Mr. William T. Cottle
President and Chief Executive Officer
STP Nuclear Operating Company
South Texas Project Electric
Generating Station
P. O. Box 289
Wadsworth, TX 77483

September 24, 1998

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 - AMENDMENT NOS. 96 AND 83 TO FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80 (TAC NOS. MA0967 AND MA0968)

Dear Mr. Cottle:

The Commission has issued the enclosed Amendment Nos. 96 and 83 to Facility Operating License Nos. NPF-76 and NPF-80 for the South Texas Project, Units 1 and 2 (STP). The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated February 16, 1998, as supplemented by letters dated April 2, July 15, and August 13, 1998.

The amendments revise TS 3/4.4.5, "Steam Generators," and its Bases 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, and make related Unit 1 administrative changes for consistency of wording (the Nuclear Regulatory Commission (NRC) had previously approved a similar 1-volt voltage-based repair criteria application for Unit 1). In addition, the amendment makes an administrative change to Bases 3/4.4.6.2, "Operational Leakage," to clarify that the allowable steam generator leakage specification applies to both Unit 1 and Unit 2.

A copy of our related Safety Evaluation is enclosed. The Notice of Issuance will be included in the Commission's next biweekly Federal Register notice.

Sincerely,
ORIGINAL SIGNED BY:
Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures: 1. Amendment No. 96 to NPF-76
2. Amendment No. 83 to NPF-80
3. Safety Evaluation

cc w/encls: See next page

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

September 24, 1998

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STP NUCLEAR OPERATING COMPANY

DOCKET NO. 50-498

SOUTH TEXAS PROJECT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 96
License No. NPF-76

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by STP Nuclear Operating Company* acting on behalf of itself and for Houston Lighting & Power Company (HL&P), the City Public Service Board of San Antonio (CPS), Central Power and Light Company (CPL), and City of Austin, Texas (COA) (the licensees), dated February 16, 1998, as supplemented by letters dated April 2, July 15, and August 13, 1998, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

---

*STP Nuclear Operating Company is authorized to act for Houston Lighting & Power Company (HL&P), the City Public Service Board of San Antonio, Central Power and Light Company and City of Austin, Texas and has exclusive responsibility and control over the physical construction, operation and maintenance of the facility.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and Paragraph 2.C.(2) of Facility Operating License No. NPF-76 is hereby amended to read as follows:

   2. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 96 , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The license amendment is effective as of its date of issuance to be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Thomas W. Alexion

Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: September 24, 1998

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

STP NUCLEAR OPERATING COMPANY

DOCKET NO. 50-499

SOUTH TEXAS PROJECT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 83
License No. NPF-80

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by STP Nuclear Operating Company* acting on behalf of itself and for Houston Lighting & Power Company (HL&P), the City Public Service Board of San Antonio (CPS), Central Power and Light Company (CPL), and City of Austin, Texas (COA) (the licensees), dated February 16, 1998, as supplemented by letters dated April 2, July 15, and August 13, 1998, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

---

*STP Nuclear Operating Company is authorized to act for Houston Lighting & Power Company (HL&P), the City Public Service Board of San Antonio, Central Power and Light Company and City of Austin, Texas and has exclusive responsibility and control over the physical construction, operation and maintenance of the facility.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and Paragraph 2.C.(2) of Facility Operating License No. NPF-80 is hereby amended to read as follows:

    2. Technical Specifications

    The Technical Specifications contained in Appendix A, as revised through Amendment No. 83 , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The license amendment is effective as of its date of issuance to be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Thomas W. Alexion

Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: **September 24, 1998**

ATTACHMENT TO LICENSE AMENDMENT NOS. 96 AND 83

FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

DOCKET NOS. 50-498 AND 50-499

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain marginal lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

REMOVE	INSERT
3/4 4-13	3/4 4-13
3/4 4-15	3/4 4-15
3/4 4-16	3/4 4-16
3/4 4-16a	3/4 4-16a
3/4 4-16b	3/4 4-16b
B 3/4 4-3	B 3/4 4-3
B 3/4 4-4	B 3/4 4-4

SURVEILLANCE REQUIREMENTS (Continued)

3) A tube inspection (pursuant to Specification 4.4.5.4a.8) shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, this shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.

4) 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.

c. The tubes selected as the second and third samples (if required by Table 4.4-2 or Table 4.4-3) during each inservice inspection may be subjected to a partial tube inspection provided:

1) The tubes selected for these samples include the tubes from those areas of the tube sheet array where tubes with imperfections were previously found, and

2) The inspections include those portions of the tubes where imperfections were previously found.

d. For Unit 1, any tube allowed to remain in service per Acceptance Criterion 11 (of Technical Specification 4.4.5.4a) shall be inspected via the rotating pancake coil (RPC) eddy current method over the F* distance. Such tubes are exempt from eddy current inspection over the portion of the tube below the F* distance which is not structurally relevant.

e. Implementation of the steam generator tube/tube support plate repair criteria requires a 100-percent bobbin coil inspection for hot-leg and cold leg tube support plate intersections down to the lowest cold-leg tube support plate with known outside diameter stress corrosion cracking (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-percent random sampling of tubes inspected over their full length. |

The results of each sample inspection shall be classified into one of the following three categories.

Category	Inspection Results
C-1	Less than 5% of the total tubes inspected are degraded tubes and none of the inspected tubes are defective.

SURVEILLANCE REQUIREMENTS (Continued)

C-2 One or more tubes, but not more than 1% of the total tubes inspected are defective, or between 5% and 10% of the total tubes inspected are degraded tubes.

C-3 More than 10% of the total tubes inspected are degraded tubes or more than 1% of the inspected tubes are defective.

Note: In all inspections, previously degraded tubes must exhibit significant (greater than 10%) further wall penetrations to be included in the above percentage calculations.

4.4.5.4 Acceptance Criteria

a. As used in this specification:

1) Tubing or Tube means that portion of the tube or sleeve which forms the primary system to secondary system pressure boundary;

2) Imperfection means an exception to the dimensions, finish, or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections;

3) Degradation means a service-induced cracking, wastage, wear, or general corrosion occurring on either inside or outside of a tube;

4) Degraded Tube means a tube containing imperfections greater than or equal to 20% of the nominal wall thickness caused by degradation;

5) % Degradation means the percentage of the tube wall thickness affected or removed by degradation;

6) Defect means an imperfection of such severity that it exceeds the plugging or repair limit. A tube containing a defect is defective;

7) Plugging Limit or Repair Limit means the imperfection depth at or beyond which the tube shall be removed from service by plugging or repaired by sleeving in the affected area because it may become unserviceable prior to the next inspection. The plugging or repair limit imperfection depths are specified in percentage of the nominal wall thickness as follows:

a. original tube wall	40%
b. Westinghouse laser welded sleeve wall	40%

This definition does not apply to tube support plate intersections for which the voltage-based repair criteria are being applied. Refer to 4.4.5.4.a.12 for the repair limit applicable to these intersections.

8) Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a steam line or feedwater line break as specified in Specification 4.4.5.3c., above;

9) Tube Inspection means an inspection of the steam generator tube from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg; and

SURVEILLANCE REQUIREMENTS (Continued)

10) Preservice Inspection means an inspection of the full length of each tube in each steam generator performed by eddy current techniques prior to service to establish a baseline condition of the tubing. This inspection shall be performed prior to initial POWER OPERATION using the equipment and techniques expected to be used during subsequent inservice inspections.

11) F* criteria [For Unit 1 only] Tube degradation below a specified distance from the hard roll contact point at or near the top-of-tubesheet (the F* distance) can be excluded from consideration to the acceptance criteria stated in this section (i.e., plugging of such tubes is not required). The methodology for determination for the F* distance as well as the list of tubes to which the F* criteria is not applicable is described in detail in Topical Report - BAW 10203P, Revision O.

12) Tube Support Plate Plugging Limit is used for the disposition of a mill annealed alloy 600 steam generator tube for continued service that is experiencing predominately axially oriented outside diameter stress corrosion cracking 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 outside diameter stress corrosion cracking within the bounds of the tube support plate with bobbin voltage less than or equal to the lower voltage repair limit (Note 1), will be allowed to remain in service.

    b) Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit (Note 1), will be repaired or plugged, except as noted in 4.4.5.4.a.12.c below.

    c) Steam generator tubes, with indications of potential degradation attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than the lower voltage repair limit (Note 1) but less than or equal to the upper repair voltage limit (Note 2), may remain in service if a rotating pancake coil inspection does not detect degradation. Steam generator tubes, with indications of outside diameter stress corrosion cracking degradation with bobbin voltage greater than the upper voltage repair limit (Note 2) will be plugged or repaired.

d) Certain Unit 1 intersections as identified in Framatome Technologies, Inc. Topical Report BAW-10204P, "South Texas Project Tube Repair Criteria for ODSCC At Tube Support Plates" will be excluded from application of the voltage-based repair criteria as it is determined that these intersections may collapse or deform following a postulated LOCA + SSE event.

e) If an unscheduled mid-cycle inspection is performed, the mid-cycle repair limits apply instead of the limits identified in 4.4.5.4.a.12.a, 4.4.5.4.a.12.b, and 4.4.5.4.a.12.c. The mid-cycle repair limits will be determined from the equations for mid-cycle repair limits of NRC Generic Letter 95-05, Attachment 2, page 3 of 7. Implementation of these mid-cycle repair limits should follow the same approach as in TS 4.4.5.4.a.12.a, 4.4.5.4.a.12.b, and 4.4.5.4.a.12.c.

Note 1: The lower voltage repair limit is 1.0 volt for 3/4-inch diameter tubing.

Note 2: The upper voltage repair limit (V_{URL}) is calculated according to the methodology in Generic Letter 95-05 as supplemented. V_{URL} may differ at the TSPs and flow distribution baffle.

13) Tube Repair refers to a process that reestablishes tube serviceability. Acceptable tube repair will be performed in accordance with the methods described in Westinghouse Reports WCAP-13698, Revision 2, "Laser Welded Sleeves for 3/4 Inch Diameter Tube Feedring-Type and Westinghouse Preheater Steam Generators," April 1995 and WCAP-14653, "Specific Application of Laser Welded Sleeves for South Texas Project Power Plant Steam Generators," June 1996, including post-weld stress relief;

Tube repair includes the removal of plugs that were previously installed as a corrective or preventive measure. A tube inspection per 4.4.5.4.a.9 is required prior to returning previously plugged tubes to service.

b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair all tubes exceeding the plugging or repair limit and all tubes containing through-wall cracks) required by Table 4.4-2 and Table 4.4-3.

4.4.5.5 Reports

a. Within 15 days following the completion of each inservice inspection of steam generator tubes, the number of tubes plugged or repaired in each steam generator shall be reported to the Commission in a Special Report pursuant to Specification 6.9.2;

b. The complete results of the steam generator tube inservice inspection shall be submitted to the Commission in a Special Report pursuant to Specification 6.9.2 within 12 months following the completion of the inspection. This Special Report shall include:

   1) Number and extent of tubes inspected,

   2) Location and percent of wall-thickness penetration for each indication of an imperfection, and

   3) Identification of tubes plugged or repaired.

c. Results of steam generator tube inspections which fall into Category C-3 shall be reported in a Special Report to the Commission pursuant to Specification 6.9.2 within 30 days and prior to resumption of plant operation. This report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

d. For implementation of the voltage-based repair criteria to tube support plate intersections, notify the Staff prior to returning the steam generators to service should any of the following conditions arise: |

   1) If estimated leakage based on the projected end-of-cycle (or if not practical, using the actual measured end-of-cycle) voltage distribution exceeds the leak limit (determined from the licensing basis dose calculation for the postulated main steam line break) for the next operating cycle.

   2) If circumferential crack-like indications are detected at the tube support plate intersections.

   3) If indications are identified that extend beyond the confines of the tube support plate.

   4) If indications are identified at the tube support plate elevations that are attributable to primary water stress corrosion cracking.

   5) If the calculated conditional burst probability based on the projected end-of-cycle (or if not practical, using the actual measured end-of-cycle) voltage distribution exceeds 1×10^{-2}, notify the NRC and provide an assessment of the safety significance of the occurrence.

STEAM GENERATORS (Continued)

plants have demonstrated the capability to reliably detect degradation that has penetrated 20% of the original tube wall thickness. Repaired tubes are also included in the inservice tube inspection program.

Exclusion of certain areas of Unit 1 tubes from consideration has been analyzed using an F* criteria. The criteria allows service induced degradation deep within the tubesheet to remain in service. The analysis methodology determines the length of sound fully rolled expanded tubing required in the uppermost area within the tubesheet to preserve needed structural margins for all service conditions. The remainder of the tube, below the F* distance, is considered not structurally relevant and is excluded from consideration to the customary plugging criteria of 40% throughwall.

The amount of primary to secondary leakage from tubes left in service by application of the F* criterion has been determined by verification testing. This leakage has been considered in the calculation of postulated primary to secondary leakage under accident conditions. Primary to secondary leakage during accident conditions is limited such that the associated radiological consequences as a result of this leakage is less than the 10 CFR 100 limits.

The voltage-based repair limits of SR 4.4.5 implement the guidance in GL 95-05 and are applicable only to Westinghouse-designed steam generators (SGs) with outside diameter stress corrosion cracking (ODSCC) located at the tube-to-tube support plate intersections. The criteria of GL 95-05 are also applicable to the Unit 2 flow distribution plate intersections. The voltage-based repair limits are not applicable to other forms of SG tube degradation nor are they applicable to ODSCC that occurs at other locations within the SG. Additionally, the repair criteria apply only to indications where the degradation mechanism is dominantly axial ODSCC with no significant cracks extending outside the thickness of the support plate. Refer to GL 95-05 for additional description of the degradation morphology.

Implementation of SR 4.4.5 requires a derivation of the voltage structural limit from the burst versus voltage empirical correlation and then the subsequent derivation of the voltage repair limit from the structural limit (which is then implemented by this surveillance).

