



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

February 16, 1998  
NOC-AE-0074  
File No.: G20.02.01  
10 CFR 50.90

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project  
Unit 2  
Docket No. STN 50-499  
Proposed Amendment to Incorporate Voltage-Based  
Repair Criteria into Technical Specification 3.4.5

South Texas Project Unit 2 proposes to amend its Operating License NPF-80 by incorporating the attached amendment to Technical Specification 3.4.5. These changes will implement 1-volt voltage-based repair criteria for the steam generator tube support plate-to-tube intersections. The proposed amendment is consistent with guidance provided in Generic Letter 95-05.

South Texas has reviewed the proposed amendment pursuant to 10CFR50.92 and determined that it does not involve a significant hazards consideration. In addition, South Texas has determined that the proposed amendment satisfies the criteria of 10CFR51.22(c)(9) for categorical exclusion from the requirement for an environmental assessment. The South Texas Plant Operations Review Committee and the Nuclear Safety Review Board have reviewed and approved the proposed amendment.

The required affidavit, a Safety Evaluation and Determination of No Significant Hazards Consideration, and the marked-up affected pages of the Technical Specifications are included as attachments to this letter. Also attached is Westinghouse Steam Generator Report SG-98-01-004 which provides the technical basis supporting the application of Generic Letter 95-05 to South Texas Project Unit 2. Marked-up pages from both the current Technical Specifications and the Improved Technical Specifications have been attached to reflect the proposed changes, although Attachment 5 is included for information only.

In accordance with 10 CFR 50.91(b), South Texas Project is notifying the State of Texas of this request for license amendment by providing a copy of this letter and its attachments.

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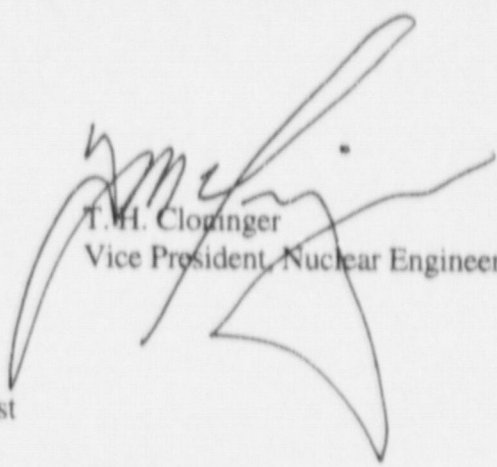
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South Texas requests that this proposed amendment be reviewed and approved by June 1, 1998 to allow procedures, NDE analysis guidelines, and the analyst training program to be revised to reflect the voltage-based repair criteria for the upcoming Unit 2 refueling outage (2RE06). South Texas also requests 30 days for implementation.

If there are any questions regarding the proposed amendment, please contact Mr. M. A. McBurnett at (512) 972-7206 or myself at (512) 972-8787.



T. H. Cloninger  
Vice President, Nuclear Engineering

jtc/

- Attachments:
1. Description of Amendment Request
  2. Safety Evaluation
  3. Determination of No Significant Hazards Consideration
  4. Proposed Changes to Current Technical Specifications
  5. Proposed Changes to Improved Technical Specifications
  6. Westinghouse Steam Generator Report SG-98-01-004



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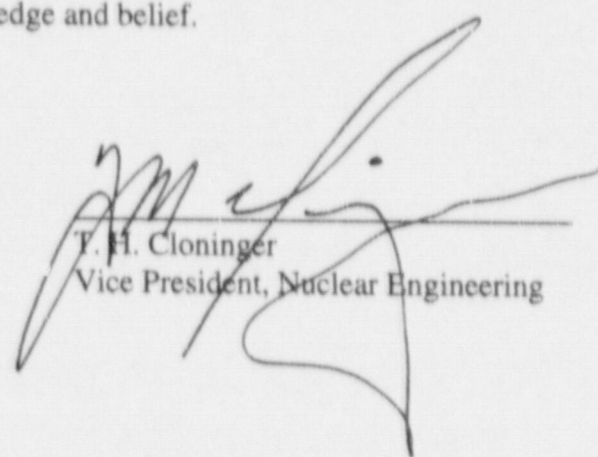
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Attention: Document Control Desk  
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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
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STP Nuclear Operating Company ) Docket No. 50-499  
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South Texas Project Unit 2 )

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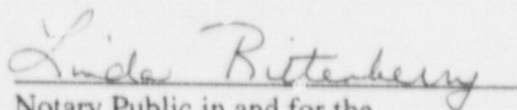
I, T. H. Cloninger, being duly sworn, hereby depose and say that I am Vice President, Nuclear Engineering, of STP Nuclear Operating Company; that I am duly authorized to sign and file with the Nuclear Regulatory Commission the attached proposed amendment to the Technical Specifications; that I am familiar with the content thereof; and that the matters set forth therein are true and correct to the best of my knowledge and belief.

