



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

November 22, 2010

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

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR SALEM NUCLEAR
GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION
FOR USE OF WESTEMS PROGRAM IN METAL FATIGUE ANALYSIS
(TAC NO. ME1834 AND ME1836)

Dear Mr. Joyce:

By letter dated August 18, 2009, Public Service Enterprise Group Nuclear, LLC, submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54 for renewal of Operating License Nos. DPR-70 and DPR-75 for Salem Nuclear Generating Station, Units 1 and 2, respectively. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staff's request for additional information is included in the Enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were provided to John Hufnagel and other members of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-2981 or by e-mail at bennett.brady@nrc.gov.

Sincerely,

A handwritten signature in cursive script that reads "Bennett M. Brady".

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

Docket Nos. 50-272 and 50-311

Enclosure:
As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION FOR SALEM NUCLEAR GENERATING
STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION FOR METAL FATIGUE
ANALYSES (TAC NOS. ME1834 AND ME 1836)

RAI 4.3-07:

Background:

Section 4.3.1 of the Salem Nuclear Generating Station, Units 1 and 2, (Salem) license renewal application (LRA) mentions 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 credits the WESTEMS® code for evaluation of fatigue for the pressurizer and surge line locations. Sections A.3.1.1 and B.3.1.1 of the Salem LRA identify that WESTEMS® computes cumulative usage factors for select locations under a discussion of the Metal Fatigue of Reactor Pressure Boundary Program. Section A.4.3.4.2 of the Salem LRA mentions that WESTEMS® was used to evaluate pressurizer insurge/outsurge transients and surge line stratification on the pressurizer.

Issue:

The staff is not clear on the specific use of WESTEMS® at Salem. In addition, the staff has identified concerns regarding the results determined by the WESTEMS® program as a part of the ASME Code fatigue evaluation process. For example, Westinghouse's response to NRC questions regarding the AP1000 Technical Report (see ADAMS Accession No. ML102300072, dated August 13, 2010), describes the ability of users to modify intermediate data (peak and valley stresses/times) used in the analyses. In addition, a response provided on August 20, 2010 (ADAMS Accession No. ML102350440) describes different approaches for summation of moment stress terms. These items can have significant impacts on calculated fatigue cumulative usage factor (CUF). The potential impact for modifications such as these formed the basis for the staff's conclusions in Regulatory Issue Summary (RIS) 2008-30, "Fatigue Analysis of Nuclear Power Plant Components," dated December 16, 2008, where it was noted that simplification of the analysis requires a great deal of judgment by the analyst to ensure that the simplification still provides a conservative result. The staff recognizes that WESTEMS® has been developed under a formal Quality Assurance Program with supporting Technical Bases; however, it is difficult to ascertain the accuracy or conservatism of a location-specific application of WESTEMS® given that a variety of analyst judgments may still be applied to the software outputs by the user on a case-specific basis.

Request:

The staff requests that the licensee provide clarification on the use of WESTEMS® at Salem, as follows:

- Please clarify how WESTEMS® is used at each Salem unit, especially with regard to the Metal Fatigue of Reactor Pressure Boundary Program. Specifically, what transients and locations are monitored by WESTEMS®, what WESTEMS® stress modules are used, and are the stress models used at each Salem unit identical?

ENCLOSURE

- Please describe whether the issues raised in ADAMS Accession Nos. ML102300072 dated August 13, 2010, and ML102350440 dated August 20, 2010, are applicable to each Salem WESTEMS® monitored location. If not, please describe the reasons those issues are not applicable.
- For each location monitored by WESTEMS®, please describe the historical fatigue analyses of record starting from the original ASME Code, Section III design basis fatigue analysis of record. For each follow-on analysis, please describe the reason for the re-analysis, whether the evaluation was referenced in the current licensing basis (CLB), and whether an updated ASME Code, Section III Design Specification and Code Reconciliation were performed in accordance with ASME Code, Section III requirements. Please describe how these analyses are reflected in the results tabulated in Tables 4.3.1-1, 4.3.4-1, 4.3.7-1 and 4.3.7-2.
- Please describe the environmentally-assisted fatigue (EAF) analyses performed for each monitored location, if any.
- Please describe the differences between the stress models used in WESTEMS® and the stress models used in the currently governing fatigue analysis of record and the EAF analysis of record (if any) for each monitored location.
- Please describe how the transient counting results tabulated in Tables 4.3.1-3 and 4.3.1-4 are incorporated into the fatigue results shown in Tables 4.3.7-1 and 4.3.7-2.

