UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 30, 2011

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: AUDIT REPORT ON THE USE OF WESTEMS™ SOFTWARE IN THE SALEM NUCLEAR GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION (TAC NOS. ME1834 and ME1836)

Dear Mr. Joyce

By letter dated August 18, 2009, Public Service Enterprise Group Nuclear, LLC (PSEG), submitted an application pursuant to Title 10 of the *Code of Federal Regulation* Part 54 (10 CFR Part 54) for renewal of Operating License DPR-70, and DPR-75 for Salem Nuclear Generating Station (Salem), Units 1 and 2. On January 18-19, 2011, and February 8, 2011, the NRC audit team completed an audit of the use of the WESTEMS™ software for analyzing and monitoring metal fatigue of selected components. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-2981 or by e-mail at Bennett.Brady@nrc.gov.

Sincerely,

Bennett M. Brady

Bennett M. Brady, Senior Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311

Enclosure:
As stated

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION –
DIVISION OF LICENSE RENEWAL
AGING MANAGEMENT AUDIT REPORT

Docket Nos:	50-272 and 50-311
License Nos:	DPR-70 and DPR-75
Licensee:	PSEG NUCLEAR LLC
Facility:	Salem Nuclear Generating Station, Units 1 and 2
Location:	Westinghouse Twinbrook Office Facility, Rockville, MD.
Dates:	January 18-19, 2011 February 8, 2011
Reviewers:	B. Brady, Sr. Project Manager, Division of License Renewal (DLR) S. Cuadrado de Jesus, Project Manager, DLR A. Hiser, Senior Technical Advisor, DLR C. Ng, Mechanical Engineer, DLR O. Yee, Mechanical Engineer, DLR G. Stevens, Senior Materials Engineer, Division of Engineering, Office of Nuclear Regulatory Research
Approved By:	Antonio Dias, Acting Chief Aging Management of Reactor Systems and Guidance Update Branch Division of License Renewal Office of Nuclear Reactor Regulation Bo Pham, Chief Projects Branch 1 Division of License Renewal Office of Nuclear Reactor Regulation

ENCLOSURE

Introduction

On August 18, 2009, the licensee for the Salem Nuclear Generating Station, Units 1 and 2, (Salem) submitted a license renewal application (LRA) for Salem. Section 4 of the LRA states that data from the WESTEMS™ fatigue monitoring software were reviewed with respect to pressurizer heatups and cooldowns. Section 4.3.4.2 of the Salem LRA identifies development of a plant-specific WESTEMS™ model for the pressurizer and surge line locations to evaluate the effects of pressurizer insurge/outsurge transients and surge line stratification on the pressurizer surge nozzle safe end to pipe weld and the surge line hot leg weld. Under discussions of the Metal Fatigue of Reactor Coolant Pressure Boundary aging management program (AMP), Sections A.3.1.1 and B.3.1.1 of the Salem LRA identify that WESTEMS™ computes fatigue cumulative usage factors (CUFs) for select locations.

The staff's review of the Salem LRA identified questions on the specific use of the WESTEMS™ software at Salem and how the software will be used in conjunction with the Metal Fatigue of Reactor Coolant Pressure Boundary AMP. In addition, staff in the NRC Office of New Reactors (NRO) has identified concerns regarding the results determined by the WESTEMS™ program as a part of the American Society of Mechanical Engineers (ASME) Code Section III NB-3600 fatigue CUF calculation process. In particular, the staff is concerned about Westinghouse's response to NRC questions regarding the AP1000 Technical Report (ADAMS Accession No. ML102300072, dated August 13, 2010) which describes the ability of users to modify intermediate data (peak and valley stresses) used in the analyses to compute CUF. In addition, a response provided to the NRC staff by Westinghouse on August 20, 2010, (ADAMS Accession No. ML102350440) describes different approaches used by the software for summation of the moment stress terms for fatigue calculations in accordance with ASME Code Section III NB-3600. These issues can have significant impacts on calculated fatigue CUF values.

