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United States Nuclear Regulatory Commission
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**REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS TO REVISE
STEAM GENERATOR TUBE SURVEILLANCE REQUIREMENTS IN
ACCORDANCE WITH WCAP-14797, REVISION 2 (W* METHODOLOGY)
SALEM GENERATING STATION - UNIT 2
DOCKET NO. 50-311
FACILITY OPERATING LICENSE NO. DPR-75**

In accordance with the provisions of 10 CFR 50.90, PSEG Nuclear LLC (PSEG) hereby transmits a request for amendment to Facility Operating License No. DPR-75 for Salem Generating Station Unit 2.

The proposed amendment will modify the Salem Unit 2 Technical Specifications by changing the scope of the steam generator (SG) tube sheet inspections required in the SG tubesheet region, using a modified application of the W* methodology (W* as defined in WCAP-14797, Revision 2). The proposed change requires that any tube identified with service induced degradation in the W* distance be removed from service by tube plugging. In addition, the W* distance shall be conservatively defined as a minimum of 8.0 inches below the top of the tubesheet (TTS) or the W* distance as defined in WCAP-14797 Revision 2, whichever is greater. This proposal is a conservative, limited scope application of the complete W* methodology as described in WCAP-14797, Revision 2, since Salem proposes to plug tubes with any service induced degradation within the W* distance. These changes will achieve full compliance for Salem Unit 2 with the NRC's position described in Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections".

These changes will be in effect until the replacement of Salem Unit 2 SGs that is currently scheduled for refueling outage 2R16, which will begin in the spring of 2008. A revision to the Technical Specifications will be submitted to accommodate the new model SGs.

APD1

PSEG has evaluated the proposed changes in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and has determined this request involves no significant hazards considerations.

Attachment 1 provides an evaluation of the proposed changes. Attachment 2 provides Westinghouse LTR-CDME-05-30-P (proprietary), "W* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination Based on WCAP-14797, Revision 2." Attachment 3 contains the Westinghouse affidavit on conforming to the provisions of 10CFR2.390 for withholding the proprietary letter from public disclosure. Attachment 4 provides Westinghouse LTR-CDME-05-30-NP (non-proprietary), "W* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination Based on WCAP-14797, Revision 2." Attachment 5 contains the existing TS pages marked up to show the proposed changes. Attachment 6 provides the existing TS bases pages marked up to show the proposed changes.

PSEG requests a 60-day implementation period after amendment approval. Approval of this change is requested by August 18, 2006 to support Salem Generating Station Unit 2 refueling outage 2R15.

Should you have any questions regarding this request, please contact Mr. Paul Duke at (856) 339-1466.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 9/20/05
(Date)

Sincerely,



Thomas P. Joyce
Site Vice President
Salem Generating Station

Attachments (6)

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P. O. Box 415
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**AFFIDAVIT FOR WITHHOLDING PROPRIETARY INFORMATION FROM
PUBLIC DISCLOSURE IN ACCORDANCE WITH 10CFR2.390**

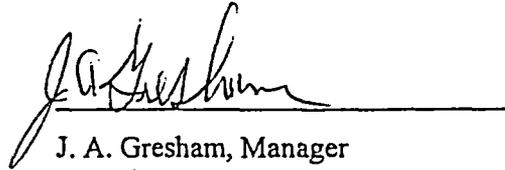
AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared J. A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



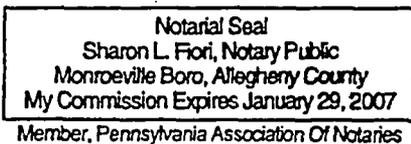
J. A. Gresham, Manager

Regulatory Compliance and Plant Licensing

Sworn to and subscribed
before me this 28th day
of June, 2005



Notary Public



- (1) I am Manager, Regulatory Compliance and Plant Licensing, in Nuclear Services, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

 - (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
- (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

- (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
- (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in LTR-CDME-05-30-P, "W* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination Based on WCAP-14797, Revision 2" (Proprietary) dated June 2005. This information is provided in support of a submittal to the Commission, being transmitted by the Public Service Electric and Gas Company letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for Salem Unit 2 is expected to be applicable to other licensee submittals in support of implementing a limited inspection of the tube joint with a rotating probe within the tubesheet region of the steam generators.

