

December 29, 2011

MEMORANDUM TO: Bo M. Pham, Chief  
Aging Management of Reactor Systems  
and Guidance Update Branch  
Division of License Renewal  
Office of Nuclear Reactor Regulation

FROM: On Yee, Mechanical Engineer /RA/  
Aging Management of Reactor Systems  
and Guidance Update Branch  
Division of License Renewal  
Office of Nuclear Reactor Regulation

SUBJECT: STAFF RESPONSE TO PUBLIC COMMENTS ON DRAFT  
REGULATORY INFORMATION SUMMARY (RIS) ON METAL  
FATIGUE ANALYSIS PERFORMED BY COMPUTER  
SOFTWARE (TAC No. ME6255)

The U.S. Nuclear Regulatory Commission (NRC) staff published a notice of opportunity for public comment on the draft RIS, "Metal Fatigue Analysis Performed By Computer Software," in the *Federal Register* (76 FR 60939) on September 30, 2011.

The agency received comments from two commenters. The first commenter, Mr. J.A. Gresham of Westinghouse Electric Company provided comments in a letter dated October 20, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML11301A104). The second commenter, Ms. Amy G. Aughtman of NuStart Energy provided her comments in a letter dated October 31, 2011 (ADAMS Accession Number ML11307A391).

All comments were considered and enclosed is the NRC staff's response to the public comments. The NRC staff will revise the draft RIS, as appropriate, based on the public comments in the final version of the RIS.

Enclosure:

1. Staff Response to Public Comments

CONTACT: On Yee, NRR/DLR  
301-415-1905

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**ADAMS Accession No.: ML11320A023**

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STAFF RESPONSE TO PUBLIC COMMENTS ON  
DRAFT REGULATORY ISSUE SUMMARY 2010-XX  
METAL FATIGUE ANALYSIS PERFORMED BY COMPUTER SOFTWARE

Source of Comments

- I. Comments from J. A. Gresham, Westinghouse (ML11301A104)
- II. Comments from Amy G. Aughtman, AP1000® Design Centered Working Group Licensing Lead (ML11307A391)

#	Source	Comment	Response
1	I-1	<p>The draft RIS addresses itself both specifically to the WESTEMS™ computer software package as well as generically to computer software packages used in performing ASME Code fatigue calculations. Westinghouse believes that it may not be the staff's intent on focusing on concerns with the WESTEMS™ computer software.</p> <p>General Proposed Change – Westinghouse proposes that the NRC consider recasting the write-up to be completely generic in nature and only refer to WESTEMS™ computer software package in the context of being one that was the subject of an audit and is representative of NRC's concerns with all such packages.</p> <p>3rd paragraph, Intent section</p>	<p>The staff agrees with the comment that the focus of the RIS is not meant to be only on the WESTEMS™ computer software, but rather generically to any computer software packages used in performing ASME Code fatigue calculations.</p> <p>The staff revised the RIS so the focus of the staff's concerns is generic to any computer software package used to perform ASME Code fatigue calculations and that the WESTEMS™ computer software was the subject of the staff's audits and is representative of NRC's concerns with all such packages.</p> <p>See response to Comment 1.</p>
2	I-2	<p>Current RIS description – “methodologies using the computer software package, WESTEMS™, to demonstrate compliance ...”</p> <p>Change to – “ ... methodologies, to demonstrate compliance ...”</p> <p>7th paragraph, Summary of Issue</p>	<p>See response to Comment 1.</p>
3	I-3	<p>Current RIS description – “ ... staff has identified concerns about</p>	<p>See response to Comment 1.</p>