To resolve these concerns relative to the Salem LRA, the staff issued a request for additional information (RAI) to the applicant on November 22, 2010 (ADAMS Accession No. ML102810194). The RAI requested, in part, the applicant to address whether the issues identified above by NRO were applicable to the use of WESTEMS™ at the Salem Units, and to describe how WESTEMS™ is used at Salem, including what transients and locations are monitored, what stress models are used, and how the environmentally assisted fatigue (EAF) analysis was performed for each monitored location. The applicant responded to these questions in a letter dated December 21, 2010 (ADAMS Accession No. ML103630403). The applicant stated that the WESTEMS™ NB-3200 module was used to prepare EAF evaluations for six locations. The evaluations were performed using WESTEMS™ to calculate CUF according to the methods defined in ASME Code Section III NB-3200 criteria. The applicant also stated that Salem will use the WESTEMS™ software to monitor online fatigue usage utilizing the WESTEMS™ NB-3200 module, and, therefore, the issue regarding the WESTEMS™ NB-3600 module does not apply to the Salem use of WESTEMS™. The letter further stated that the WESTEMS™ online fatigue monitoring module does not have the user capability to modify the stress peak and valley times used in the online fatigue calculations. The applicant further stated that:

> fatigue calculations did involve limited adjustment to the stress peak and valley times; specifically, redundant stress peaks and valleys were removed from the

stress histories calculated in the EAF analyses. The removal of these redundant stress peaks were technically justified, verified, and documented in the supporting engineering calculations, that these adjustments were considered to have an insignificant impact on the final calculated CUF, and that these adjustments would not result in any CUF exceeding 1.00.

In the same RAI, the staff also requested that the applicant conduct benchmarking evaluations for two of the limiting locations monitored in the Salem WESTEMS™ NB-3200 fatigue analysis using the same input parameters and assumptions as those used in traditional ASME Code Section III CUF calculations for each location. Further, the staff requested that if such traditional calculations do not exist for either of the selected locations, calculations should be developed using techniques that allow independent comparison with the WESTEMS™ results. This benchmarking evaluation was intended to confirm that the results of the WESTEMS™ NB-3200 module, including any analyst judgments and user intervention, are acceptable and comparable to traditional ASME Code Section III analyses for the selected monitored locations. The applicant provided a summary of the results of the requested benchmarking evaluations in a letter dated January 7, 2011, (ADAMS Accession No. ML110110428), and made the results of the benchmarking evaluations available to the NRC staff for audit.

On January 18 -19, 2011, the staff conducted an audit of Salem's WESTEMS™ NB-3200 fatigue analysis benchmarking evaluations in Rockville, Maryland at the Westinghouse Twinbrook Office Facility. The locations evaluated in the benchmarking studies were the Unit 2 safety injection boron injection tank (BIT) nozzle [coupling] to cold leg weld and the Unit 2 pressurizer surge nozzle safe end-to-pipe weld. This audit was ultimately extended an additional day, February 8, 2011.

The objectives of the audit were:

1. To review the benchmark calculations performed by the applicant using the WESTEMS™ NB-3200 module and compare the results with traditional ASME Code, Section III analyses for the same locations.

2. To address user intervention that was used to modify program intermediate peak and valley stress results and the associated issues identified by NRO.

3. To address the use of the NB-3600 module at Salem and the associated issues identified by NRO regarding computation of moment stresses.

The benchmarking evaluation for each of the two locations included:

1. Comparison of calculated stresses.

2. Comparison of CUF values calculated by WESTEMS™ (NB-3200 Fatigue Usage Calculations) to that calculated from a traditional ASME Code Section III Analysis.

3. Comparison of CUF values from the WESTEMS™ "Online Monitoring" mode and the WESTEMS™ "Design CUF" mode.

Comparison of calculated stresses

During the audit, the applicant explained in detail how the calculations and input parameters were performed in the benchmarking evaluations. The applicant stated that, in order to benchmark the calculated stresses for both components, the nozzle transfer function stress response from the WESTEMS™ module for each component was compared to an equivalent ANSYS™ finite element analysis of the same input loadings. The staff noted that the results of WESTEMS™ transient time history stress responses for the two models are consistent with those in an independent finite element transient analysis, and that the transfer functions were acceptable to generate stress histories for use in WESTEMS™ NB-3200 fatigue analyses.

Comparison of CUF calculated by WESTEMS™ NB-3200 to that calculated from a traditional ASME Code Section III Analysis

As requested in RAI 4.3-07, the applicant developed a spreadsheet to reproduce the hand calculations using the traditional ASME Code Section III analysis using additional transient pairs representing up to 75 percent of the total CUF for the two locations. These results were provided to NRC in the January 7, 2011, letter and discussed at the audit.

