

June 26, 2002

Mr. Alan P. Nelson  
Nuclear Energy Institute  
1776 I Street, NW., Suite 400  
Washington, DC 20006-3708

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING EPRI TECHNICAL REPORT, "GUIDELINES FOR ADDRESSING FATIGUE ENVIRONMENTAL EFFECTS IN A LICENSE RENEWAL APPLICATION (MRP-47)"

Dear Mr. Nelson:

By letter dated July 31, 2001, Nuclear Energy Institute (NEI) submitted for the Nuclear Regulatory Commission's (NRC's) review of EPRI Technical Report, Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application (MRP-47)," Draft Revision G, dated June 5, 2001. The staff has identified, in the enclosure, areas in the technical report for which additional information is needed to complete its review.

Please provide by letter or electronic mail, your responses to the enclosed requests for additional information (RAIs) within sixty (60) days. If you have any questions concerning RAIs, please contact S. K. Mitra, License Renewal Project Manager, at (301)415-2783.

Sincerely,

/RA by JTappert for/

Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION  
CONCERNING  
EPRI TECHNICAL REPORT  
GUIDELINES FOR ADDRESSING FATIGUE  
ENVIRONMENTAL EFFECTS IN A LICENSE  
RENEWAL APPLICATION (MRP-47)

1. Section 3.1 of the report describes the attributes of a fatigue management plan. The program indicates that the procedure contained in ASME Section XI, Appendix L, or an NRC-approved methodology is an acceptable alternative to meeting the ASME Section III Code-allowable limit. This statement implies staff endorsement of the Appendix L procedure. The staff has not endorsed the ASME Section XI, Appendix L procedure as an alternative to meeting the ASME Section III Code-allowable limit. The section should be revised to clearly indicate that the use of the ASME Section XI, Appendix L procedure will also require NRC review and approval.
2. Section 3.2.2 of the report describes Method 1 for evaluating environmental effects. This method allows the license renewal applicant to demonstrate that the design basis loadings contain sufficient conservatism to bound environmental effects. The report indicates that the assessment can be based on the results of previous industry studies. On the basis of the staff review of later license renewal applications, the EPRI report should provide additional guidance on the use of previous industry studies. For example, the report references the response to a request for additional information related to the review of a previously submitted License Renewal Application in Appendix D of the report. The License Renewal Application response relied, in part, on monitored data from another facility. The staff did not accept the use of monitored data from another plant without a demonstration that the monitored data was directly applicable to the plant. Therefore, the reference in Appendix D to the response to a staff request for additional information should be eliminated from the report since it did not provide an acceptable method to resolve the environmental fatigue issue.
3. Section 3.2.3 of the report describes Method 2 for evaluating environmental effects. This method allows for an update of the fatigue calculation using environmental factors. This section refers to the PVRC recommendations in Appendix B for calculating the environmental factors. The staff has not endorsed the PVRC procedure for calculating the environmental factors. The report should cite the correlations contained in NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," and NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels" for the calculation of the environmental factors. The strain amplitude thresholds provided in the PVRC procedure are acceptable to the staff.
4. Section 3.2.3 presents a formula for calculating an effective environmental factor using strain rate averaging that is different from the method presented in EPRI report TR-107515, "Evaluation of Thermal Fatigue Effects on Systems Requiring Aging Management Review for License Renewal for the Calvert Cliffs Nuclear Plant." Tests have been performed to study the effects varying strain rates have on fatigue life in LWR

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environments. The results of these tests are reported in a paper, "Effects of Strain Rate Fluctuation and Strain Holding on Fatigue Life Reduction for LWR Structural Steels in Simulated LWR Water," PVP-Volume 419 presented at the 2001 PVP conference. Compare the calculated effective environmental factor obtained using the formula provided in Section 3.2.3 of the EPRI report with the experimental results presented in the referenced paper for the S-F-F tests and discuss the results of the comparison.

5. Section 3.2.3 of the report provides for the use of a Z-factor to adjust environmental factors obtained from the fatigue test data correlations. The technical justification for the Z-factor is contained in Appendix C of the report. The technical justification consists of an evaluation of component tests to assess the influence of size and surface finish effects and a statistical evaluation of the test data. Provide the following additional information regarding these evaluations:
  - a. The evaluation of component tests did not include the data from the Southwest Research Institute tests on vessels that is shown on page 4 of NUREG/CR-6583. This test data does not appear to support conclusion regarding the maximum effect of size and surface finish on fatigue life. Explain why this data was omitted from the evaluation. Provide an assessment of the Southwest Research Institute using the same method used to assess the KWU tube tests and the General Electric pipe tests.
  - b. The component test data shown in Figures C-2 and C-3 show significant data scatter. Provide the mean and standard deviation of each population set. Population sets should be defined using the same procedures applied to the evaluation of the specimen test data. Discuss the statistical significance of the results.
  - c. The statistical evaluations of the test data scatter do not appear to include all the test data developed by Argonne National Laboratory (ANL). Indicate whether the statistical evaluations of the test data scatter have included all relevant test data, including test data developed by ANL. Explain the basis for omitting any of the relevant test data from the statistical evaluations.
  - d. The statistical evaluations are performed on adjusted test data. The test data is first adjusted using environmental factors derived from the ANL correlations. The ANL correlations were derived from a statistical model fitted to the test data as described in NUREG/CR-6583 and NUREG/CR-5704. The NUREG reports contain a discussion regarding the development of the statistical models. The Appendix C statistical evaluation then eliminates certain "outliers" from the data scatter assessment. If the ANL statistical correlations are applicable to these "outlier" data points, then discuss the basis for eliminating these "outliers" from the data scatter evaluation.
  - e. Appendix C defines the data scatter as the ratio of the sum of the mean plus three times the standard deviation, to the mean. Provide the technical basis for this definition of data scatter. Indicate the probability of fatigue crack initiation associated with this definition of data scatter.

Project No. 690

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