The voltage structural limit is the voltage from the burst pressure/bobbin voltage correlation, at the 95-percent prediction interval curve reduced to account for the lower 95/95-percent tolerance bound for tubing material properties at 650°F (i.e., the 95-percent LTL curve). The voltage structural limit must be adjusted downward to account for potential flaw growth during an operating interval and to account for NDE uncertainty. The upper voltage repair limit; V_{URL}, is determined from the structural voltage limit by applying the following equation:

$$V_{URL} = V_{SL} - V_{GR} - V_{NDE}$$

where V_{GR} represent the allowance for flaw growth between inspections and V_{NDE} represents the allowance for potential sources of error in the measurement of the bobbin coil voltage. Further discussion of the assumptions necessary to determine the voltage repair limit are discussed in GL 95-05.

STEAM GENERATORS (Continued)

The mid-cycle equation in SR 4.4.5.4.a.12.e should only be used during unplanned inspections in which eddy current data is acquired for indications at the tube support plates.

SR 4.4.5.5 implements several reporting requirements recommended by GL 95-05 for situations which the NRC wants to be notified prior to returning the SGs to service. For the purpose of this reporting requirement, leakage and conditional burst probability can be calculated based on the as-found voltage distribution rather than the projected end-of-cycle voltage distribution (refer to GL 95-05 for more information) when it is not practical to complete these calculations using the projected EOC voltage distributions prior to returning the SGs to service. Note that if leakage and conditional burst probability were calculated using the EOC voltage distribution for the purposes of addressing the GL section 6.a.1 and 6.a.3 reporting criteria, then the results of the projected EOC voltage distribution should be provided per the GL section 6.b.(c) criteria.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results will be promptly reported to the Commission in a Special Report pursuant to Specification 6.9.2 within 30 days and prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

3/4.4.6 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.6.1 LEAKAGE DETECTION SYSTEMS

The RCS Leakage Detection Systems required by this specification are provided to monitor and detect leakage from the reactor coolant pressure boundary. These Detection Systems are consistent with the recommendations of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.

3/4.4.6.2 OPERATIONAL LEAKAGE

PRESSURE BOUNDARY LEAKAGE of any magnitude is unacceptable since it may be indicative of an impending gross failure of the pressure boundary. Therefore, the presence of any PRESSURE BOUNDARY LEAKAGE requires the unit to be promptly placed in COLD SHUTDOWN.

Industry experience has shown that while a limited amount of leakage is expected from the RCS, the unidentified portion of this leakage can be reduced to a threshold value of less than 1 gpm. This threshold vale is sufficiently low to ensure early detection of additional leakage.

OPERATIONAL LEAKAGE (Continued)

The leakage limits incorporated into SR 4.4.6 are more restrictive than the standard operating leakage limits and are intended to provide an additional margin to accommodate a crack which might grow at a greater than expected rate or unexpectedly extend outside the thickness of the tube support plate. Hence, the reduced leakage limit, when combined with an effective leak rate monitoring program, provides additional assurance that should a significant leak be experienced in service, it will be detected, and the plant shut down in a timely manner.

The steam generator tube leakage limit of 150 gpd for each steam generator not isolated from the RCS ensures that the dosage contribution from the tube leakage will be limited to a small fraction of 10 CFR Part 100 dose guideline valves in the event of either a steam generator tube rupture or steam line break. The 150 gpd limit per steam generator is conservative compared to the assumptions used in the analysis of these accidents. The 150 gpd leakage limit per steam generator ensures that steam generator tube integrity is maintained in the event of a main steam line rupture or under LOCA conditions.

The 10 gpm IDENTIFIED LEAKAGE limitation provides allowance for a limited amount of leakage from known sources whose presence will not interfere with the detection of UNIDENTIFIED LEAKAGE by the Leakage Detection Systems.

The specified allowed leakage from any RCS pressure isolation valve is sufficiently low to ensure early detection of possible in-series check valve failure. It is apparent that when pressure isolation is provided by two in-series check valves and when failure of one valve in the pair can go undetected for a substantial length of time, verification of valve integrity is required. Since these valves are important in preventing overpressurization and rupture of the ECCS low pressure piping which could result in a LOCA that bypasses containment, these valves should be tested periodically to ensure low probability of gross failure.

The Surveillance Requirements for RCS pressure isolation valves provide added assurance of valve integrity thereby reducing the probability of gross valve failure and consequent intersystem LOCA. Leakage from the RCS pressure isolation valve is IDENTIFIED LEAKAGE and will be considered as a portion of the allowed limit.

3/4.4.7 CHEMISTRY

The limitations on Reactor Coolant System chemistry ensure that corrosion of the Reactor Coolant System is minimized and reduces the potential for Reactor Coolant System leakage or failure due to stress corrosion. Maintaining

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 96 AND 83 TO

FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

STP NUCLEAR OPERATING COMPANY

DOCKET NOS. 50-498 AND 50-499

SOUTH TEXAS PROJECT, UNITS 1 AND 2

1.0 INTRODUCTION

By application dated February 16, 1998, as supplemented by letters dated April 2, July 15, and August 13, 1998, STP Nuclear Operating Company, et. al., (STPNOC, the licensee) requested changes to the Technical Specifications (TSs) (Appendix A to Facility Operating License Nos. NPF-76 and NPF-80) for the South Texas Project, Units 1 and 2 (STP). The proposed changes would revise TS 3/4.4.5, "Steam Generators," and its Bases to allow the implementation of 1-volt voltage-based repair criteria for the steam generator (SG) tube support plate-to-tube intersections for Unit 2 in accordance with Generic Letter (GL) 95-05, and make related Unit 1 administrative changes for consistency of wording (the Nuclear Regulatory Commission (NRC) had previously approved a similar 1-volt voltage-based repair criteria application for Unit 1). In addition, the proposed changes would make an administrative change to Bases 3/4.4.6.2, "Operational Leakage," to clarify that the allowable steam generator leakage specification applies to both Unit 1 and Unit 2.

The July 15 and August 13, 1998, supplements provided clarifying information and did not change the initial no significant hazards consideration determination.

2.0 VOLTAGE-BASED STEAM GENERATOR TUBE REPAIR CRITERIA

2.1 Discussion

On August 3, 1995, the NRC issued GL 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," which outlined generic criteria for licensees considering implementation of an alternate repair criteria. The licensee has stated that the proposed amendment request is consistent with the guidance provided in GL 95-05. The voltage-based SG tube repair criteria allows axially oriented outside diameter stress corrosion cracking (ODSCC) confined within the thickness of the tube support plates (TSPs) to remain in service based on the magnitude of the bobbin coil voltage response.

SG tube flaw acceptance criteria (i.e., plugging limits) are specified in the plant TSs. The traditional strategy for achieving adequate structural and leakage integrity of the tubes has been to establish a minimum wall thickness requirement in accordance with NRC Regulatory Guide

(RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes." Development of minimum wall thickness requirements to satisfy RG 1.121 is governed by analyses assuming a uniform thinning of the tube wall. This assumed degradation mechanism is inherently conservative for certain forms of SG tube degradation. Conservative repair limits may lead to removing degraded tubes from service that have adequate structural and leakage integrity for further service.