During the audit on January 18-19, 2011, the staff reviewed the results of hand-calculated fatigue usage and the WESTEMS™ NB-3200 fatigue CUF calculation for the pressurizer surge nozzle location. The applicant stated that the controlling fatigue transient pair for this component was formed from stress states of a plant heatup transient with a maximum system ΔT (difference between the pressurizer temperature and the reactor coolant system temperature) of 320°F (heatup at 320°F ΔT) at the corresponding peak and valley times. The staff noted that the largest incremental usage factor from the stress states of a plant heatup at 320°F ΔT was calculated to be 0.0078 by the hand calculation and by WESTEMS™. The staff also reviewed the hand calculations performed by the applicant for this controlling fatigue transient pair and confirmed that they were performed consistent with the methodology defined in NB-3200.

The applicant used a Microsoft™ Excel spreadsheet to complete the calculations of the incremental fatigue usage for the remaining fatigue pairs representing at least 75 percent of the total CUF. The staff noted that the contribution of CUF of each transient pair between the hand calculation and WESTEMS™ evaluation are identical except for a 0.0001 difference in one transient pair. The staff noted that the calculated CUF values were 0.0855 and 0.0856 for the hand calculation and WESTEMS evaluation, respectively. The staff finds that the difference between these two calculated fatigue usages is insignificant because it can be attributed to rounding error.

For the BIT nozzle location, the staff reviewed the applicant's benchmarking evaluations, and confirmed that the applicant selected the controlling fatigue transient pair, which provided the largest incremental usage factor and had the largest significant alternating stress. The staff also confirmed in this benchmarking evaluation that the stress states of an inadvertent injection transient formed the controlling fatigue pair for this component. The staff noted that the largest incremental usage factor from the stress states of an inadvertent injection transient was calculated to be 0.1529 by the hand calculation and 0.1527 by WESTEMS™. The staff noted that the results indicated a negligibly small difference. The staff also reviewed the hand

calculation performed by the applicant for this controlling fatigue transient pair and confirmed that it was consistent with the methodology defined in NB-3200. The staff also noted this resultant fatigue usage from the single transient pair produced a CUF of 0.1527 is approximately 89 percent of the 60-Year Design CUF for this location as reported in LRA Table 4.3.7-2. The applicant stated that the safety injection BIT nozzle to cold leg weld had only a single fatigue transient pair contributing to over 75 percent of the CUF and, therefore, it was not required to generate additional calculations.

The staff noted that the applicant could not provide explicit documentation of the user intervention, i.e., the addition or deletion of peak and valley stresses during the CUF computation process for either the pressurizer surge nozzle location and for the BIT nozzle location. During the initial two days of the audit, the applicant re-ran the CUF calculation using the WESTEMS™ "Design CUF" module for the BIT nozzle evaluation, including the user intervention that was used (but not documented) in the benchmark evaluation. As a part of this re-run, justification of the removal of redundant peaks and valleys during the CUF re-calculation was described verbally by the applicant to the staff. The re-calculation and user intervention produced a CUF value that was close to, but did not exactly match, the original CUF value cited in the RAI response dated January 7, 2011.

For the pressurizer surge line nozzle calculation, the applicant could not complete re-analysis of the CUF calculation during the two days scheduled for the audit due to the complexity of the problem and the associated long computer run-time. In addition, the applicant was not able to show documentation of the user intervention that had been used in the benchmark evaluation for this component. As a result, the staff concluded that the applicant did not have sufficient documentation to justify the user intervention that had been performed for both the BIT nozzle and pressurizer surge line nozzle calculations, as was requested in the RAI. Thus, the staff could not conclude, with reasonable assurance, that the CUF calculations performed using WESTEMS™ for these two locations were acceptable and comparable to a traditional ASME Section III calculation.

The staff and the applicant mutually agreed that the applicant would revisit the calculations for the BIT nozzle and pressurizer surge line locations and continue the audit in early February to review revised results that were satisfactory to the NRC staff.

Comparison of CUF values from the WESTEMS™ "Online Monitoring" mode and the WESTEMS™ "Design CUF" mode

For the WESTEMS™ online monitoring method of computing CUF, the applicant described the functionality of the monitoring mode and addressed staff questions on the differences between the design and the online monitoring modes of WESTEMS™.