#	Source	Comment	Response
4	I-4	<p>the computer software package, WESTEMS™, that is used to ..."</p> <p>Change to - "... staff has identified potential concerns regarding the implementation of computer software packages used to..."</p> <p>8th paragraph, Summary of Issue</p> <p>Current RIS description – "One such concern was that the methodology used by this computer software package to determine the peak stress intensity range time history in fatigue calculations uses the algebraic summation of three orthogonal moment vectors."</p> <p>Change to – "One such concern was that the methodology used by this computer software package to determine the peak and valley times in the total stress intensity time history used in fatigue calculations includes inputs that could be misused to include the algebraic summation of three orthogonal moment vectors."</p> <p>Comment – Recommended change to correct the accuracy of the current description. Westinghouse basis is that NRC has not identified in our calculations a misuse of moment inputs to an NB-3600 evaluation or an error in the engineering removal of conservative peaks and valleys in a fatigue evaluation.</p>	<p>The staff agrees with the comment to revise the RIS to correct the accuracy of the current description related to the staff's concern. The staff revised the RIS to more accurately describe the staff's concerns related to the algebraic summation of three orthogonal moment vectors.</p> <p>As described in the draft RIS, the staff's documentation of its concern is in the safety evaluation report (ADAMS Accession No. ML103430502) and related audit report (ADAMS Accession No. ML110250634).</p>
5	I-5	<p>8th paragraph, Summary of Issue</p> <p>Current RIS description – "The staff also identified a concern in which, under certain circumstances, the use of this computer software package requires the user to manually modify peak and valley times/stresses during intermediate calculations in the software."</p>	<p>The staff agrees with the comment to revise the RIS to correct the accuracy of the current description related to the staff's concern. The staff revised the RIS to more accurately describe the staff's concerns related to the manual modification of stress peak and valley times in the total stress intensity time history during intermediate calculations.</p>

#	Source	Comment	Response
6	I-6	<p>Change to – “The staff also identified a concern in which, under certain circumstances, the use of this computer software package allows the user to manually modify stress peak and valley times selected for input to the fatigue usage factor calculation, during intermediate calculations in the software, to reduce identified conservatism.”</p> <p>Comment – Recommend change to correct the accuracy of the current description.</p> <p>8th paragraph, Summary of Issue</p> <p>Current RIS description – “Although this method of analyst intervention could provide acceptable results in some cases, reliance on the user’s engineering judgment and ability to modify peak and valley times/stresses, without control and documentation, could produce results that are not predictable, repeatable, or conservative.”</p> <p>Change to – “Analyst intervention or adjustment of computer program inputs based on user judgment and application of ASME criteria should be documented.”</p> <p>Comment - Almost all typical ASME Code fatigue calculations have been performed using the results of stress calculations, either manual or computerized, plus engineering processing, including engineering judgment where required, to complete the fatigue evaluations consistent with Code requirements. Use of a computer tool that provides a semi-automated process and user control of inputs and parameters used in the evaluation is not inconsistent with the methods historically proven. Westinghouse QA procedures provide control of the overall process used by</p>	<p>As described in the draft RIS, the staff’s documentation of its concern is in the safety evaluation report (ADAMS Accession No. ML103430502) and related audit report (ADAMS Accession No. ML110250634).</p> <p>The staff agrees with the comment that typical ASME Code fatigue calculations have been performed using the results of stress calculations with engineering processing, including engineering judgment where required, to be consistent with ASME Code requirements. The RIS only provides information about concerns that are documented in the staff’s safety evaluation report (ADAMS Accession No. ML103430502) and related audit report (ADAMS Accession No. ML110250634).</p> <p>As stated in the backfit discussion, the RIS does not impose any requirements; therefore, it cannot prescribe what should be documented. It is the responsibility of the addressee to assure the methodology selected for performing ASME Code fatigue calculations meets the ASME Code requirements in accordance with 10 CFR 50.55a and the quality assurance requirements for design control in accordance with Appendix B to 10 CFR Part 50.</p> <p>Therefore, no change was made to the sentence as a</p>