  
T. H. Cloninger  
Vice President, Nuclear Engineering

STATE OF TEXAS )  
 )  
COUNTY OF MATAGORDA )

Subscribed and sworn to before me, a Notary Public in and for the State of Texas, this 16<sup>th</sup>  
day of February, 1998.



  
Notary Public in and for the  
State of Texas



# **ATTACHMENT 1**

## **DESCRIPTION OF AMENDMENT REQUEST**

## DESCRIPTION OF AMENDMENT REQUEST

The proposed amendment would revise Technical Specifications 3/4.4.5 and its Basis to allow the implementation of 1-volt voltage-based repair criteria for the steam generator tube support plate-to-tube intersections for Unit 2 in accordance with Generic Letter 95-05. The proposed amendment also includes an administrative change to Basis 3.4.6.2 to clarify that the allowable steam generator leakage specification applies to both units at South Texas. This amendment is consistent with the guidance provided in NRC Generic Letter 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking."

## BACKGROUND

Previous inservice inspections and examinations of the steam generator tubes have identified intergranular stress corrosion cracking (IGSCC) on the outer diameter of the tubes at the tube support plate (TSP) intersections. This particular form of IGSCC is known as outer diameter stress corrosion cracking (ODSCC) and is a degradation phenomenon found in a number of nuclear power plant steam generators. Various tubes, including tube-to-TSP intersections, have been removed from affected steam generators in numerous nuclear plants for examination and testing. Each of the pulled tubes was sectioned and metallographically examined. The examinations have revealed multiple, segmented, and axial cracks with short lengths for the deepest penetrations. The ODSCC is generally confined within the thickness of the TSPs, consistent with the corrosion mechanism which involves the concentration of impurities, including caustics, in the tube-to-TSP crevices. There is some potential for shallow ODSCC for a short distance above or below the TSP. This has been observed in the TSP intersections of some pulled tubes from another plant.

The steam generator tube specimens pulled from South Texas Unit 1 in 1993 and 1995 have shown only limited intergranular attack (IGA) associated with the ODSCC. However, more significant IGA has been observed to occur occasionally with ODSCC on some pulled tube specimens from other plants. These results suggest that in some cases the degradation developed as IGA plus stress corrosion cracking (SCC). This combination of IGA plus SCC was seen when maximum IGA depths were greater than 25 percent. A large number (> 100) of axial cracks around the circumference are commonly found on these tubes. The maximum depth of IGA is typically one-half to one-third of the SCC depth. Patches of cellular IGA/ODSCC formed by combined axial and circumferential orientation of microcracks are occasionally found in pulled-tube examinations. Axial crack segments have been the dominant flaw feature affecting the structural integrity of the pulled-tube specimens as evidenced by results of burst tests of the pulled TSP intersections prior to sectioning. Testing of tubes with ODSCC has demonstrated a high margin to failure and evaluations have shown that existing tube plugging criteria would cause unnecessary and inappropriate tube plugging.



## DESCRIPTION OF CHANGES

The proposed amendment modifies the steam generator surveillance requirements to allow implementation of the tube support plate voltage-based repair criteria for Unit 2. These surveillance requirements have been previously approved for Unit 1.

The 100% bobbin coil inspection for all hot leg tube support plate intersections and all cold leg intersections down to the lowest cold leg tube support plate with known ODSCC indications in Surveillance Requirement 4.4.5.2.e now applies to both units.

The definitions of plugging limit and imperfection depths in Surveillance Requirement 4.4.5.4.a.7 now apply to both units.

The Tube Support Plate Plugging Limit described in Surveillance Requirement 4.4.5.4.a.12 now applies to both units. Note 1 has been amended to remove tube diameter information not applicable to South Texas that was introduced by Generic Letter 95-05 sample Technical Specifications.

Section 4.4.5.4.a.12(d) reflects that certain intersections in Unit 1 are excluded from application of the voltage-based repair criteria.

The additional reporting criteria in Surveillance Requirement 4.4.5.5.d now apply to both units.

The Bases for 3/4.4.5 and 3/4.4.6.2 reflect that voltage-based repair criteria and steam generator tube leakage limits now apply to both units.

## JUSTIFICATION

Technical Specification 4.4.5.4.a.7, Plugging Limit, requires that tubes with imperfections exceeding 40% of the nominal tube wall thickness be removed from service. This criterion would result in unnecessarily plugging significant numbers of steam generator tubes affected with ODSCC at TSPs. Unnecessarily plugged tubes reduce steam generator heat removal capability in both accident conditions and during normal operations. To preclude this reduced capability, South Texas proposes voltage-based repair criteria for Westinghouse steam generator tubes affected by ODSCC.