This information is part of that which will enable Westinghouse to:

- (a) Provide documentation of the analyses, methods, and testing for the implementation of the limited inspection length of the steam generator tube joint using the W* criteria.
- (b) Provide a primary-to-secondary leakage evaluation for Salem Unit 2 during all plant conditions.
- (c) Assist the customer to respond to NRC requests for additional information.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for licensing documentation.
- (b) Westinghouse can sell support and defense of this information to its customers in the licensing process.
- (c) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar licensing support documentation and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

**SALEM GENERATING STATION – UNIT 2
FACILITY OPERATING LICENSES NOS. DPR-75
DOCKET NO. 50-311**

**CHANGE TO TECHNICAL SPECIFICATIONS TO REVISE STEAM GENERATOR
TUBE SURVEILLANCE REQUIREMENTS IN ACCORDANCE WITH WCAP-14797,
REVISION 2 (W* METHODOLOGY)**

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**SALEM GENERATING STATION - UNIT 2
DOCKET NO. 50-311
CHANGE TO TECHNICAL SPECIFICATIONS TO REVISE STEAM
GENERATOR TUBE SURVEILLANCE REQUIREMENTS IN ACCORDANCE
WITH WCAP-14797, REVISION 2 (W* METHODOLOGY)**

1.0 DESCRIPTION

This letter requests an amendment to Operating License DPR-75 for Salem Generating Station Unit 2. PSEG Nuclear LLC (PSEG) is proposing to modify the Salem Unit 2 Technical Specifications (TS) changing the scope of the steam generator (SG) tube sheet inspections required in the SG tubesheet region, using a modified application of the W* methodology (W* as defined in WCAP-14797, Revision 2). The proposed change requires that any tube identified with service induced degradation in the W* distance be removed from service by tube plugging. In addition, the W* distance shall be conservatively defined as a minimum of 8.0 inches below the top of the tubesheet (TTS) or the W* distance as defined in WCAP-14797, Revision 2, whichever is greater. This proposal is a conservative, limited scope application of the complete W* methodology as described in WCAP-14797, Revision 2, since Salem proposes to plug tubes with any service induced degradation within the W* distance.

After implementation, any degradation occurring below the W* distance may remain in service regardless of its axial or circumferential extent. The amendment will be based on portions of WCAP-14797, Revision 2, entitled "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTX Expansions," and supporting information developed in Westinghouse LTR-CDME-05-30, entitled "W* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination."

This amendment addresses NRC Generic Letter (GL) 2004-01 with respect to defined tube inspection depth below the TTS, using supplemental inspection techniques qualified for flaw detection in expanded tubesheet conditions, such as RPC (rotating probe coil) or array probes. Hereafter, use of the terminology "RPC" inspection also includes RPC equivalent inspection technology.

2.0 PROPOSED CHANGE

PSEG proposes to modify Salem Unit 2 TS 3/4.4.6, Steam Generators surveillance requirements, based on WCAP-14797 Revision 2 and supporting information developed in LTR-CDME-05-30. The Salem Unit 2 proposed change requires a 100 percent inspection of the in-service tubes in the hot leg (HL) tubesheet limited to eight inches below the TTS, or the W* distance as defined in WCAP-14797 Revision 2, whichever is greater. Any tube identified with service

induced degradation in the W^* distance must be removed from service by tube plugging. This proposal is a conservative limited scope application of the complete W^* methodology as described in WCAP-14797 Revision 2, since Salem proposes to plug tubes with any service induced degradation within the W^* distance. The proposed TS changes are as follows:

1. Add TS 4.4.6.2.d to provide a new requirement for a 100 percent inspection of the hot-leg tubesheet W^* distance.
2. Revise TS 4.4.6.4.a.6 to change the current definition of "Plugging Limit" to account for plugging all service induced degradation in the W^* distance.
3. Revise TS 4.4.6.4.a.8, "Tube Inspection" definition to exclude the portion the tube below the W^* distance.
4. Add TS 4.4.6.4.a.10, TS 4.4.6.4.a.11, and TS 4.4.6.4.a.12 definitions related to the application of W^* .
5. Add TS 4.4.6.5.b.4 to include reporting requirements for W^* indications and postulated leakage.
6. Revise Bases 3/4.4.6 to add information that explains the basis for the WEXTEx inspections utilizing W^* .

