

February 15, 2013

Mr. Rich DeLong, Director
AP1000 Licensing
Westinghouse Electric Company
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: AUDIT SUMMARY FOR REVIEW OF WESTINGHOUSE TOPICAL REPORT
WCAP-17577-P, REVISION 1, "TOPICAL REPORT ON AMERICAN SOCIETY
OF MECHANICAL ENGINEERS SECTION III PIPING FATIGUE ANALYSIS
UTILIZING THE WESTEMS™ COMPUTER CODE"

Dear Mr. DeLong:

On December 3 – 5 and December 10, 11, and 13, 2012, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an audit related to the review of the Westinghouse Electric Company (Westinghouse) topical report, WCAP-17577-P, Revision 1, "Topical Report on ASME Section III Piping Fatigue Analysis Utilizing the WESTEMS™ Computer Code." The enclosed audit summary describes the content of the review, identifies the audit participants, and a list of audit exit questions that will be turned into requests for additional information (RAIs).

If you have any questions, please contact the Project Manager, Bruce Bovol, at (301) 415-6715 or Bruce.Bovol@nrc.gov.

Sincerely,

/RA/

Lawrence J. Burkhart, Acting Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Project No. 0799

Enclosures:
1. Audit Participation
2. Audit Summary

cc w/encls: See next page

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Audit Participation - December 3 – 5 and December 10, 11, and 13, 2012

The following table provides a comprehensive list of the audit participants from the U.S. Nuclear Regulatory Commission (NRC), Westinghouse Electric Company (Westinghouse), and applicable licensees.

Name	Affiliation
Bruce Bavol	NRC
Aixa Belen	NRC
Ian Tseng	NRC
John Wu	NRC
Ching Ng	NRC
Robert Hsu	NRC
Y.C. (Renee) Li	NRC
Joe Colaccino	NRC
Victor Hall	NRC
John McInerney	Westinghouse
Paul Russ	Westinghouse
Andy Pfister	Westinghouse
Rick Brice-Nash	Westinghouse
Mark Gray	Westinghouse
Phil Kotwicki	Westinghouse
Eric Johnson	Westinghouse
Dan Holzman	Westinghouse
Lyles Cranford	Westinghouse
Brian McIntyre	Westinghouse
Brad Carpenter	Westinghouse
Chuck Herbst	SNC
Kevin Pigg	SNC
Amy Aughtman	SNC
Mark Wilson	SNC
April Rice	SCANA
Julie Ezell	SCANA
Richard Troficanto	SCANA
Jamie LaBorde	SCANA

**Audit Summary for Reviewing WCAP-17577-P, Revision 1, “Topical Report on ASME
Section III Piping Fatigue Analysis Utilizing the WESTEMS™ Computer Code”
Project No. 0799**

December 3 – 5 and December 10, 11, and 13, 2012

1. Audit Summary

On December 3 – 5 and December 10, 11, and 13, 2012, NRC staff conducted an audit related to the review of the Westinghouse topical report, WCAP-17577-P, Revision 1, “Topical Report on ASME Section III Piping Fatigue Analysis Utilizing the WESTEMS™ Computer Code.”

The audit was conducted by a team of U. S. Nuclear Regulatory Commission (NRC) staff members who are knowledgeable in various aspects of the piping and component stress evaluation, fatigue analysis and computer program review. Based on the scope of review, the team spent two consecutive weeks at the Westinghouse Twinbrook Office in Rockville, Maryland auditing materials.

During this audit, the staff reviewed WESTEMS™ supporting references (see Section 3) in sufficient detail to enable a complete detailed review of the topical report. Staff focused on the five “gaps” that were identified in the acceptance review of WCAP-17577 Revision 0, and documented in the Enclosure of “Withdrawal Acknowledgement Letter for WCAP-17577,” dated June 1, 2012, Agencywide Documents Access and Management System Accession Number ML12151A221.

At the audit exit staff prepared a preliminary list of questions derived from their review (see Section 2) for Westinghouse that will be turned into request for additional information (RAIs).