The staff developed generic criteria for voltage-based limits for ODSCC confined within the thickness of the TSPs. The staff published several conclusions regarding voltage-based repair criteria in draft NUREG-1477, "Voltage-Based Interim Plugging Criteria for Steam Generator Tubes" and in a draft generic letter titled "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes." The latter document was published for public comment in the *Federal Register* on August 12, 1994 (59 FR 41520). On August 3, 1995, the staff issued GL 95-05, which took into consideration public comments on the draft generic letter cited above, domestic operating experience under the voltage-based repair criteria, and additional data made available from European nuclear power plants.

The guidance of GL 95-05 does not set depth-based limits on predominantly axially oriented ODSCC at TSP locations; rather it relies on empirically derived correlations between a nondestructive inspection parameter, the bobbin coil voltage, and tube burst pressure and leak rate. The staff recognizes that although the total tube integrity margins may be reduced following application of a voltage-based repair criteria, the guidance in GL 95-05 ensures structural and leakage integrity continue to be maintained at acceptable levels consistent with the requirements of 10 CFR Part 50 and the guideline values in 10 CFR Part 100. Since the voltage-based repair criteria do not incorporate a minimum tube wall thickness requirement, there is the possibility for tubes with throughwall cracks to remain in service. Because of the increased likelihood of such flaws, the staff included provisions for augmented SG tube inspections and more restrictive operational leakage limits.

The NRC staff documented its generic position on voltage-based limits for ODSCC affecting the SG tubes at the TSP elevations in GL 95-05 and in it's supporting documentation. This approach takes no credit for the TSPs in preventing and/or reducing the likelihood of a tube from bursting and/or leaking during postulated main steam line break (MSLB) conditions. In essence it assumes that the degradation affecting the SG tubes at the TSP elevation is in the tube free span.

The licensee's proposed amendment involves a change to the STP TSs to incorporate the voltage-based repair criteria for both units per the guidance of GL 95-05. The guidance specifies, in part, that: (1) the repair criteria are only applicable to predominantly axially oriented ODSCC located within the bounds of the TSPs, (2) licensees should perform an evaluation to confirm that the SG tubes will retain adequate structural and leakage integrity until the next scheduled inspection, (3) licensees should adhere to specific inspection criteria to ensure consistency in methods between inspections, (4) tubes must be periodically removed from the SGs and examined to verify the morphology of the degradation and provide additional data for structural and leakage integrity evaluations, (5) the operational leakage limit should be reduced, (6) licensees should implement an operational leakage monitoring program, and (7) specific reporting requirements should be incorporated into the plant TSs.

STP Unit 2 is a Westinghouse 4-loop pressurized water reactor plant which utilizes four model E2 SGs with 3/4-inch diameter mill annealed Alloy 600 tubing and drilled hole stainless steel tube support plates. A total of 15 tubes in SG D are thermally treated Alloy 600 tubing, these tubes are excluded from application of the voltage-based repair criteria since they are not constructed of Alloy 600 mill annealed tubing.

2.2 Evaluation

2.2.1 Applicability of GL 95-05

2.2.1.1 Applicability of GL 95-05 to SG with Stainless Steel TSPs

GL 95-05 defines applicability of the voltage-based repair limits to drilled hole TSPs. South Texas Unit 2 has drilled hole 405 Stainless Steel (SS) TSPs. This section addresses the influence of the TSP on the voltage response of flaws to demonstrate the applicability of the voltage based repair limits to drilled hole 405 SS TSPs. A large portion of the 3/4" pulled tube database is taken from pulled tube data from the Doel-4 plant, which originally used Model E1 SGs with 405 SS TSPs. The licensee performed confirmatory eddy current testing using both carbon steel and stainless steel TSP stimulants to show that the primary mix channel bobbin coil voltage response is unaffected by the TSP material. The licensee determined that there was reasonable agreement between voltages measured for known American Society of Mechanical Engineers (ASME) holes and axial slots with carbon steel support plates and compared to voltages measured for known ASME holes and axial slots with stainless steel support plates.

Therefore, the staff concludes that the voltage-based repair criteria can be applied to SGs with drilled hole stainless steel TSPs as well as the more common drilled hole carbon steel TSPs.

2.2.1.2 Applicability of Voltage-Based Repair Criteria at Flow Distribution Baffle Plates

GL 95-05 does permit application of the voltage-based repair criteria at the flow distribution baffle plate (FDBP) provided the licensee addresses the potential for higher growth rates at the FDBP. Two plants have experienced high growth rates at their FDBP intersections.

The first event occurred at a European plant. The event was attributed to the incomplete rinsing of the SG following a copper removal stage of a secondary side cleaning process. The inadequate rinsing process resulted in large amounts (up to 1 inch deep) of highly concentrated copper products to become deposited atop the FDBP. After the plant returned to power, a primary-to-secondary leak was detected and the plant shut down to address the leakage. Axial outside diameter stress corrosion cracking was observed immediately above the flow distribution baffle by eddy current testing. The eddy current testing also provided evidence of the sediment (copper rich product) atop the flow distribution baffle plate.

The second event involved a U.S. plant which observed large growth indications in tubes in one SG at the FDBP. The cause of the cracking was attributed to high copper concentrations, caustic crevice conditions, and FDBP hole misalignment. The FDBP hole misalignment, leads to partial packing of the FDBP holes from the contact between the tubes and the FDBP holes.

The source of the high copper ingress was attributed to ammonia breakthrough in the plant's SG B demineralizer bed which supplied large quantities of ammonia and sodium species into the feedwater. The ammonia accelerated the transport of copper species from the copper moisture separator reheater tubes to the SG. Copper acts as an oxidizer, thereby accelerating the corrosion process. The sodium-chloride molar ratio was found to be elevated during a major portion of the cycle with the high growth rates. With the potential for a caustic crevice due to the sodium transport from the demineralizer bed and the presence of an oxidizer, the potential existed for high crack growth rates at the FDBP. The FDBP to tube misalignment was also considered an influencing factor in the high growth rate. The TSP crevices are smaller than the FDBP crevices. These smaller crevices were already packed prior to the high growth rate cycle. Copper and sodium was able to transport from the bulk water to the partially packed FDBP crevices during the cycle with the high growth rates. Outside diameter crevice deposits were noted over approximately 80° to 160° arc on the tubes at the FDBP. The axial flaws were located within these deposit regions. Contact points were also noted on the tube pull exam at the FDBP at the US plant with the high growth rates.

