



NUCLEAR ENERGY INSTITUTE

**Alex Marion**  
DIRECTOR, ENGINEERING  
NUCLEAR GENERATION DIVISION

September 17, 2001

Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** Steam Generator Degradation Specific Management Database,  
Addendum 4

**PROJECT NUMBER: 689**

Enclosure 1 to this letter transmits Addendum 4 to the Steam Generator Degradation Specific Management Database. This Addendum extends the database for outside diameter stress corrosion cracking at tube support plates previously reported in Addendum 3 of the report. Pulled tube data from one plant with 3/4-inch tubes and one plant with 7/8-inch tubes are added to the database. The data is evaluated against the EPRI data exclusion criteria and indications not excluded on this basis are included in the ARC database and correlations.

The revised databases are used to update the ARC correlations for burst pressure, probability of leakage and SLB leak rate as a function of bobbin coil voltage for both the 3/4 and 7/8 inch diameter tubing. The database changes incorporated in Addendum 4 did not result in any significant, non-conservative shift in the correlations.

No new test results have been obtained for the forces required for axial tensile tearing of cellular indications, and the correlations of Addendum 2 remain applicable for axial tensile tearing.

An update to the probability of detection as a function of bobbin voltage reported in Addendum 3 is provided in this addendum. Very little change is found in the updated POD, which includes twenty-nine inspections compared to twenty-five inspections reported in Addendum 3.

A new EPRI data exclusion Criterion 2c for evaluating data sets against the domestic pulled tube data relative to the potential for leakage at high voltages (above 4 to 5 volts) is presented in this Addendum for NRC review and approval. The currently approved data exclusion criterion is documented in Addendum 2.

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extra 2's  
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P. Wen*



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Upon NRC approval, the correlations based on applying Criterion 2c, as given in Section 6 of Addendum 4, would be applied for ARC analyses. Completion of the NRC review for Criterion 2c is requested by late November 2001 in order to include use of the updated correlations in the 90-day reports for fall outages.

The NRC approved industry program defining tube pull requirements in support of the voltage based ARC that replaces the NRC GL 95-05 tube removal requirements is documented in Section 8 of Addendum 4.

The proprietary information in Addendum 4 is supported by the signed affidavits in Enclosure 2. The affidavits set forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity, the consideration listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations. Accordingly, we respectfully request that the information, which is proprietary to EPRI, be withheld from public disclosure in accordance with 10 CFR 2.790. A non-proprietary version of these guidelines is provided in Enclosure 3.

As has been the past practice, we believe any NRC staff review of the enclosed information is exempt from the fee recovery provision contained in 10 CFR Part 170. This submittal provides information that might be helpful to NRC staff when evaluating licensee submittals provided in response to Generic Letter 95-05. Such reviews are exempted under §170.21, Schedule of Facility Fees. Footnote 4 to the Special Projects provision of §170.21 states, "Fees will not be assessed for requests/reports submitted to the NRC...as means of exchanging information between industry organizations and the NRC for the purpose of supporting generic regulatory improvements or efforts."

We would be pleased to meet with you or provide any support necessary to expedite acceptance of the outstanding issues regarding the database. If you have any questions regarding the technical content of this letter, please contact Dr. Govinda Srikantiah of EPRI at (650) 855-2109.

Sincerely,



Alex Marion

JHR/maa  
Enclosures

c: Mr. Ted Sullivan, U. S. Nuclear Regulatory Commission  
Mr. Kenneth Karwoski, U. S. Nuclear Regulatory Commission

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Mr. Davis Goetcheus, TVA  
Ms. Helen Cothron, TVA  
Mr. Greg Kammerdeiner, Duquesne Light  
Mr. Richard Pearson, NSP  
Mr. Rick Mullins, Southern Co  
Mr. Ron Baker, South Texas  
Mr. Bob Exner, PG&E  
Mr. John Arhar, PG&E  
Mr. Steve Swilley, TU  
Mr. John Jensen, AEP  
Mr. Tim Olsen, WPS  
Mr. Tom Pitterle, Westinghouse  
Mr. Bob Keating, Westinghouse  
Dr. Govinda Srikantiah, EPRI  
NEI Steam Generator Program Task Force