The staff noted that the CUF values calculated by the WESTEMS™ NB-3200 design analysis mode and the WESTEMS™ online monitoring mode were 0.1121 and 0.8061, respectively, for the controlling location of the Unit 2 pressurizer surge nozzle safe end to pipe weld. The staff also noted that the CUF values calculated by the WESTEMS™ NB-3200 design analysis mode and the WESTEMS™ online monitoring mode were 0.1717 and 0.7078, respectively, for the controlling location of the Unit 2 safety injection BIT nozzle [coupling] to cold leg weld. The staff

questioned the reasons for the large differences in the calculated CUF values between the design mode and online monitoring mode for each of the two benchmark locations. The applicant explained (both during the audit and in their January 7, 2011, letter) that the major contributing factors to the differences were as follows:

- The stress peaks and valleys in the online monitoring mode are grouped in 1.0 ksi intervals. Therefore, stresses are rounded up to the next 1.0 ksi in magnitude, which leads to increased CUF estimates.

- The stress values are assigned an appropriate sign (positive, "+" or negative, "-") for conservative combination by WESTEMS™, based on the sign of the controlling principal stress, resulting in conservative stress intensity ranges for the CUF calculations. The purpose of this approach is to maintain conservatism while minimizing computational requirements over time for the monitoring system. Due to the conservative stress intensity ranges and any associated elastic-plastic strain correction factors (K_e) resulting from this assumption, a conservative CUF is computed.

- The WESTEMS™ design analysis mode provides the user controls on the transient pairing and allows user intervention to remove redundant peaks and valleys that may be present as an artifact of the WESTEMS™ calculation process. Such intervention is not possible in the "online monitoring" mode. Inclusion of redundant peaks and valleys leads to a more conservative CUF in the online monitoring mode.

Based on the staff's review, the staff concluded that the WESTEMS™ online monitoring mode provides conservative results for the Salem application.

During the audit, the staff confirmed that the use of WESTEMS™ at Salem does not utilize the WESTEMS™ NB-3600 module, which the NRO staff identified as having a potential for user error in the moment stress calculation routine. Therefore, the error associated with the WESTEMS™ NB-3600 module is not applicable to Salem and therefore required no further investigation for the Salem plant-specific application of WESTEMS™.

Based on the foregoing, the staff was unable to complete all objectives of the audit during the two days scheduled for the audit. Therefore, it was agreed that the audit would be continued at a later time after the applicant could complete the WESTEMS™ re-run for the surge nozzle location, and revise the benchmark evaluation calculations for the two locations to include documentation of technical justification for the stress peak and valley user intervention used in the calculations.

Specifically, the Audit Questions Nos.1-5 that resulted from the January audit were:

1. For the WESTEMS™ "Design CUF" module EAF analysis of the BIT nozzle and pressurizer surge line nozzle, provide written explanation and technical justification of any user intervention used in the evaluations.

2. Provide written explanation and technical justification of any user intervention that was applied in the WESTEMS™ "Design CUF" module EAF analyses performed for the remaining monitored locations at Salem (surge line hot leg nozzle, residual heat removal/accumulator nozzle, and charging line nozzle) will be completed at least two years prior to the period of extended operation.

3. For any future use of the WESTEMS™ "Design CUF" module at Salem, written explanation and technical justification of any user intervention in the calculation shall be documented in an auditable and retrievable form.

4. Provide a license renewal Commitment that the WESTEMS™ "Design CUF" NB-3600 module will not be implemented or used in the future at Salem without NRC staff review and approval.

5. Provide a description of the peak and valley selection process used by WESTEMS™ and how that process aligns with the ASME Code Section III methodology.

In a letter dated January 31, 2011 (ADAMS Accession No. ML110340050), the applicant provided a written response to the audit questions. Regarding Audit Question No. 1, the applicant stated that it had completed the requested activities and the complete results would be made available to the staff for audit. In addition, three new commitments were made that were amended to the LRA table of license renewal commitments to address Audit Questions Nos. 2, 3, and 4. For Audit Question No. 5, the applicant attached a technical journal article that describes the WESTEMS™ method of selecting the peak and valley stress points for use in a NB-3200 CUF calculation. The staff found the responses in the January 31, 2011, letter acceptable to resolve the concerns identified in the aforementioned Audit Questions. After receipt and review of the applicant's letter, the staff continued the audit at the Westinghouse Twinbrook Office Facility in Rockville, Maryland, on February 8, 2011.

During this portion of the audit, the applicant provided revised documentation of the WESTEMS™ NB-3200 fatigue calculations for the Unit 2 pressurizer surge nozzle safe end to pipe weld and the Unit 2 safety injection BIT nozzle coupling to cold leg weld. The revised documentation identified the peak and valley times selected by WESTEMS™, as well as the peak and valley times selected for removal by the analyst. The documentation also included technical justification for each peak and valley removed by the analyst. Graphical plots of the WESTEMS™ and the analysts' peak and valley sets simplified evaluation of the user intervention in each calculation.