The STP Unit 2 feedwater system is largely a copper free system. The moisture separators were re-tubed from copper nickel to stainless steel prior to commercial operation. The feedwater heater tubes are stainless steel and the condenser tubes are titanium. Copper in the STP Unit 2 has been eliminated with the exception of the condenser aluminum-bronze tube sheets. Prior to station startup, full-flow deaerators and condensate polishers were added between the SGs and the aluminum-bronze condenser tubes sheets, and were modified to incorporate a lead cation bed design. The licensee concludes that the limited presence of copper is insufficient to support accelerated corrosion. In STPNOC's response to GL 97-06, visual inspection of the STP Units 1 and 2 SG FDBP holes indicate that there is no contact between the tubes and the FDBP holes. STPNOC also reports that no contact points were noted on the six tube pulls with FDBP intersections from STP Unit 1.

The licensee has assessed the potential for high growth rates at the FDBP. The licensee has minimized copper in the secondary system at STP Unit 2, meets Electric Power Research Institute (EPRI) guidelines for secondary chemistry control, and performed visual inspection of the SGs to evaluate if tubes were in contact with the FDBP.

2.2.1.3 Thermally Treated Alloy 600 Tubing in SG D

A total of 15 tubes in SG D are thermally treated Alloy 600 tubing, the licensee stated that these tubes are excluded from application of the voltage-based repair criteria since they are not constructed of alloy 600 mill annealed tubing. The proposed TS reflect that the voltage-based repair criteria is applicable only to alloy 600 mill annealed tubing.

2.2.2 Implementation of GL 95-05

The licensee has proposed to follow the requested actions of GL 95-05 for implementing the voltage-based plugging criteria. The implementation methodologies are documented in a technical support document, "Westinghouse Steam Generator Report SG-98-01-004," accompanying the TS amendment request.

2.2.3 Tube Repair Criteria

The proposed criteria will: (1) permit tubes having indications confined to within the thickness of the TSPs with bobbin voltages less than or equal to 1.0 volts to remain in service, (2) permit tubes having indications confined to within the thickness of the TSPs with bobbin voltages greater than 1.0 volts but less than or equal to the upper voltage limit to remain in service if a motorized rotating pancake coil probe or acceptable alternative inspection does not detect degradation, and (3) require tubes having indications confined to within the thickness of the TSPs with bobbin voltages greater than the upper voltage limit be plugged or repaired.

The lower voltage limit of 1.0 volts is consistent with the recommended value specified in GL 95-05 for 3/4-inch SG tubing. The upper voltage limit is derived based on the lower 95 percent prediction interval of the burst pressure versus bobbin voltage correlation, adjusted for lower bound material properties evaluated at the 95 percent confidence level. The upper voltage limit is further reduced to account for uncertainty in the nondestructive examination technique and flaw growth over the next operating cycle. Using this reduced lower prediction bound curve, the structural limit is determined for a free span burst pressure of 1.43 times MSLB differential pressure. The proximity of the TSP prevents burst during normal operating conditions. The industry periodically updates the database for burst pressure and bobbin voltage when the destructive test data from pulled tubes are available; therefore, the upper voltage limit may vary as additional data are incorporated into the database.

The increased tube to FDBP gap does not provide sufficient constraint such that burst will not occur within the FDBP. Therefore, the upper voltage repair limit for the FDBP has been determined using the same methodology as for TSP except that the tube structural limit is determined for a free span burst pressure of 3 times normal operational differential pressure or 1.43 times MSLB differential pressure, whichever is more limiting. In addition, the licensee should determine if the growth rate of indications at the FDBPs is considerably different than the growth rate at TSPs. This analysis should address if there is a need to use a higher growth allowance for the determination of the repair limits at the FDBP. The licensee has stated that recent inspections have noted only a few occurrences of indications at the FDBP in the STP Unit 2 SGs. Only one bobbin indication was reported in Unit 2 at the hot-leg FDBP for the fifth refueling outage. The indication was not representative of a flaw-like indication. No other bobbin indications were found during other inspections at the FDBPs. Rotating pancake coil indications for the fifth refueling outage at FDBP locations were determined to be either no detectable degradation (NDD), no degradation found (NDF), manufacturing buff marks (MBMs), or permeability variations. The licensee determined that these are not crack-like indications. The licensee concludes that the growth rates at the FDBP is not considerably different and a higher growth rate allowance is not warranted at this time.

2.2.4 Alternatives to GL 95-05 - Inspection Issues

The licensee proposed the following alternatives to the guidance in GL 95-05 for implementing voltage-based repair criteria: use of an alternate approach for addressing probe variability and wear, and use of an alternate probability of detection (POD).

2.2.4.1 Probe Variability

With respect to probe variability (Section 3.c.2. of Attachment 1 to GL 95-05), the licensee proposed to follow an approach developed through the Nuclear Energy Institute (NEI). The proposed procedures and methodology are described in the January 23, 1996, letter from Alex Marion of NEI to Brian Sheron of the NRC and are supplemented in the October 15, 1996 letter, from Alex Marion of NEI to Brian Sheron of the NRC. Based on a review of data used originally to support the position that only the primary frequency was required for test on new probes to verify that they met the voltage variability specification of ±10 percent of the nominal response, the industry indicated that testing at only the primary frequency was not sufficient. The proposed approach specifies that the voltage responses from the primary frequency and mix frequency channel of new probes be within ±10 percent of the nominal voltage response when voltages are normalized to the 20 percent throughwall flaw values. The nominal voltage responses were established as the average voltages obtained from ASME standard drilled hole flaws for at least 10 production probes. In a letter from Brian Sheron of the NRC to David Modeen of NEI, dated July 29, 1997, the NRC indicated that this approach to Section 3.c.2 of Attachment 1 to GL 95-05 to address probe variability is acceptable. Therefore, the licensee's proposal to follow the industry approach is acceptable.

2.2.4.2 Probe Wear

Section 3.c.3 of Attachment 1 to GL 95-05 provides guidance for consideration of probe wear. The licensee proposed to use an alternative to the guideline in section 3.c.3. The alternative approach, developed through NEI, specifies that if the probe does not satisfy the voltage variability criterion for wear of ±15 percent limit before its replacement, all tubes which exhibited flaw signals with voltage responses measured at 75 percent or greater of the lower repair limit (i.e., 2 volts) must be reinspected with a bobbin probe satisfying the ±15 percent wear standard criterion. The voltages from the reinspection will be used as the basis for tube repair. The NRC staff completed a review of the NEI proposed alternative method and concluded that the approach is acceptable as discussed in a letter from Brian Sheron of the NRC to Alex Marion of NEI dated March 18,1996. The licensee's proposal to follow the industry approach to address probe wear is acceptable.

2.2.4.3 Alternate POD

The licensee requested staff approval to use a voltage dependent POD instead of the constant POD of 0.6 in accordance with GL 95-05. The voltage dependent POD approach affects the calculation of the distribution of bobbin indications as a function of voltage at the beginning of cycle. The staff is currently reviewing such an approach submitted by NEI. Pending staff review and approval of such an approach, the licensee should implement a constant POD of 0.6 in accordance with GL 95-05.