### Certificate of Conformance

Date: 9-27-01

Customer: U.S. NUCLEAR REGULATORY COMMISSION

Reference: N/A

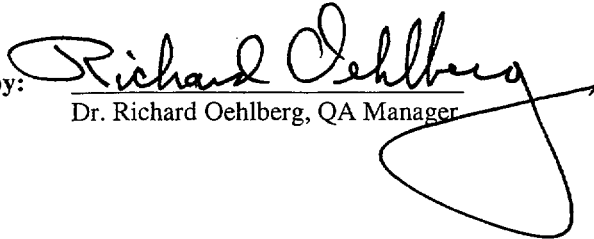
Purchase Order or Agreement Number: N/A

  
Responsible for Delivery

**Product(s):** Orderable ID# 1006255:  
**Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at  
Tube Support Plates Data base for Alternate Repair Limits, Update 2001,  
NP-7480-L, Addendum 4, Interim Report, August 2001**  
(prepared by Westinghouse Electric Company, LLC)

The above item(s) were procured or developed in compliance with the Quality Assurance requirements of the EPRI Quality Program. The current version of the EPRI Quality Program Manual is Revision 4, dated July 19, 2001. Past and current revisions of EPRI's Quality Program are in compliance with 10CFR50 Appendix B.

Certified by:

  
Dr. Richard Oehlberg, QA Manager

28- August - 2001

Date

Form 1.2.1  
Revision 2  
11/07/00

**CORPORATE HEADQUARTERS**

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**SG Degradation Specific Management Database  
Addendum 4**

**Proprietary Affidavits**

AFFIDAVIT

RE: Request for Withholding of Proprietary Information Entitled,  
Request for Withholding of Proprietary Information Entitled, "Steam  
Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube  
Support Plates Database", Volume 4, TR- 1006255

I, Kevin Chu, being duly sworn, depose and state as follows:

I am an Attorney at the Electric Power Research Institute, Inc. ("EPRI"), and I specifically have been delegated responsibility for the Information listed above that is sought under this affidavit to be withheld (the "Information") and authorized to apply for its withholding on behalf of EPRI. This affidavit is submitted to the Nuclear Regulatory Commission ("NRC") pursuant to 10 CFR 2.790 (a)(4) based on the fact that the Information consists of trade secrets of EPRI and that the NRC will receive the Information from EPRI under privilege and in confidence.

The basis for withholding such Information from the public is set forth below:

(1) The Information has been held in confidence by EPRI, its owner. All those accepting copies of the Information must agree to preserve the confidentiality of the Information.

(2) The Information is a type customarily held in confidence by EPRI and there is a rational basis therefor. The Information is a type that EPRI holds in confidence by means of a trade secret(s). This information is held in confidence by EPRI because disclosing it would prevent EPRI from licensing the Information and collecting royalties. Such royalty fees allow EPRI to recover its investment. If consultants and/or other businesses providing services in the electric/nuclear power industry were able to publicly obtain the Information, they would be able to use it commercially for profit and avoid spending the large amount of money that EPRI was required to spend in preparation of the Information. The rational basis that EPRI has for classifying the Information as a trade secret(s) is justified by the Uniform Trade Secrets Act, which California adopted in 1984 and which has been adopted by over twenty states. The Uniform Trade Secrets Act defines a "trade secret" as follows:

"Trade secret" means information, including a formula, pattern, compilation, program, device, method, technique, or process, that:

(i) Derives independent economic value, actual or potential, from not being generally known to the public or to other persons who can obtain economic value from its disclosure or use; and

(ii) Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.

(3) The Information will be transmitted to the NRC in confidence.

(4) The Information is not available in public sources. EPRI developed the Information only after making a determination that the Information was not available from public sources. Developing the Information required a large expenditure of dollars and EPRI employees' time. The money spent, plus the value of EPRI's staff time in preparing the Information, shows that the Information is highly valuable to EPRI. Finally, the Information was developed only after a long period of effort of at least several months.

(5) A public disclosure of the Information would be highly likely to cause substantial harm to EPRI's competitive position and the ability of EPRI to license the Information both domestically and internationally. The Information can only be acquired and/or duplicated by others using an equivalent investment of time and effort.

I have read the foregoing, and the matters stated therein are true and correct to the best of my knowledge, information and belief. I make this affidavit under penalty of perjury under the laws of the United States of America and under the laws of the State of California.

Executed at 3412 Hillview Avenue, Palo Alto, California being the premises and place of business of the Electric Power Research Institute, Inc.