The staff reviewed the stress peak and valley points removed by the analyst and the written technical justification provided for each removed point. For the pressurizer surge nozzle location, the CUF values were the same for the original calculation and the revised calculation with no user intervention, indicating that no user intervention occurred for this calculation. For the BIT nozzle location, the CUF was lower for the original calculation with user intervention than the calculation without user intervention in selecting peaks and valleys. The staff reviewed the user intervention and the technical justification provided for each by the analyst. For two of the points removed by the analyst, the staff agreed with the removal of the points but did not agree with the technical justification provided by the applicant. The staff requested, as an

applicant action item, that the justification for these two points be revised in the documentation. The staff identified no other concerns with either the user intervention or the documented technical justifications.

Based on the discussions during the audit, the staff identified that, for the Salem pressurizer sure nozzle safe end to pipe weld location, a different version of the WESTEMS™ stress model was used for the fatigue analyses than the model that will be used for on-line fatigue monitoring. However, in its response to RAI 4.3-7, Bullet No. 5 dated December 21, 2010, the applicant stated that the stress models used in the fatigue analyses are the same as the stress models employed in the WESTEMS™ on-line monitoring module. The staff requested, in Audit Question No. 6, that the applicant clarify the contradiction.

The applicant stated, in the audit, that manual transient counting would continue to be used at Salem. The applicant also clarified and provided the date for the benchmarking calculation records, for documentation in this audit report. As a result of the audit, one applicant action item and Audit Question No. 6 were identified at the conclusion of the audit.

The action item is:

- Revise the BIT nozzle benchmark evaluation to change the justification for removal of two of the peak and valley points from the stress history used to compute CUF.

By letter dated February 24, 2011, the applicant provided the following basis for the analyst removal of the peak and valley times from the data.

> - One peak was removed because it represented the same Total Stress as a prior peak and, since the Primary plus Secondary stress in this evaluation does not result in any K_e (simplified elastic plastic penalty factor applied to alternating stress when the Primary plus Secondary Stress Intensity Range limit is exceeded) values greater than 1.0, it is redundant with the previous peak, and not required.
>
> -Two of the peaks in the transient are redundant peaks of the initial state captured by a peak time, since the transient returns to the same stress state as it started, and this stress state is redundant to another transient that begins at a similar plant no load condition.

The applicant also stated that the analyst added one peak that was not selected by WESTEMS™ at the initial time of the transient for additional conservatism in the fatigue evaluation. The staff found that the addition of any stress peaks and valleys is acceptable because this practice will yield a more conservative CUF value. The applicant stated that the BIT nozzle calculation has been updated to properly capture the basis for the user intervention activities. With the submittal of the information by a letter dated February 24, 2011, the staff verified that the applicant has adequate documentation and written technical justification for removal of stress peaks and valleys by the analyst in determination of the CUF for the two locations. The staff identified no concerns with the revised documentation.

Audit Question No.6 is:

- Clarify the WESTEMS™ stress models used in the currently governing fatigue analyses and the WESTEMS™ models used for the online fatigue monitoring applications

In its response dated February 24, 2011, the applicant stated that the stress model used in the existing EAF analyses are the same as the stress models employed in WESTEMS™ online monitoring tool, with the exception of the pressurizer surge nozzle safe end to pipe weld location and the surge line hot leg nozzle to pipe weld location. The applicant stated that the stress models used in the existing EAF analyses for these two locations are specific to each Salem unit due to slight physical differences of the pipe wall thickness of the 14-in surge line, whereas the WESTEMS™ online monitoring models are the same for both units and they are conservative and bounding for each of these two locations. The staff found the response acceptable to resolve the concerns identified in Audit Question No. 6.

Summary

The staff met its objectives during the three-day audit. Specifically, the staff concluded that:

- The audit provided the staff reasonable assurance that Salem's use of the WESTEMS™ NB-3200 module provides calculations of stresses and cumulative usage factors that are consistent with a traditional ASME Code Section III analysis.

- The audit provided the staff reasonable assurance that the analyst judgment in choosing to delete or add stress peak and valley times in these calculations is reasonable, and can be appropriately justified and documented. The staff concluded that justifications of any user intervention should be documented when using computer software, such as WESTEMS™, to perform calculations.