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7	I-7	<p>authors and verifiers of engineering calculations, including those that use a computer program.</p> <p>8th paragraph, Summary of Issue</p> <p>Current RIS description – “Because of these concerns the applicant for the AP1000 design certification elected to remove the use of this computer software package from its design certification document, such that it is not used in the design for the AP1000 , as documented in ...”</p> <p>Change to – “Due to the continuing work needed to resolve the staff concerns, the applicant for the AP1000® design certification elected to remove the use of this computer software package from its design certification amendment, as documented in ADAMS Accession No. MLI02770329. The Applicant is intending to gain NRC approval of WESTEMS™ software as part of the Combined Operating License (COL) design acceptance criteria (DAC) closure process.”</p> <p>Comment – WESTEMS™ was removed from the Design Control Document (DCD) because it became apparent that the NRC's concerns would not be resolved in a timely manner that would support the Design Certification and rulemaking schedule.</p>	<p>result of this comment.</p> <p>The purpose of the RIS informs addressees of concerns with the use of computer software packages to perform ASME Code fatigue calculations and reminds them of the ASME Code requirements in accordance with 10 CFR 50.55a and the quality assurance requirements for design control in accordance with Appendix B to 10 CFR Part 50. Therefore, the intent of the applicant for the AP1000® design certification document amendment and ongoing work and review related to gaining NRC approval of WESTEMS™ software as part of the Combined Operating License design acceptance criteria closure process is not within the scope of this RIS.</p> <p>The staff revised the RIS to eliminate confusion related to the removal of the WESTEMS™ computer software from the AP1000® design certification document amendment.</p>
8	I-8	<p>9th paragraph, Summary of Issue</p> <p>Current RIS description – “License renewal applicants have attempted to use this computer software package to demonstrate acceptable fatigue calculations for plant operation during the period of extended operation.”</p>	<p>See response to Comment 1.</p> <p>The staff revised the RIS to clarify that license renewal applicants have proposed the use of various computer software packages in License Renewal Applications. The staff's review of a license renewal applicant's use of a computer software package to perform ASME Code</p>

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9	I-9	<p>Change to – “License renewal applicants have used this computer software package to demonstrate acceptable fatigue calculations for plant operation during the period of extended operation.”</p> <p>Comment – Using the word "attempted" implies that they were not successful. However, the example cited demonstrates that it was successful. This example demonstrated that engineers using the software within the QA program resulted in evaluations that are in accordance with the ASME Code methodology.</p> <p>10th paragraph, Summary of Issue</p> <p>Current RIS description – “At the conclusion of the audit, the staff determined, as described in its audit report (ADAMS Accession No. MLI 10871243), that the license renewal applicant's use of this computer software package demonstrated (1) that it produced calculations of stresses and cumulative usage factors that are consistent with the methodology in ASME Code, Section III, Subsection NB, Subarticle NB-3200, (2) that the analyst's judgment in manually modifying peak and valley times/ stresses in these calculations was reasonable and can be appropriately justified and documented, though justification of any user intervention should be documented,…”</p> <p>Comment – This conclusion verifies that the WESTEMS™ program performs calculations according to the ASME Code Section III methodology, and that allowing the user to adjust inputs to the evaluation based on knowledge of the problem and the ASME Code requirements does not reduce the quality of the results.</p>	<p>fatigue calculations is done on a case-by-case basis. The staff's evaluation will be documented in the Safety Evaluation Report and is specific to that license renewal applicant.</p> <p>See response to Comment 8.</p> <p>This RIS provides information regarding the staff's conclusion following the audit for this license renewal applicant. These conclusions are based on the staff's review of the ASME Code fatigue calculations and documentation provided during this audit. Therefore, the conclusions in the audit report (ADAMS Accession No. ML110871243) are specific to this license renewal applicant.</p>

#	Source	Comment	Response
10	I-10	Westinghouse proposes a public meeting with the staff to discuss our comments pertaining to the draft RIS at the earliest opportunity.	<p>Mr. J.A. Gresham was contacted by email and telephone, on November 8, 2011, and informed that the staff does not intend to hold a public meeting to discuss the comments he provided because the comments were clear and concise and the staff did not require clarification.</p> <p>He was also informed that the staff will issue this document that dispositions each of the public comments that were received and that the RIS will be revised, as appropriate, based on the public comments.</p>
11	II	The utility members of the AP1000® Design Centered Working Group (DWC) endorse the Westinghouse Electric Company (WEC) comments in LTR-NRC-11-39 dated October 20, 2011. As WEC indicated in their comments, the AP1000® DCWG believes that the staff concerns regarding WESTEMS™ software will be resolved, and intend to work with the cognizant NRC staff members by requesting a meeting.	<p>As discussed in the response to Comment 8, the intent of the applicant for the AP1000® design certification document amendment and ongoing work and review related to gaining NRC approval of WESTEMS™ software as part of the Combined Operating License design acceptance criteria closure process is not within the scope of this RIS.</p> <p>Ms. Amy Aughtman was contacted by email on November 9, 2011, and informed that the staff does not intend to hold a public meeting to discuss the comments WEC provided. See response to Comment 9.</p>