Voltage-based repair criteria for Westinghouse steam generator tubes affected by ODSCC involves a correlation between eddy current bobbin coil signal amplitude (voltage) versus tube burst pressure and leak rate. The principal parameter is bobbin voltage amplitude which is correlated with tube burst capability and leakage potential. The voltage-based repair criteria are developed by EPRI from testing of laboratory-induced ODSCC specimens and extensive examination of pulled tubes from operating steam generators.

The voltage-based repair criteria are based on compliance with the NRC Generic Letter 95-05 and are described in the attached Westinghouse Steam Generator Report SG-98-01-004. The methodology employed follows the industry degradation-specific management methodology developed by EPRI and is similar to that implemented for nine plants, four of which had 3/4" diameter steam generator tubing. The bobbin coil voltage criteria detailed in this proposed amendment to the Technical Specifications reflects a conservative approach for the South Texas Project voltage-based repair criteria, recognizing that higher limits have been demonstrated to provide adequate margins in accordance with applicable regulatory requirements. The proposed voltage-based repair criteria for Unit 2 are provided in accordance with the following:

1. Implementation of the steam generator tube/tube support voltage-based repair criteria requires a 100% bobbin coil inspection for all hot leg tube support plate intersections and all cold leg tube support plate intersections down to the lowest cold leg tube support plate with ODSCC indications. The determination of the lowest cold leg tube support plate intersections having ODSCC indications shall be based on the performance of at least a 20% random sampling of tubes inspected over their full length.
2. The tube support plate voltage-based repair criteria limit is used for the disposition of a mill annealed alloy 600 steam generator tube for continued service that is experiencing predominately axially oriented ODSCC confined within the thickness of the tube support plates. At tube support plate intersections, the plugging (repair) limit is based on maintaining steam generator tube serviceability as described below:
  - a. Steam generator tubes whose degradation is attributed to ODSCC within the bounds of the tube support plate with bobbin voltage less than or equal to the lower voltage repair limit (1 volt) will be allowed to remain in service.
  - b. Steam generator tubes whose degradation is attributed to ODSCC within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit will be repaired or plugged except as noted in item 2.c below.
  - c. Steam generator tubes, with indications of potential degradation attributed to ODSCC within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit but less than or equal to the upper repair voltage limit, may remain in service if a rotating pancake coil inspection does not detect degradation. Steam generator tubes, with indications of ODSCC degradation with bobbin voltage greater than the upper voltage repair limit (as calculated in accordance with the methodology in Generic Letter 95-05 as supplemented) will be plugged or repaired.
  - d. As part of an inspection program to help ensure that additional degradation modes are not occurring, all indications with bobbin coil voltage greater than 1.0 volt will be inspected by rotating pancake coil (RPC). For the purpose of this guidance, RPC inspection includes the use of comparable or improved inspection techniques.



3. For each upcoming cycle, the projected end-of-cycle voltage distribution will be established based upon the previous end-of-cycle eddy current data. Based upon this distribution, postulated steam generator tube leakage during a steam line break will be estimated based on the guidance of Generic Letter 95-05. Projected leakage must remain below a level which results in offsite dose estimates remaining within the limits of 10CFR100 and control room doses within GDC 19 limits. Should this estimation exceed the applicable dose limits, the highest voltage indications will be successively plugged until the leakage estimation drops below the applicable dose limits. Projected steam generator tube leakage during a steam line break will be calculated as prescribed in Generic Letter 95-05.
4. An overall tube burst probability during a postulated steam line break event will be calculated and compared to the threshold of  $1 \times 10^{-2}$  defined in Generic Letter 95-05.
5. Indications left in service as a result of application of the tube support plate voltage-based repair criteria shall be inspected by bobbin coil probe during all future refueling outages.
6. No intersections will be excluded from application of the voltage-based repair criteria because it has been determined that no intersections will collapse or deform following a postulated loss of coolant accident (LOCA) concurrent with a safe shutdown earthquake (SSE).
7. If an unscheduled mid-cycle inspection is performed, the mid-cycle repair limits apply instead of the limits identified in Technical Specifications 4.4.5.4.a.12.a through 4.4.5.4.a.12.c. The mid-cycle repair limits will be determined from the equations for mid-cycle repair limits in Generic Letter 95-05, Attachment 2, page 3 of 7. Implementation of these mid-cycle repair limits should follow the same approach as in Technical Specifications 4.4.5.4.a.12.a through 4.4.5.4.a.12.c.
8. All intersections with interfering signals greater than 1.0 volt from copper deposits with dents exceeding 5.0 bobbin volts, or with mixed residual signals, will be inspected with an RPC probe. Any indications found will be plugged or repaired.

South Texas inspections are consistent with Generic Letter 95-05, Section 3, "Inspection Criteria."