2.2.5 Structural and Leakage Integrity Assessments

The staff guidance for the implementation of the voltage-based repair criteria focuses on maintaining tube structural integrity during the full range of normal, transient and postulated accident conditions with adequate allowance for eddy current test uncertainty and flaw growth projected to occur during the next operating cycle. In order to confirm the structural and leakage integrity of the tube until the next scheduled inspection, GL 95-05 specifies a methodology to determine the conditional burst probability and the total primary-to-secondary leak rate from an affected SG during a postulated main steam line break event. Consistent with the GL 95-05 prescribed assessments, the licensee proposes to follow the methodology described in WCAP-14277, Revision 1, "SLB Leak Rate and Tube Burst Probability Analysis Methods for ODSCC at TSP Intersections," dated December 1996. The staff finds the methodology in WCAP-14277, Revision 1, acceptable.

GL 95-05 specifies that the structural and leakage integrity assessments should use the latest available data from destructive examination of tubes removed from Westinghouse designed steam generators. NRC staff has agreed with NEI on a protocol by which the industry will periodically update the ODSCC database used to perform GL 95-05 specified calculations. The protocol ensures that the latest available data from destructive examination of tubes is considered. The licensee stated that they will follow the protocol.

NRC Information Notice (IN) 97-79, "Potential Inconsistency in the Assessment of the Radiological Consequences of a Main Steam Line Break Associated with the Implementation of Steam Generator Tube Voltage-Based Repair Criteria" states that a licensee implementing the voltage-based repair criteria had used two different temperature conditions when comparing the projected end-of-cycle tube leakage with the maximum allowable tube leakage. The same temperature conditions should have been used in the calculations. The IN also states that other licensees may have made similar mistakes. The calculated leak rate limit and maximum allowable leak rate values for STP Unit 2 are specified as room temperature values. The values are compared using a consistent set of reference conditions. The staff finds this acceptable.

2.2.5.1. Conditional Probability of Burst

The licensee will use the methodology described in Revision 1 of WCAP-14277 for performing a probabilistic analysis to quantify the potential for SG tube ruptures given an MSLB event. The results of the probabilistic analysis will be compared to a threshold value of 1×10^{-2} per cycle in accordance with GL 95-05. This threshold value provides assurance that the probability of burst is acceptable considering the assumptions of the calculation and the results of the staff's generic risk assessment for SGs contained in NUREG-0844, "NRC Integrated Program for the Resolution of Unresolved Safety Issues A-3, A-4, and A-5 Regarding Steam Generator Tube Integrity." Failure to meet the threshold value indicates ODSCC confined to within the thickness of the TSP could contribute a significant fraction to the overall conditional probability of tube rupture from all forms of degradation assumed and evaluated as acceptable in NUREG-0844. NRC staff concludes that the licensee's proposed methodology for calculating the conditional burst probability is consistent with the guidance in GL 95-05 and is acceptable.

2.2.5.2 Accident Leakage

The licensee will use the methodology described in Revision 1 of WCAP-14277 for calculating the SG tube leakage from the faulted SG during a postulated MSLB event. The model consists of two major components: (1) a model predicting the probability that a given indication will leak as a function of voltage (i.e., the probability of leakage model) and (2) a model predicting leak rate as a function of voltage, given that leakage occurs (i.e. the conditional leak rate model). The staff concludes that the licensee's proposed methodology for calculating the tube leakage is consistent with the guidance in GL 95-05 and is acceptable.

2.2.5.3 Primary-to-Secondary Leakage During Normal Operation

Because the voltage-based repair criteria would allow degraded tubes to remain in service, the degraded tubes may develop throughwall cracks during an operational cycle, thus creating the potential for primary-to-secondary leakage during normal operation, transients, or postulated accidents. Therefore, as a defense-in-depth measure, GL 95-05 specifies that the operational leakage limits of the plant TSs be limited to 150 gallons per day from any one SG. The staff concludes that adequate leakage integrity during normal operation is reasonably assured by the TS limits on allowable primary-to-secondary leakage.

2.2.6 Tube Pulls

To confirm the nature of the degradation occurring at the tube support plate elevations, tubes are periodically removed from the SGs for destructive analysis. Tube pulls are used to confirm that the nature of the degradation being observed at these locations is predominantly axially oriented ODSCC, provide data for assessing the reliability of the inspection methods, and supplement the existing databases (e.g. burst pressure, probability of leakage, and leak rate).

GL 95-05 contains guidance that states licensees should remove at least two pulled tube specimens with the objective of retrieving as many intersections as practical (a minimum of four intersections) during the plant SG inspection outage that implements the voltage-based repair criteria or during an inspection outage preceding initial application of the voltage-based criteria. On an ongoing basis, additional tube specimen removals (minimum of two intersections) should be obtained at the first refueling outage following 34 effective full power months of operation or at the maximum interval of three refueling outages after the previous tube pull. Alternatively, the licensee may participate in an industry-sponsored tube pull program endorsed by the NRC as described in GL 95-05.

Currently, no tubes have been removed from STP Unit 2. Consistent with Section 4 of GL 95-05, the licensee stated that upon the initial implementation of the voltage based repair criteria, a minimum of four hot-leg TSP intersections will be removed from STP Unit 2. The licensee also stated that it will comply with GL 95-05 for future tube removals. The staff concludes that the licensee satisfies the tube removal guidance of GL 95-05, and therefore, the tube removal program is acceptable.

2.3 Summary

The licensee submitted an application for a license amendment to permit the use of the voltage-based repair criteria for SG tubes at STP Unit 2. The staff has reviewed the proposed amendment and concludes that the proposed alternate repair criteria are consistent with GL 95-05 and are acceptable. Concerning the use of a voltage dependent POD for application in SG voltage-based alternate repair criteria, the staff is currently addressing such an approach generically through the Nuclear Energy Institute. Pending staff review and approval of a revised POD submitted by NEI, the licensee should implement a constant POD of 0.6 in accordance with GL 95-05. The staff also concludes that adequate structural and leakage integrity will be assured, consistent with applicable regulatory requirements, for indications to which the voltage-based repair criteria will be applied. The licensee may incorporate the proposed alternate repair criteria into the TSs for STP Unit 2.

3.0 SG TUBE EXCLUSION ANALYSIS FOR APPLICATION OF VOLTAGE-BASED REPAIR CRITERIA

3.1 Discussion

STPNOC has proposed to amend TS 3.4.5 for STP Unit 2 related to the implementation of the voltage-based repair criteria for the SG TSP-to-tube intersections. The most limiting condition to be considered in the application of the voltage-based plugging criteria is a combined safe shutdown earthquake (SSE) plus a loss of coolant accident (LOCA). For the combined LOCA plus SSE event, the potential exists for yielding of the TSPs in the vicinity of peripheral wedge support locations, accompanied by deformation of the tubes and subsequent loss of flow area and possible in-leakage due to opening of preexisting axial cracks. The wedge-shaped steel components are used to provide radial contact between the TSP and the wrapper at multiple locations around the periphery of the TSP.