In addition, the staff requests benchmarking evaluations for two of the limiting locations monitored in the Salem WESTEMS® application using the same input parameters and assumptions as those used in traditional, ASME Code, Section III CUF calculations for each location. If such calculations do not exist for either of the selected locations, they should be developed using techniques that allow independent comparison with the WESTEMS® results. The intent of this benchmarking evaluation is to confirm that the results of the WESTEMS® models, including any analyst judgments, are acceptable and comparable to traditional ASME Code, Section III analyses for the selected monitored locations.

For the pressurizer surge nozzle and the 1.5" BIT line locations that Salem has indicated are monitored in WESTEMS®, provide a summary of the benchmarking evaluation that includes the following information:

- A comparison of the calculated stresses and CUF using WESTEMS® to the same results from the ASME Code, Section III CUF calculations for all transient pairs representing at least 75 percent of the total CUF from the ASME Code, Section III CUF calculations. One comparison for each unique stress model used in WESTEMS® for each selected location is sufficient
- Describe the differences in the results between the WESTEMS® evaluation and the ASME Code, Section III CUF calculations for each selected location, and provide a justification for acceptability of the differences.

RAI 4.3-08

Background:

By letter dated July 13, 2010, the applicant responded to RAI 4.3-05. In its response to request 1, the applicant provided a discussion on the methodology used to determine the locations that required environmentally assisted fatigue analyses, consistent with NUREG/CR-6260. In its response to request 3, the applicant stated that the correction temperature, T , and transformed oxygen content parameter, O^* , were set to values of zero, therefore, the F_{en} is maximized when these two terms are set equal to zero. The applicant also stated that its primary water chemistry specification for dissolved oxygen during normal operations is less than 0.005 ppm. Furthermore, a review of the Units 1 and 2 reactor coolant system (RCS) quarterly dissolved oxygen data indicated that the dissolved oxygen content was less than 0.05 ppm since 2000, except for short periods of time during start-up and shutdown conditions.

Issue:

GALL AMP X.M1 states the impact of the reactor coolant environment on a sample of critical components should include the locations identified in NUREG/CR-6260, as a minimum, or propose alternatives based on plant configuration. The staff noted that the applicant's plant-specific configuration may contain locations that should be analyzed for the effects of reactor coolant environment, other than those generic locations identified in NUREG/CR-6260. The staff noted this may include locations, for example, (1) that are limiting or bounding for a particular plant-specific configuration or (2) that have calculated CUF values that are greater than those for the locations identified in NUREG/CR-6260.

The staff noted that the statement " F_{en} is maximized when these two terms are set equal to zero" is not accurate because the last term in the F_{en} expression can be less than zero (thus subtracting a negative value and providing a higher value of F_{en} and the use of T equal to zero in the second term of the F_{en} expression is not technically correct). The staff also noted that setting the transformed oxygen content parameter, O^* , to a value of zero is based on the assumption that the applicant has always operated with dissolved oxygen less than 0.05 ppm since initial plant start-up. However, the applicant's response only confirmed the dissolved oxygen content for the time period since the year 2000. The staff also noted that it is not clear how much time elapses during the short periods of time during start-up and shutdown conditions when dissolved oxygen content is greater than 0.05 ppm.

Request:

1. Confirm and justify that the locations selected for environmentally assisted fatigue analyses, consistent with NUREG/CR-6260, are the most limiting and bounding for the plant. If these locations are not the most limiting and bounding for the plant, clarify the locations that require an environmentally assisted fatigue analysis and the actions that will be taken for these additional locations. If the most limiting location consists of nickel alloy, NUREG/CR-6909 methodology for nickel alloy will be used.
2. Justify the statement " F_{en} is maximized when these two terms are set equal to zero" made in response to RAI 4.3-05.
3. Clarify whether dissolved oxygen content has always been maintained less than 0.05 ppm since initial plant start-up, and provide justification to support this clarification. If not, justify why the F_{en} values provided in LRA Tables 4.3.7-1 and 4.3.7-2 do not account for these

periods of time in which dissolved oxygen content was not maintained less than 0.05 ppm, including the "short periods of time during start-up and shutdown conditions."

November 22, 2010

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
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/RA/
Bennett M. Brady, 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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ADAMS Accession No.: ML102810194

OFFICE	LA:DLR	PM:DLR:RPB1	BC:DLR:RPB1	PM:DLR:RPB1
NAME	IKing	B. Brady	B. Pham (BBrady for)	B. Brady
DATE	10/13/10	11/22/10	11/22/10	11/22/10

OFFICIAL RECORD COPY

Letter to T. Joyce from B. Brady dated November 22, 1010.

**SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR SALEM NUCLEAR
 GENERATING STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION
 FOR BURIED PIPING INSPECTION PROGRAM
 (TAC NOS. ME1834 AND ME1836)**

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