3.0 BACKGROUND

3.1 Reason for Requested Changes

This license change request addresses PSEG's response to GL 2004-01, as documented in PSEG LR-N04-0433 dated October 29, 2004. PSEG stated its intent to improve the Salem Unit 2 TS and achieve consistency with the NRC's position by submitting a License Change Request utilizing WCAP-14797, Revision 2 as the basis for limited inspections in the tubesheet region.

3.2 Salem Unit 2

Salem Unit 2 is a 4-loop, Westinghouse-designed plant with Model 51 SGs. The SG tubes are mill-annealed Alloy 600 with an outside diameter of 0.875 inch and a wall thickness of 0.050 inch. Each U-tube is roll expanded for approximately 2.75 inches into the bottom of the tubesheet, then secured into the remaining portion of the tubesheet by an explosive expansion process referred to as the Westinghouse Explosive Tube Expansion (WEXTEx) process. The WEXTEx process expands each tube over its entire length of the tubesheet and forms an interference fit between the tube and tubesheet. This interference fit provides the structural and partial leak tight boundary between the primary and secondary systems at each SG tube end. Located near the top of the tubesheet is a region where the tube transitions from the tubesheet hole diameter to that of the original tube. This region is referred to as the WEXTEx transition region.

3.3 WCAP-14797 (W*)

Existing plant TS tube repair/plugging criteria apply throughout the tube length and do not take into account the reinforcing effect of the tubesheet on the external surface of an expanded tube. The tubesheet constrains the tube and complements tube integrity in that region by essentially precluding tube deformation beyond the expanded outside diameter. The resistance to both tube rupture and tube collapse is significantly enhanced by the tubesheet. In addition, the proximity of the tubesheet in the expanded region significantly reduces the leakage of through wall tube cracks. Based on these considerations, alternate repair criteria to the portion of tubing expanded by the WEXTEx process is supported by testing and analysis results included in WCAP-14797, Revision 2.

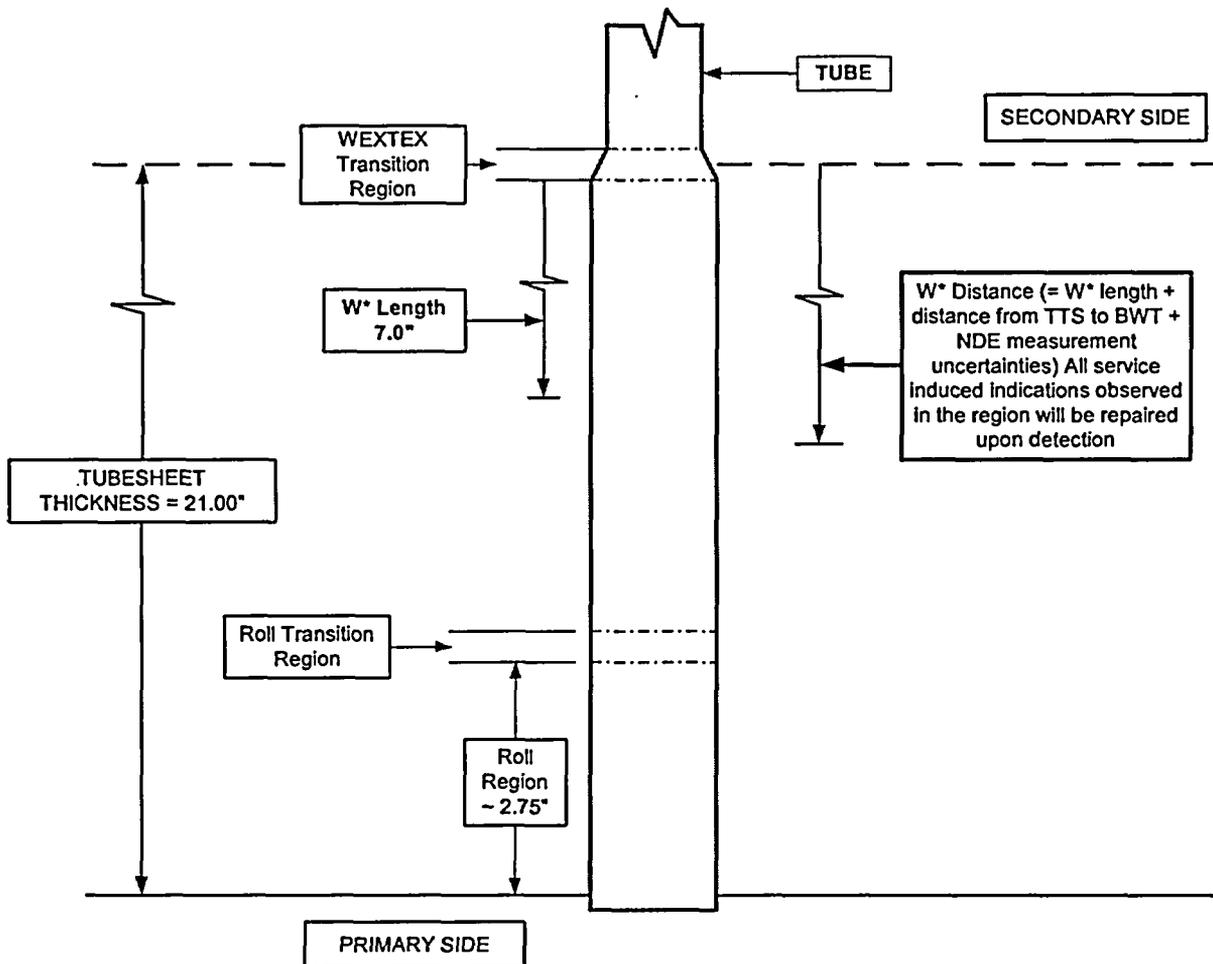
For the Salem Unit 2 Westinghouse Model 51 Series SGs with WEXTEx expansions, the full depth tube-to-tubesheet expansion can be defined as follows: from the lower tube end and extending upward for a length of approximately 2.75 inches is a region expanded by a tube rolling expansion process, from the top of the rolled expansion region to the vicinity of the TTS the expansion joint was produced by the WEXTEx process. The resulting full depth tube-to-tubesheet expansion can be considered as four distinct areas. These are described in WCAP-14797 Revision 2 and depicted in the sketch on the following page as:

1. The Roll Region – The tube region that has been expanded by the tube rolling process. This region extends from the bottom of the tube to approximately 2.75 inches above the bottom of the tube.
2. The Roll Transition – The tube region that extends from the roll expanded region to the initially unexpanded region, which is subsequently expanded by the WEXTEx process.
3. The WEXTEx Region – The tube region explosively expanded to be in contact with the tubesheet. This region starts at the roll transition and extends to the WEXTEx transition in the vicinity of the tubesheet top.
4. The WEXTEx Transition – The tube region that acts as a juncture between the WEXTEx region and the unexpanded tube region. The region starts at the top of the explosively expanded region and extends for approximately 0.25 inches.

The alternate SG tube repair criteria, referred to as W*, were developed by Westinghouse to permit tubes with predominantly axially oriented primary water stress corrosion cracking in the WEXTEx and hardroll regions to remain in service. The W* analysis determined the W* length as measured from the bottom of the tube explosive expansion transition that would permit flaws below that length to remain in service. This is based on adequate strength available to

resist the axial pullout loads experienced within the tubesheet during all plant conditions.

Sketch of W* Distance in Salem Unit 2 Steam Generator Tube Sheet



The following definitions describe the W* criteria:

BWT – The bottom of the WEXTEX Transition is defined in WCAP-14797, Rev. 2, as approximately 0.25 inches from the top of the tubesheet.

W* length – The maximum length of tubing below the bottom of the WEXTEX transition (BWT) which must be demonstrated to be non-degraded and is defined in WCAP-14797, Rev. 2, Section 4.0 as 7.0 inches below the bottom of the WEXTEX transition on the hot leg side.

W* distance – The distance from the top of the tubesheet to the bottom of the W* length including the distance from the top of the tubesheet to the BWT and measurement uncertainties.

The W^* analysis provides the basis for tubes with any form of degradation below the W^* length to remain in service. The surrounding tubesheet prevents tube rupture and provides resistance against axial pullout loads during normal and accident conditions, as discussed in WCAP-14797, Revision 2. Any primary-to-secondary leakage from tube degradation below the W^* length is acceptably low as discussed in WCAP-14797, Revision 2 and LTR-CDME-05-30. WCAP-14797, Revision 2 and LTR-CDME-05-30 provide that both SG tube structural and leakage integrity will meet the required performance criteria of NEI 97-06 and necessary regulatory criteria provided below.