3.2 Evaluation

The licensee has provided a description of the tube collapse determination methodology during the combined LOCA plus SSE event. Analytical results have been provided at locations where tubes with degradation could substantially deform or collapse during postulated LOCA plus SSE loadings. Bounding LOCA rarefaction wave loadings for the postulated surge and accumulator line breaks and plant-specific seismic data were used to perform the analysis. The resulting loads on the TSPs were compared with data from a TSP crush test program to ultimately determine the susceptibility of tubes with preexisting cracks to deform and potentially collapse during a LOCA plus SSE event. Such tubes need to be excluded from the implementation of the voltage-based tube repair criteria.

Seismic Loads

Seismic loads result from motion of the ground during an earthquake. The SSE excitation of the SG is defined in the form of acceleration response spectra at the SG supports. To perform the analysis, the response spectra were converted into acceleration time history input. Acceleration time histories were synthesized from the El Centro Earthquake motions, using a frequency suppression/raising technique, such that the resulting spectrum in each of the axes closely enveloped the original specified spectrum. The resulting time histories were then simultaneously applied at each SG support. For the tube exclusion analysis, results of some response spectra seismic analyses for STP taken from Westinghouse Report VVNT-150, "Model E2 Stress Report Plant Specific Seismic Analysis South Texas Nuclear Power Plant

Units 1 and 2" were used to develop nonlinear plate loads. A factor of three was applied to the response spectra values to develop these loads. The bounding TSP load was applied to all the TSPs. The staff finds the development of the seismic loads, as discussed above acceptable.

LOCA Loads

Leak before break (LBB) of the primary loop piping has been previously approved by the NRC for STP Unit 2, therefore, governing branch line breaks were considered for determining LOCA loads. The LOCA hydraulic forcing functions, consisting primarily of rarefaction loads, were obtained from a previous thermal/hydraulic analysis of a Model D5 SG, and are considered conservative for analyzing Model E SGs at STP Unit 2. Several parameters of the D5 and E steam generators were compared to establish the conservatism in D5 LOCA loads. These parameters included the tube bundle geometries and pressure drops across the tube bundle as well as the time history characteristics of the breaks. The comparison indicated that in every respect, the surge and accumulator line break loads for the Model D5 SGs bounded those for Model E SGs. Therefore, the D5 LOCA forcing functions were considered conservative for analyzing the Model E SGs at STP Unit 2.

The LOCA and SSE loads were combined using a square-root-of-the-sum-of-the-squares (SRSS) technique. The load distribution on the wedge follows a cosine function. Typically, only half of the wedges are loaded at any given time. In determining the load distribution for seismic and LOCA loads, the directionality of the load was considered. LOCA loads are unidirectional, in that they only act in the plane of the U-bend. Seismic loads on the other hand are random, and can act in any direction. The TSPs were grouped on the basis of similarity of their wedge support locations and calculations were performed to determine load factors for the TSP groups. The loads at wedge locations on the various TSP were then determined with the application of the appropriate load factors. Based on its review as discussed above, the staff finds the development of the LOCA loads at the TSPs acceptable.

Deformation and Collapse Potential of Tubes

In estimating the number of deformed tubes, the results of TSP crush tests for Model D SGs were used. The applicability of using the Model D tests was based on a comparison of Model D and Model E plate geometries. The criterion for establishing that a tube will undergo permanent deformation and would therefore be susceptible to in-leakage has been previously established from geometrical considerations and has been accepted by the staff. In accordance with the criterion, a deformation of 0.030" or less will not result in significant in-leakage. Using the crush test data, a correlation was developed between an elastic plate load and the number of tubes that would have a deformation of 0.030" or greater. This correlation was used to approximate the number of affected tubes. For the STP Unit 2 analysis, TSP material certifications were available which showed that the actual TSP material property values were greater than the ASME Code minimum values. These actual material property values were used in the analysis. In order to account for the thicker Model E top support plate, loads were scaled down in proportion to the top plate and actual test plate thicknesses. To account for the higher yield strength of the STP Unit 2 TSPs, the yield point of the test plates was scaled up proportionately. Once yielding occurred, the TSPs were assumed to follow the same inelastic slope as the test plates. The applied combined loadings were then compared with the expected load to cause permanent deformation of the STP Unit 2 TSPs. On this basis, it was determined that no tubes in the wedge regions will experience a diametral deformation of greater than 0.030" at the STP Unit 2 SGs.

3.3 Summary

Based on its review of the SG tube exclusion analysis as discussed above, the staff concurs with the licensee's assessment that there are no tubes which need to be excluded from application of the voltage-based repair criteria due to a collapse potential during a worst case accident condition.

4.0 ASSESSMENT OF RADIOLOGICAL CONSEQUENCES

4.1 Discussion

The licensee proposes to change their TSs to implement a voltage-based alternate SG tube plugging repair criteria per the requirements of NRC GL 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking". In their license amendment submittal dated February 16, 1998, the licensee requested that the specific activity limits of dose equivalent ^{131}I in the primary coolant be established at 1.0 μCi/g for the 48-hour limit and at 60 μCi/g for the maximum instantaneous limit (in accordance with GL 95-05). The allowable activity level of dose equivalent ^{131}I in the secondary coolant was assumed to be equal to the TS limit of 0.1 μCi/g. This license amendment also requested that STP be approved to operate based upon a 15.4 gpm (at room temperature and pressure) primary to secondary leak initiated by an accident in the faulted SG and an allowable value for primary to secondary leakage from each of the three intact SGs of 130 gpd per SG (which is within the TS limit of 150 gpd). As part of this amendment request, the licensee performed an assessment of the radiological dose consequences of an MSLB accident. The licensee found the radiological dose consequences of incorporating these proposed changes to be acceptable based on the NRC acceptance criteria for doses at the Exclusion Area Boundary (EAB), the Low-Population Zone (LPZ), and the control room.

4.2 Evaluation

The staff reviewed the licensee's calculations and performed confirmatory calculations to check the acceptability of the licensee's methodology and resulting doses. As part of the staff's review, the staff calculated the doses resulting from an MSLB accident using the methodology associated with Standard Review Plan (SRP) 15.1.5, Appendix A. The staff performed two separate assessments. One was based upon a pre-existing iodine spike activity level of 60 μCi/g of dose equivalent ^{131}I in the primary coolant and the other was based upon an accident initiated iodine spike. For the accident initiated spike case, the staff assumed that the primary coolant activity level was 1.0 μCi/g of dose equivalent ^{131}I. The accident initiated an increase in the release rate of iodine from the fuel by a factor of 500 over the normal release rate to maintain an activity level of 1.0 μCi/g of dose equivalent ^{131}I in the primary coolant. For these two cases, the staff calculated the thyroid doses for individuals located at the EAB and at the LPZ. The staff also calculated the thyroid dose to the control room operator. The parameters which were utilized in the staff's assessment are presented in Table 1. For the control room makeup and recirculation flow rates, the staff used the TS flow rate value less ten percent, as allowed by the TSs. The EAB, LPZ, and control room doses calculated by the staff are presented in Table 2.