2. AP1000 WESTEMS Audit Exit Questions

1. What is the root cause of generating additional peak and valleys?
2. Show that peaks and valleys from hand calculations exist in WESTEMS run, and ensure that no real peaks/valleys are missed by WESTEMS calculation (V&V). Prove that hand calc peaks and valleys are a subset of WESTEMS output peaks and valleys. As such, confirm that the first run of WESTEMS always generates conservative results.
3. Explain process for ensuring that no real peaks are removed. For the case here the initial run output peaks are modified by users to reduce cumulative usage factor (CUF), confirm whether the final results are correct in comparing the final results with the hand calculation.
4. The staff noted that PSDR-QP-4.7 is the American Society of Mechanical Engineers (ASME) Code Section III NB-3600 fatigue analysis and verification process for the user intervention. However, TR is also applied to ASME Code Section III NB-3200. Provide the equivalent documents for NB-3200 or limit TR for NB-3600 only.
5. Provide justification and step by step procedure in determining that only redundant peaks/valleys are removed and any manual elimination.

6. Pages 1–3 of the WESTEMS TR indicated that “The effort to develop algorithms to cover all possible conceived problem dependencies is not practically justified compare to the effort for analysts to make reasonable engineering decisions about the inputs for known problems. The staff is asking Westinghouse to identify all “reasonable engineering decisions” and clarify whether these are all included in the procedures.
7. The staff noted that there are different benchmark problems between WESTEMS Version 4.5, 4.5.1, 4.5.2 and 4.5.6. The benchmark problem has been changed from the previous code version. How to ensure that the changes made to the program with newer version do not affect other functionality of the code that may not be tested by a different test problem.
8. Noise filter process was used in the code. Explain the process to ensure the critical (max stress for peak, min stress for valley) noise points are retained.

3. Reference Documents Provided by Westinghouse

- Westinghouse document PSDR-QP-4.7, Revision 2, “WESTEMSTM WESTEMS NB-3600 Fatigue Analysis and Verification Procedure.” (proprietary)
- Westinghouse document CN-PAFM-12-56, Revision 0, “WESTEMSTM 4.5.6 Software Change Specification.” (proprietary)
- Westinghouse document CN-PAFM-12-20, Revision 0, “WESTEMSTM 4.5.6 Validation and Verification.” (proprietary)
- Westinghouse Software Manual, “WESTEMSTM Version 4.5.6 User Manual Revision 4 Volume 2 (Design Analysis),” include as an attachment to LTR-PAFM- 12-111 [11]. (proprietary)
- Westinghouse document CN-PAFM-10-98, Revision 1, “Salem Pressurizer Surge Nozzle WESTEMSTM Fatigue Analysis Benchmark.” (proprietary)
- Westinghouse document CN-PAFM-10-101, Revision 0, “Salem Boron Injection Tank (BIT) Nozzle WESTEMS Fatigue Analysis Benchmark.” (proprietary)
- Westinghouse document CN-PAFM-08-119, Revision 1, “WESTEMSTM 4.5.2 Verification and Validation.” (proprietary)

DC Westinghouse - AP1000 Mailing List
cc:

(Revised 12/03/2012)

Ms. Sara Barczak
Southern Alliance for Clean Energy
P.O. Box 8282
Savannah, GA 31401

Mr. Tony Robinson
AREVA NP, Inc.
3315 Old Forest Road
Lynchburg, VA 24501

Paul M. Bessette
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004

Mr. Paul A. Russ
Director, AP1000 Licensing
Westinghouse
1000 Westinghouse Drive
Cranberry Township, PA 16066

Ms. Michele Boyd
Legislative Director
Energy Program
Public Citizens Critical Mass Energy
and Environmental Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Mr. Gary Wright, Director
Division of Nuclear Facility Safety
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, IL 62704

Mr. Barton Z. Cowan, Esquire
Eckert Seamans Cherin & Mellott, LLC
600 Grant Street, 44th Floor
Pittsburgh, PA 15219

Mr. Paul Gaukler
Pillsbury, Winthrop, Shaw, Pittman
2300 N Street, NW
Washington, DC 20037

Ms. Sophie Gutner
P.O. Box 4646
Glen Allen, VA 23058

Ms. Shannon Bowyer Hudson
Office of Regulatory Staff
State of South Carolina
1401 Main Street
Suite 900
Columbia, SC 29201