- General Design Criteria (GDC) 1, 2, 4, 14, 30, 31, and 32 of 10 CFR 50, Appendix A, define requirements for the reactor coolant pressure boundary (RCPB) with respect to structural and leakage integrity.
- GDC 19 of 10 CFR 50, Appendix A, defines the radiation protection requirements for the operators working within the control room. Accidents involving SG tube leakage or bursts comprise a challenge to the control room habitability.
- 10 CFR 50, Appendix B, establishes quality assurance requirements for the design, construction and operation of safety related components. This appendix applies to all activities affecting the safety related functions of these components including, inspection, testing, operation and maintenance. Criteria IX, XI and XVI of Appendix B apply to the SG tube integrity program defined by NEI 97-06, Rev. 1 "Steam Generator Program Guidelines."
- 10 CFR 100, specify criteria to establish a reactor site risk of public exposure to the release of radioactive fission products. Accidents involving SG tube leakage or burst may compromise a challenge to the containment and thus involve an increased risk of radioactive release.

Compliance to the TS SG tube repair limits and normal operating and accident-induced primary-to-secondary leakage limits, provides reasonable assurance that the SG tubing remains capable of fulfilling its specific safety function of maintaining the reactor coolant pressure boundary.

The W^* methodology is described in WCAP-14797, Revision 2 (Proprietary) and WCAP-14798 (Nonproprietary), Revision 2, "Generic W^* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTX Expansions." Westinghouse Letter Report LTR-CDME-05-30-P (Proprietary) and LTR-CDME-05-30-NP (Nonproprietary), " W^* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination" is provided as Attachment 2 (Proprietary) and Attachment 4 (Nonproprietary). These reports detail the analyses and testing performed to verify the adequacy of the W^* methodology for Salem Unit 2.

4.0 TECHNICAL ANALYSIS

PSEG is proposing to modify the Salem Unit 2 TS in accordance with section 2 of this evaluation. The proposed changes alter the tube inspection scope to exclude the portion of the tube within the tubesheet below the W^* distance, and remove from service by tube plugging any service induced degradation identified in the W^* distance. In addition, the W^* distance shall be conservatively defined as a minimum of 8.0 inches below the TTS, or the W^* distance as defined in WCAP-14797, Revision 2, whichever is greater. This amendment request is based on WCAP-14797, Revision 2 and LTR-CDME-05-30. This proposal is a conservative limited scope application of the complete W^* methodology, since Salem proposes to plug tubes with any service induced degradation within the W^* distance as described in WCAP-14797, Revision 2. WCAP-14797, Revision 2 was developed for Westinghouse fabricated SGs that utilized the WEXTEx tube expansion process, including Salem Unit 2, for application of W^* methodology. The W^* methodology accounts for the reinforcing effect that the tubesheet has on the external surface of the SG tube within the tubesheet region. The W^* methodology shows that tube integrity and leakage below the W^* distance remain within the existing design limits. The W^* criteria were developed for the tubesheet region of 51 Series SGs considering the most stringent loads associated with plant operation, including transients and postulated accident conditions. The W^* criteria were selected to prevent tube burst and axial separation due to axial pullout forces acting on the tube, and to ensure that the steam line break (SLB) leakage limits are not exceeded; thus satisfying the Regulatory Guide (RG) 1.121 criteria.

Conceivably, a 360-degree through-wall circumferential crack or a significant number of axially oriented cracks could permit tube severing and pullout from the tubesheet, when the tube is subjected to axial forces from primary-to-secondary pressure differentials. The W^* criteria were developed to allow certain tubes with indications in the W^* distance in the tubesheet region to remain in service, while precluding tube pullout from the tubesheet under axial loading conditions. A non-degraded W^* length is required such that the tube-to-tubesheet contact pressures integrated over the W^* length are sufficient to compensate for the axial forces on the tube and thus prevent tube pullout.

Loading analyses were conducted per RG 1.121 requirements for both the $3\Delta P$ normal operating load and the limiting faulted condition load (with the applicable safety factor applied). To prevent pullout, these loads must be reacted by the axial restraint afforded by the contact pressure between the tube and tubesheet times the friction coefficient of the tube-to-tubesheet interface acting over some interface length. Contact pressure between the tube and tubesheet is a function of the WEXTEx expansion pressure, and primary-to-secondary pressure and temperature differentials. The W^* length is defined as the length of non-degraded tube that provides assurance that tube pullout criteria are met for the

most limiting loading scenario (the 3ΔP operating condition loading). The WCAP-14797, Revision 2 bounding generic methodology parameters used in the calculation of the W^* length are conservative for Salem Unit 2.