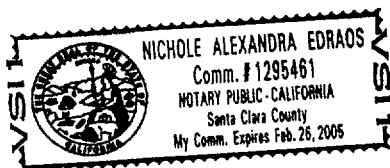


Kevin Chu

Subscribed and sworn before me this day: August 28, 2001



Nichole Alexandra Edraos, Notary Public



**SG Degradation Specific Management Database  
Addendum 4**

**Non-Proprietary Version**



Steam Generator Tubing Outside Diameter  
Stress Corrosion Cracking at Tube Support  
Plates Data base for Alternate Repair  
Limits, Update 2001



*Technical Report*

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# **Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube Support Plates Database for Alternate Repair Limits, Update 2001**

**1006255**

Interim Report, August 2001

EPRI Project Manager  
G. Srikantiah

## CITATIONS

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This report was prepared by

Westinghouse Electric Company, LLC  
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This report describes research sponsored by EPRI.

The report is a corporate document that should be cited in the literature in the following manner:

*Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube Support Plates Database for Alternate Repair Limits. Update 2001.* EPRI, Palo Alto, CA: 2001. 1006255.

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ORGANIZATION(S) THAT PREPARED THIS DOCUMENT

**Westinghouse Electric Company, LLC Nuclear Services Division**

This report was prepared in accordance with the applicable provisions of 10CFR50 Appendix B.

## **ORDERING INFORMATION**

Requests for copies of this report should be directed to EPRI Customer Fulfillment, 1355 Willow Way, Suite 278, Concord, CA 94520, (800) 313-3774, press 2.

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# REPORT SUMMARY

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This report updates and extends the database on outside diameter stress corrosion cracking at tube support plates previously reported in addendum 3 of EPRI report NP-7480-L. It covers new data on 3/4 inch and 7/8-inch tubing and updates correlations for burst pressure and probability of leak.

## Background

The database required to support alternate repair limits for outside diameter stress corrosion cracking (ODSCC) of steam generator tubes at support plate intersections was originally developed from pulled tube examination results and tests of specimens produced in model boilers. Leak rate and burst pressure correlations with bobbin coil voltage were developed from overall data. Database extensions and correlations were reported in Addenda 1, 2, and 3 of EPRI report NP-7480-L as additional tube pull data became available.

## Objectives

To extend the ODSCC database previously reported in Addendum 3 with pulled tube data from one plant for 3/4-inch tubing and from a second plant with 7/8 inch tubing; to update correlations for burst pressure and probability of leak.

## Approach

Researchers evaluated pulled tube data from one plant with 3/4 inch tubes and one plant with 7/8 tubes against EPRI data exclusion criteria and added those data not excluded to the ODSCC database. Using the modified database, they updated correlations for burst pressure, probability of leakage, and steam-line break leak rate. They evaluated model boiler, Belgian, and French datasets against the domestic pulled tube data to develop a data exclusion criterion for evaluating these datasets against the domestic pulled tube data relative to the potential for leakage at high voltages.

## Results

Researchers performed tests on pulled tube specimens and obtained burst pressure and leakage rate data. They evaluated the data against the EPRI exclusion criteria to select data that can be included for updating the database. Using the results from 7 additional inspection evaluations, they also updated the pulled tube database for field no destruction detected (NDD) indications and voltage-dependent probability of prior cycle detection (POPCD)

They developed a new data exclusion criterion to compare other data sets against domestic pulled tube data. Based upon the criterion, the French data could be excluded from the alternate plugging criteria (ARC) correlations because the data show a much lower potential for leakage at high voltages (above 5 volts) than the domestic pulled tube data. ARC correlations with and

without the French data are given in the report. Also included in the report is a documentation of the industry recommended program for tube pulls in support of the voltage-based ARC as approved by the NRC.

### **EPRI Perspective**

Degradation of tubes at support plate intersections is one of the dominant degradation mechanisms in PWR steam generators. Alternate repair criteria were developed based upon eddy current data to replace the more restrictive criteria based on percent through-wall penetration of the degradation (EPRI TR-100407). The ODSCC database developed to support the alternate repair criteria is updated as more pulled tube data became available from the utilities using the alternate criteria. The current report describes database update #4 and revised correlations based on the recent pulled tube data.

### **Keywords**

Stress corrosion cracking

PWRs

Steam generator tubes

*Target:*


Nuclear Power

### **About EPRI**

EPRI creates science and technology solutions for the global energy and energy services industry. U.S. electric utilities established the Electric Power Research Institute in 1973 as a nonprofit research consortium for the benefit of utility members, their customers, and society. Now known simply as EPRI, the company provides a wide range of innovative products and services to more than 1000 energy-related organizations in 40 countries. EPRI's multidisciplinary team of scientists and engineers draws on a worldwide network of technical and business expertise to help solve today's toughest energy and environmental problems.

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