Rita Kilpatrick
250 Arizona Ave.
Atlanta, GA 30307

DC Westinghouse - AP1000 Mailing List

Email

agaughtm@southernco.com (Amy Aughtman)
amonroe@scana.com (Amy Monroe)
APAGLIA@Scana.com (Al Paglia)
APH@NEI.org (Adrian Heymer)
awc@nei.org (Anne W. Cottingham)
bgattoni@roe.com (William (Bill) Gattoni))
Bill.Jacobs@gdsassociates.com (Bill Jacobs)
cberger@energetics.com (Carl Berger)
crpierce@southernco.com (C.R. Pierce)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
doug.ellis@shawgrp.com (Doug Ellis)
eddie.grant@excelservices.com (Eddie Grant)
erg-xl@cox.net (Eddie R. Grant)
ewallace@nuscalepower.com (Ed Wallace)
fbelser@regstaff.sc.gov
gcesare@enercon.com (Guy Cesare)
George.Madden@fpl.com (George Madden)
gzinke@entergy.com (George Alan Zinke)
james1.beard@ge.com (James Beard)
jcsaldar@bechtel.com (James Saldarini)
jerald.head@ge.com (Jerald G. Head)
jflitter@regstaff.sc.gov
jim@ncwarn.org (Jim Warren)
john.elnitsky@pgnmail.com (John Elnitsky)
Joseph_Hegner@dom.com (Joseph Hegner)
jrappe@nuscalepower.com (Jodi Rappe)
kinneyrw@dhec.sc.gov (Ronald Kinney)
KSutton@morganlewis.com (Kathryn M. Sutton)
kwaugh@impact-net.org (Kenneth O. Waugh)
lchandler@morganlewis.com (Lawrence J. Chandler)
lindg1da@westinghouse.com (Don Lindgren)
maria.webb@pillsburylaw.com (Maria Webb)
marilyn.kray@exeloncorp.com
mark.beaumont@wsms.com (Mark Beaumont)
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)
maurerbf@westinghouse.com (Brad Maurer)
media@nei.org (Scott Peterson)
Mitch.Ross@fpl.com (Mitch Ross)
MSF@nei.org (Marvin Fertel)
nirsnet@nirs.org (Michael Mariotte)

DC Westinghouse - AP1000 Mailing List

nscjiangguang@sina.com (Jiang Guang)
Nuclaw@mindspring.com (Robert Temple)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)
Paul.Jacobs@fpl.com (Paul Jacobs)
Paul@beyondnuclear.org (Paul Gunter)
pbessette@morganlewis.com (Paul Bessette)
pshastings@generationmpower.com (Peter Hastings)
Raymond.Burski@fpl.com (Raymond Burski)
rclary@scana.com (Ronald Clary)
rgrumbir@gmail.com (Richard Grumbir)
Richard.Orthen@fpl.com (Richard Orthen)
ritterse@westinghouse.com (Stanley E. Ritterbusch)
RJB@NEI.org (Russell Bell)
robert.kitchen@pgnmail.com (Robert H. Kitchen)
rong-pan@263.net (Pan Rong)
sabinski@suddenlink.net (Steve A. Bennett)
saporito3@gmail.com (Thomas Saporito)
sara@cleanenergy.org
sfrantz@morganlewis.com (Stephen P. Frantz)
shudson@regstaff.sc.gov (Shannon Hudson)
sisk1rb@westinghouse.com (Rob Sisk)
smsloan@babcock.com (Sandra Sloan)
stephan.moen@ge.com (Stephan Moen)
Steve.Franzone@fpl.com (Steve Franzone)
strambgb@westinghouse.com (George Stramback)
Tansel.Selekler@nuclear.energy.gov (Tansel Selekle)
Timothy.Beville@nuclear.energy.gov (Tim Beville)
tom.miller@hq.doe.gov (Tom Miller)
tomccall@southernco.com (Tom McCallum)
TomClements329@cs.com (Tom Clements)
trsmith@winston.com (Tyson Smith)
Vanessa.quinn@dhs.gov (Vanessa Quinn)
vijukrp@westinghouse.com (Ronald P. Vijuk)
Wanda.K.Marshall@dom.com (Wanda K. Marshall)
wayne.marquino@ge.com (Wayne Marquino)
whorin@winston.com (W. Horin)