attendance. This meeting was noticed as a public meeting and the meeting agenda is available in the NRC Agencywide Documents Access and Management System (ADAMS) under Accession Number ML083440320. Other than industry representatives, no members of the public were present.

Information presented by the industry during the meeting is available in ADAMS under Accession Number ML083540661.

Background: The Westinghouse models are being developed to support future license applications for an alternate repair criterion (ARC) applicable to the tube-to-tubesheet joints. This ARC is termed "H*." The ANL models are being developed under contract to the NRC's Office of Nuclear Regulatory Research to evaluate the behavior of the joints under severe accident conditions; however, the ANL models can also be used to evaluate the joint behavior under design basis conditions.

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The following summarizes the meeting discussions. Numerous differences between the models were discussed that appear to be responsible for the discrepancy in analysis results reported earlier. One difference was more realistic modeling of the connection between the tubesheet and the SG shell and channel head in the Westinghouse model, and the ANL model was recently revised accordingly. Another significant difference was the use of different effective material properties by Westinghouse and ANL to model the stiffness of the perforated tubesheet. The Westinghouse properties stem from an approach (SLOT) with a sixty-year pedigree in the literature and which was used in the original design of the tubesheets, whereas the ANL properties were developed independently of SLOT. Other differences in analysis input assumptions were also identified; however, the different Westinghouse assumptions appeared to be in the direction of being more prototypical and more realistic of actual conditions in the field. To ensure that the key differences between Westinghouse and ANL models were identified and understood, Westinghouse conducted an analysis with input assumptions consistent as practical to those used by ANL. This analysis resulted in predicted tubesheet displacements and tube to tubesheet contact pressures consistent with those predicted by ANL.

In summary, the Westinghouse and ANL models appear to provide consistent results, given the use of consistent input parameters. Past differences in reported results between the models appear to be attributable to Westinghouse's use of the SLOT methodology for modeling tubesheet stiffness, and to the use of more realistic and prototypic modeling and input parameter assumptions by Westinghouse. ANL will continue to interact with Westinghouse to better understand the differences in how tubesheet stiffness has been modeled.

The action item that came out of the meeting was, ANL will clarify (to the NRC) the origin of Poisson's ratio used in the ANL analysis.

Project No. 689

Enclosure:
Attendance List

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| **OFFICE** | DCI/CSGB | DCI/CSGB | DCI/CSGB |
| **NAME** | AJohnson /RA/ | EMurphy /RA/ | AHiser /RA/ |
| **DATE** | 01/08/2009 | 01/09/2009 | 01/09/2009 |

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ATTENDANCE LIST

December 17, 2008 Meeting with NEI, SGTF, and Industry to Discuss H*/B* Issues

SGTF/Industry
Herm Lagally, Westinghouse
Cheryl Hammer, Westinghouse
Gary Whiteman, Westinghouse
Chris Cassino, Westinghouse
Damian Testa, Westinghouse
Mike Melton, NEI
Jay Smith, Exelon (via phone)
Steve Leshnoff, Exelon (via phone)
Don Gerber, Dominion (via phone)
James Begley, AREVA (via phone)
Russ Cipolla, APTECH Engineering (via phone)
Pete Riccardella, Structural Integrity Associates (via phone)

ANL/NRC
Saurin Majumdar, ANL
Emmett Murphy, NRC

ENCLOSURE