The generic W^* methodology detailed in WCAP-14797, Revision 2 is applicable to the Salem Unit 2 SGs and defines the maximum hot leg W^* length for pullout resistance as 7.0 inches below the bottom of the WEXTEx transition. An allowance for Non-Destructive Examination (NDE) uncertainties in measuring the W^* length must also be considered, and therefore the maximum NDE uncertainty on the W^* length is defined in WCAP-14797, Revision 2 as 0.12 inch. Consideration of the NDE uncertainty and BWT provides the W^* distance, and is defined in WCAP-14797, Revision 2, as the non-degraded distance from the top of the tubesheet to the bottom of the W^* length, including the distance from the top-of-tubesheet to the bottom of the WEXTEx transition (BWT) and Non-Destructive Examination (NDE) measurement uncertainties (i.e., W^* distance = W^* length + distance to BWT + NDE uncertainties). PSEG conservatively defines the W^* distance as a minimum of 8.0 inches below the TTS, or the W^* distance as defined in WCAP-14797, Revision 2, whichever is greater. The W^* methodology provides the basis for tubes with any form of degradation below the W^* distance to remain in service. This includes a tube with a 360 degree circumferential through wall crack located just below the W^* distance, which would not be pulled out by the worst-case steam line break (SLB) axial loads on the tube. The presence of the surrounding tubesheet prevents tube rupture and provides resistance against axial pullout loads during normal and accident conditions. In addition, any primary-to-secondary leakage from tube degradation below the W^* distance would contribute negligible leakage for a postulated SLB accident. Consequently, any tube degradation that may go undetected in this area would not affect structural or leakage margins.

To reduce the probability and consequences of SG tube rupture or tube failure, PSEG performs examinations (RPC or equivalent), in critical regions for crack-like indications that would not be easily identified with the bobbin coil probe. These critical regions are based on a degradation assessment where potential and active degradation is expected in SG tubes that could challenge structural and/or leakage integrity if the tubes are not removed from service via tube plugging.

The critical region of the tubes in the tube-to-tubesheet expansion in Westinghouse Model 51 SGs with WEXTEx explosive expansions is defined as the W^* length. The W^* length is defined for Salem Unit 2 in WCAP-14797, Revision 2, considering the most stringent loads associated with plant operation, including transients, and accident conditions. The W^* distance is the total RPC probe inspected length as measured downward from the top of the tubesheet including the distance to the BWT and includes the NDE uncertainty. The full W^* length of tubing must be demonstrated to be non-degraded below the BWT. If

service-induced degradation is found within the W^* distance, the tube must be removed from service. Below the W^* distance, any degradation is acceptable.

Salem Unit 2 does not use WCAP-14797, Revision 2 to leave degraded tubes in service using the W^* methodology. PSEG's proposed change for Salem Unit 2 requires that any service induced degradation identified in the W^* distance be removed from service by tube plugging. The WCAP is only used to define the length of tubing that will be inspected (RPC probe or equivalent), to remove degraded tubes from service by plugging. PSEG will implement the following W^* repair criteria and acceptance criteria:

1. All service-induced indications within the W^* distance must be removed from service by tube plugging.
2. Any type or combination of tube degradation below the W^* distance is acceptable.

Tube burst is precluded for cracks within the tubesheet by the constraint provided by the tubesheet. The tubesheet constraint satisfies the structural criterion. However, a 360-degree circumferential crack or many axially oriented cracks could permit tube severance and tube pullout from the tubesheet under the axial forces on the tube from primary to secondary pressure differentials. Section 4 of WCAP-14797, Revision 2 describes the testing that was performed to define the length of non-degraded tubing that is sufficient to compensate for the axial forces on the tube and thus prevent pullout. The operating conditions utilized in WCAP-14797, Revision 2 bound the operating conditions for Salem Unit 2. This is also supported by a WCAP-14797, Revision 2 applicability review for Salem Unit 2, provided in section 4 of LTR-CDME-05-30.