- The WESTEMS™ NB-3600 module is not currently used in the Salem application of WESTEMS™. Any future use of the NB-3600 module requires demonstration that it performs calculations consistent with ASME Code Section III, Subsection NB-3600.

The NRC staff concluded that the objectives of the audit have been met and the audit was closed.

Supporting References for Salem WESTEMS™ NB-3200 Fatigue Analysis Benchmark Calculations

Number	Title	Proprietary
1	Westinghouse WCAP-16994-P, "Environmental Fatigue Evaluation for Salem Unit 1", Rev. 0, January 2009	Yes
2	Westinghouse WCAP-16995-P, "Environmental Fatigue Evaluation for Salem Unit 2", Rev. 0, January 2009	Yes
3	Westinghouse Calculation Note CN-PAFM-10-98, "Salem Pressurizer Surge Nozzle WESTEMS™ Fatigue Analysis Benchmark", Rev. 0, January 2011	Yes
4	Westinghouse Calculation Note CN-PAFM-10-101, "Salem Boron Injection Tank (BIT) Nozzle WESTEMS™ Fatigue Analysis Benchmark", Rev. 0, January 2011	Yes
5	Westinghouse Calculation Note CN-PAFM-08-81, "Salem Units 1 and 2 Pressurizer Surge Nozzle Environmental Fatigue Evaluation", Rev. 0, February 2009	Yes
6	Westinghouse Calculation Note CN-PAFM-08-74, "Salem Units 1 and 2: Transfer Function Database Development for a Pressurizer Lower Head", Rev. 0, February 2009	Yes
7	Westinghouse Calculation Note CN-PAFM-08-50, "Salem Unit 1 WESTEMS™ Stress Models", Rev. 0, February 2009	Yes
8	Westinghouse Calculation Note CN-PAFM-08-82, "Salem Unit 2 WESTEMS™ Stress Models", Rev. 0, February 2009	Yes
9	Westinghouse Calculation Note CN-PAFM-08-68, "Salem Units 1 and 2 Boron Injection Tank Cold Leg Nozzle Environmental Fatigue Evaluations", Rev. 0, February 2009	Yes
10	Westinghouse Calculation Note CN-PAFM-08-84, "Salem Units 1 and 2: Transfer Function Database Development for a Boron Injection Nozzle", Rev. 0, February 2009	Yes
11	Westinghouse Calculation Note CN-PAFM-08-112, "Salem WESTEMS™ Projects", Rev. 0, June 2009	Yes
12	Westinghouse Letter No. LTR-PAFM-09-43, "Technical Manual for Salem Units 1 and 2 WESTEMS™", Rev. 0, May 2009	Yes
13	Westinghouse WCAP-16963-P, "Salem Units 1 & 2 Transient and Fatigue Cycle Monitoring Program Transient History Evaluation", Rev. 2, September 2009	Yes
14	Westinghouse WCAP-12914, "Structural Evaluation of Salem Nuclear Plant Units 1 and 2 Pressurizer Surge Lines, Considering the Effects of Thermal Stratification", Rev. 1, June 1992	Yes
15	Westinghouse WCAP-16194, " Evaluation of Pressurizer Insurge/Outsurge Transients for Salem Units 1 & 2", Rev. 0, December 2003	Yes
16	Westinghouse Calculation Note CN-PAFM-10-98, "Salem Pressurizer Surge Nozzle WESTEMS™ Fatigue Analysis Benchmark", Rev. 1., January 2011	Yes

17	Westinghouse Calculation Note CN-PAFM-08-81, "Salem Units 1 and 2 Pressurizer Surge Nozzle Environmental Fatigue Evaluation", Rev. 1, January 2011	Yes
18	Westinghouse Calculation Note CN-PAFM-08-68, "Salem Units 1 and 2 Boron Injection Tank Cold Leg Nozzle Environmental Fatigue Evaluation", Rev. 1, January 2011	Yes

March 30, 2011

Mr. Thomas Joyce
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If you have any questions, please contact me by telephone at 301-415-2981 or by e-mail at Bennett.Brady@nrc.gov.

Sincerely,

/RA/

Bennett M. Brady, Senior Project Manager
Projects Branch 1
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Office of Nuclear Reactor Regulation

Docket Nos. 50-272 and 50-311
Enclosure:
As stated
cc w/encl: Distribution via listserv
ADAMS Accession Number: ML110871243

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Letter to T. Joyce from B. Brady, dated March 30, 2011

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