The staff's calculations confirmed that the doses from a postulated MSLB accident meet the acceptance criteria and that the licensee's calculations are acceptable. The results of both the licensee's and staff's calculations showed that the thyroid doses at the EAB and LPZ would be less than the guidelines established by SRP 15.1.5, Appendix A of NUREG-0800 (acceptance criterion of 300 rem thyroid dose at the EAB and LPZ for the pre-existing spike case and 30 rem thyroid dose at the EAB and LPZ for the accident initiated spike case). The control room operator thyroid dose would be less than the guidelines of SRP 6.4 of NUREG-0800 (acceptance criterion of 30 rem thyroid to the control room operator).

4.3 Summary

Based on the above, the staff approves the licensee's request to implement a voltage-based repair criteria for the SG TSP intersections at STP Unit 2. Use of this voltage-based repair criteria will permit the licensee to maintain specific activity limits of dose equivalent ^{131}I in the primary coolant of 1.0 μCi/g for the 48-hour limit and 60 μCi/g for the maximum instantaneous limit, as well as restricting the allowable maximum primary to secondary coolant leakage to 15.4 gpm.

5.0 PROPOSED CHANGES TO TSs AND ASSOCIATED BASES

Surveillance Requirement (SR) 4.4.5.2.e deletes "For Unit 1." This surveillance requirement is proposed to be applicable to both Unit 1 and Unit 2. The SR directs the utility to inspect 100-percent bobbin coil for hot-leg and cold-leg TSP intersections down to the lowest cold-leg tube support plate with known ODSCC indications, for implementation of the tube/TSP repair criteria. This change follows the guidance of GL 95-05 and the staff finds it acceptable.

SR 4.4.5.4.a.7) and SR 4.4.5.4.a.12) also deletes "For Unit 1." This modification to the acceptance criteria allows the definitions to be applied to both Unit 1 and Unit 2. This is acceptable based on the staff's finding that the proposed alternate repair criteria is consistent with GL 95-05.

SR 4.4.5.4.a.12) adds the wording of "mill annealed" to clarify that the voltage-based alternate repair criteria is to be applied to mill annealed alloy 600. This clarifies that the voltage-based alternate repair criteria is not applicable to the thermally treated alloy 600 tubes in SG D, Unit 2. The staff finds this modification acceptable.

SR 4.4.5.4.a.12)c) adds the word "of." This modification is grammatical in nature and is therefore, acceptable.

SR 4.4.5.4.a.12)d) adds the wording of "Unit 1." This modification clarifies that certain intersections at Unit 1 are excluded from application of the voltage-based repair criteria. This is acceptable because the licensee's analysis shows that the alternate repair criteria of GL 95-05 is not appropriate for these Unit 1 intersections.

SR 4.4.5.4.a, Note 1, deletes reference to 7/8-inch diameter tubing. Neither unit at STP has 7/8-inch tubing and the staff agrees with the licensee that the wording is unnecessary.

SR 4.4.5.5.d. deletes "Unit 1," indicating that the notification requirements are required for both Unit 1 and Unit 2.

TS Bases 3/4.4.5 deletes "For Unit 1," to indicate that the voltage-based repair limits of SR 4.4.5 are applicable to both Unit 1 and Unit 2, and it adds a phrase to indicate that the criteria of GL 90-05 are also applicable to the Unit 2 FDBP intersections. This change is consistent with the staff's evaluation and is acceptable.

TS Bases 3/4.4.6 clarify the SG leakage limits discussion to now be applicable to both Unit 1 and Unit 2.

The staff finds the TS and Bases changes to be consistent with GL 95-05 and therefore, are acceptable.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Texas State official was notified of the proposed issuance of the amendments. The State official had no comments.

7.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (63 FR 27765). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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TABLE 1
INPUT PARAMETERS FOR SOUTH TEXAS UNIT 2
EVALUATION OF MAIN STEAMLINE BREAK ACCIDENT

1. Primary Coolant Concentration of 60 μCi/g of Dose Equivalent ^{131}I

Pre-existing Spike Value (μCi/g)

^{131}I = 46.3
^{132}I = 54.0
^{133}I = 73.3
^{134}I = 11.0
^{135}I = 40.5

2. Data on Primary Coolant and Secondary Coolant

Primary Coolant Volume (ft^3)	13,103
Primary Coolant Temperature (°F)	592
Secondary Coolant Liquid Mass (pounds/SG)	142,441
Secondary Coolant Steam Mass (pounds/SG)	13,109
Secondary Coolant Operating Temperature (°F)	556
Feedwater Temperature (°F)	390

3. TS Limits for DE ^{131}I in the Primary and Secondary Coolant

Maximum Instantaneous DE ^{131}I Concentration (μCi/g)	60.0
Primary Coolant DE ^{131}I Concentration (μCi/g)	1.0
Secondary Coolant DE ^{131}I Concentration (μCi/g)	0.1

4. TS Value for the Primary to Secondary Leak Rate (gpm)

Primary to secondary leak rate, maximum per intact SG	130
Primary to secondary leak rate, maximum for faulted SG	210
Primary to secondary leak rate, total all 4 SGs	600

5. Maximum Primary to Secondary Leak Rate to the Faulted and Intact SGs

Faulted SG (gpm)	15.4
Intact SGs (gpm/SG)	0.1

6. Iodine Partition Factor

Faulted SG	1.0
Intact SG	0.01

7. Steam Released to the Environment (lbs)

Faulted SG (0 - 30 minutes)	210,000
Intact SGs (0 - 2 hours)	484,000
Intact SGs (2 - 8 hours)	1,106,000

8. Letdown Flow Rate (gpm) 100

9. Release Rate for 1.0 μCi/g of Dose Equivalent ^{131}I

	Release Rate (Ci/hr)	500X Release Rate (Ci/hr)
^{131}I =	12.78	6,390
^{132}I =	83.2	41,600
^{133}I =	29.6	14,790
^{134}I =	39.8	19,900
^{135}I =	28.6	14,300

10. Atmospheric Dispersion Factors

	sec/m^3
EAB (0-2 hours)	* 1.4×10^{-4}
LPZ (0-8 hours)	* 1.9×10^{-5}
Control Room	* 1.7×10^{-2}

11. Control Room Parameters

Filter Efficiency (%) (E/O/P)	
Air Intake Filter	99/ 94.32/ 98.86
Air Recirculation Filter	99/ 95/ 95
Volume (ft^3)	280,000
Makeup Flow (cfm)	1,800
Filtered Recirculation Flow (cfm)	9,000
Unfiltered Inleakage (cfm)	10
Occupancy Factors	
0-1 day	1.0
1-4 days	0.6
4-30 days	0.4

* NRC staff calculated values

Table 2 - THYROID DOSES FROM SOUTH TEXAS UNIT 2 MAIN STEAM LINE BREAK ACCIDENT (REM) (VALUES CALCULATED BY NRC STAFF)

	DOSE	
LOCATION	**Pre-Existing Spike**	**Accident-Initiated Spike****
EAB	15.3*	10.0
LPZ	7.8*	19.7
Control Room **	6.86	17.86

* Acceptance Criterion = 300 rem thyroid
** Acceptance Criterion = 30 rem thyroid