Operating experience has demonstrated negligible normal operating leakage from primary water stress corrosion cracking (PWSCC) even under free span conditions in roll transitions. PWSCC in WEXTEx expansion in the tubesheet region would be even further leakage limited by the tight tube-to-tubesheet crevice and the limited crack opening permitted by the tubesheet constraint. The SLB conditions provide the most stringent radiological hazards for postulated accidents involving loss of pressure or fluid in the secondary system. WCAP-14797, Revision 2, describes the methodology for calculating leakage for all cracks left in service and the justification to neglect the total SLB leak rate contributed by cracks below the W^* distance. Therefore, RPC probe inspection (or equivalent) in the area below the W^* distance is not necessary to preclude normal operating or accident induced leakage.

Even though there will be negligible leakage from any type of degradation below the W^* distance, even under SLB conditions, PSEG proposes to postulate a conservative additional leakage below the W^* distance be included in the total

Salem Unit 2 SLB leak rate during postulated SLB conditions, as described in LTR-CDME-05-30.

5.0 REGULATORY SAFETY ANALYSIS

PSEG is proposing to modify the Salem Unit 2 TS to change the scope of the SG tube sheet inspections required in the SG tubesheet region using a modified application of the W^* methodology. W^* is defined in WCAP-14797, Revision 2. The Salem Unit 2 proposed change requires that any tube identified with service induced degradation in the W^* distance be removed from service via plugging of the tube. Since Salem proposes to plug tubes with any service induced degradation within the W^* distance, this proposal is a conservative limited scope application of the complete W^* methodology as described in WCAP-14797, Revision 2.

5.1 No Significant Hazards Consideration

PSEG has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

Of the various accidents previously evaluated, the proposed changes only affect the steam generator tube rupture (SGTR) event evaluation and the postulated steam line break (SLB) accident evaluation. Loss-of-coolant accident (LOCA) conditions cause a compressive axial load to act on the tube. Therefore, since the LOCA tends to force the tube into the tubesheet rather than pull it out, it is not a factor in this amendment request. Another faulted load consideration is a safe shutdown earthquake (SSE); however, the seismic analysis of Westinghouse 51 Series SGs has shown that axial loading of the tubes is negligible during an SSE.

PSEG's amendment request takes credit for how the tubesheet enhances the tube integrity in the Westinghouse Electric Company explosive tube expansion (WEXTEx) region by precluding tube deformation beyond its initial expanded outside diameter. For the SGTR and SLB events, the required structural margins of the SG tubes will be maintained due to the presence of the tubesheet. Tube rupture is precluded for axial cracks in the WEXTEx region due to the constraint provided by the tubesheet. Therefore, the normal operating $3\Delta P$ margin and the postulated accident $1.43\Delta P$ margin against burst are maintained.

The W^* length supplies the necessary resistive force to preclude pullout loads under both normal operating and accident conditions. The contact pressure results from the WEXTEx expansion process, thermal expansion mismatch between the tube and tubesheet, and from the differential pressure between the primary and secondary side. Therefore, the proposed change results in no significant increase in the probability or the occurrence of an SGTR or SLB accident.

The proposed changes do not affect other systems, structures, components or operational features. Therefore, based on the above evaluation, the proposed changes do not involve a significant increase in the probability of an accident previously evaluated.

The consequences of an SGTR event are primarily affected by the primary-to-secondary flow rate and the time duration of the primary-to-secondary flow during the event. Primary-to-secondary flow rate through a postulated ruptured tube (i.e., complete severance of a single SG tube) is not affected by the proposed change since the flow rate is based on the inside diameter of a SG tube and the pressure differential. PSEG's amendment request does not change either of these. The duration of primary-to-secondary leakage is based on the time required for an operator to determine that a SGTR has occurred, the time to identify and isolate the faulted SG, and ensure termination of radioactive release to the atmosphere from the faulted SG. PSEG's amendment request does not affect the duration of the primary-to-secondary leakage because it does not change the control room indicators with which an operator would determine that an SGTR has occurred. The consequences of an SGTR are secondarily affected by primary-to-secondary leakage, which could occur due to axial cracks remaining in service in the WEXTEx region in a non-faulted SG. During a SGTR, the primary-to-secondary differential pressure is less than or equal to the normal operating differential pressure; therefore, the primary-to-secondary leakage due to axial cracks in the WEXTEx region of a non-faulted SG during a SGTR would be less than or equal to the primary-to-secondary leakage experienced during normal operation. Primary-to-secondary leakage is considered in the calculation determining the consequences of a SGTR and the value is bounding.

The postulated SLB has the greatest primary-to-secondary pressure differential, and therefore could experience the greatest primary-to-secondary leakage. PSEG's amendment request requires the aggregate leakage, (i.e., the combined leakage for the tubes with service induced degradation inside the tubesheet) to remain below the maximum allowable SLB primary-to-secondary leakage rate limit such that the doses are maintained to less than the 10 CFR 100 limits and also less than the GDC-19 limits.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

PSEG's amendment request does not introduce any physical changes to the Salem Unit 2 SGs. PSEG's amendment request takes credit for how the tubesheet enhances the SG tube integrity in the WEXTEx region. Because degradation detected within the W^* distance are required to be plugged, it is highly unlikely that a tube would fail as a result of a circumferential defect. Therefore a tube severance, which would strike neighboring tubes and create a multiple tube rupture, is not credible. The proposed change does not introduce any new equipment or any change to existing equipment. No new effects on existing equipment are created. Based on the above evaluation, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The amendment request maintains the structural margins of the SG tubes for both normal and accident conditions that are required by Regulatory Guide 1.121. For cracking located within the tubesheet, tube burst is precluded due to the presence of the tubesheet. WCAP-14797, Revision 2 defines a length W^* of degradation free expanded tubing, that provides the necessary resistance to tube pullout due to the pressure induced forces (with applicable safety factor applied). Application of the W^* methodology will preclude unacceptable primary-to-secondary leakage during all plant conditions. The methodology for determining leakage provides for large margins between calculated and actual leakage values in the W^* criteria.

Based on the above, it is concluded that the proposed changes do not result in a significant reduction of margin with respect to plant safety as defined in the Updated Final Analysis Report or Technical Specifications. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, PSEG concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92, and accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

The regulatory requirements associated with SG tube inspections include the following:

10 CFR 50 Appendix A Criterion 14 - Reactor Coolant Pressure Boundary - The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and gross rupture.

10 CFR 50 Appendix A Criterion 15 - Reactor Coolant System Design - The reactor coolant system and associated auxiliary, control, and protection systems shall be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences.

10 CFR 50 Appendix A Criterion 30 - Quality of Reactor Coolant System Pressure Boundary - Components which are part of the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical. Means shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage.

10 CFR 50 Appendix A Criterion 31 - Fracture Prevention of Reactor Coolant Pressure Boundary - The reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner, and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the boundary material under operating, maintenance, testing, and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual steady state and transient stresses, and (4) size of flaws.

10 CFR 50 Appendix A Criterion 32 - Inspection of Reactor Coolant Pressure Boundary - Components that are part of the reactor coolant pressure boundary shall be designed to permit periodic inspection and testing of important areas and features to assess their structural and leak tight integrity, and an appropriate material surveillance program for the reactor pressure vessel.

Regulatory Guide 1.83, Revision 1 – Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes.

Regulatory Guide 1.121, Revision 0 - Bases for Plugging Degraded Pressurized Water Reactor (PWR) Steam Generator Tubes.

There have been no changes to the plant design such that all of the regulatory requirements are bounded by Salem's existing design basis. PSEG's amendment application revises Salem Unit 2 TS to clearly delineate the scope of the SG inspection required in the tubesheet region. PSEG continues to comply with applicable regulatory requirements.

In conclusion, based on the considerations discussed above, (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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment relates to changes in a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or relates to changes in an inspection or surveillance requirement. The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 50.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

- 7.1 WCAP-14797, Revision 2 (proprietary), "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEx Expansions."
- 7.2 WCAP-14798, Revision 2 (non-proprietary), "Generic W* Tube Plugging Criteria for 51 Series Steam Generator Tubesheet Region WEXTEx Expansions."
- 7.3 LTR-CDME-05-30, "W* Integrity Evaluation for Salem Unit 2 Limited SG Tube RPC Examination."
- 7.4 NRC Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections."
- 7.5 LR-N04-0433, "Response to Generic Letter 2004-01, 'Requirements for Steam Generator Tube Inspections,' Salem Generating Station Unit 1 and Unit 2, dated October 29, 2004."