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1CAN090008

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Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Proposed Technical Specification Change For OTSG Reroll Repair Process

Gentlemen:

Attached for your review and approval is a proposed amendment to Arkansas Nuclear One Unit 1 (ANO-1) Technical Specifications, Section 4.18. The proposed amendment request modifies the existing reroll repair process used to repair tubes with eddy-current indications within the tubesheet region of the ANO-1 Once-Through Steam Generators (OTSGs). The basis for this change is the attached report prepared for Arkansas Nuclear One by Framatome Technologies, Inc. (FTI); Topical Report BAW-2303P, Revision 4, "*OTSG Repair Roll Qualification Report*." This report supports the application of the reroll repair process to the upper and lower tubesheet regions, removal of the limitation of only one reroll per OTSG tube, and permits the installation of overlapping rerolls. BAW-2303P, Revision 4, does not consider the Large Break Loss of Coolant Accident (LBLOCA). The LBLOCA was excluded as a result of the ongoing evaluation of topical report BAW-2374, July 2000, "*Justification for Not Including Postulated Breaks in Large-Bore Reactor Coolant System Piping in the Licensing Basis for Existing and Replacement Once-Through Steam Generators*." BAW-2374 has been submitted separately for NRC review and approval (B&WOG letter to the NRC dated July 7, 2000). Approval of topical report BAW-2374 is also requested in conjunction with the approval and issuance of this ANO-1 Technical Specification change.

Topical report BAW-2303P, Revision 4, is considered proprietary to Framatome Technologies, Inc. (FTI). Accordingly, Entergy Operations requests that the topical report contained in this amendment request be withheld from public disclosure pursuant to the provisions of 10CFR2.790(b)(4). The FTI affidavit supporting the proprietary nature of the topical is provided as enclosure 1. A non-proprietary version of the topical report will be prepared and provided to the NRC in a future submittal.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using the standards of 10CFR50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in the attached submittal.

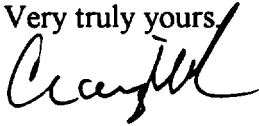
APOI

We request to have the repair options proposed by this amendment request available by the upcoming 1R16 refueling outage scheduled to begin on March 15, 2001. It is anticipated that having these options available will reduce the number of tubes required to be removed from service; thus, improving the unit efficiency, reducing outage cost and radiation exposure. Although this request is neither exigent nor emergency, your prompt review is requested.

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

Executed on September 28, 2000

Very truly yours,

A handwritten signature in cursive script, appearing to read 'CGA/fpv', written over the closing 'yours'.

CGA/fpv
Attachments

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ATTACHMENT
TO
1CAN090008
PROPOSED TECHNICAL SPECIFICATION
AND
RESPECTIVE SAFETY ANALYSES
IN THE MATTER OF AMENDING
LICENSE NO. DPR-51
ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNIT ONE
DOCKET NO. 50-313

DESCRIPTION OF PROPOSED CHANGES

The proposed changes to Arkansas Nuclear One, Unit 1 (ANO-1), Technical Specifications provide for the implementation of a revised reroll repair process for ANO-1 Once-Through Steam Generators (OTSG). Current Technical Specifications limit application of the reroll repair process to repair tubes with defects in the upper tubesheet area only, using a 1 inch roll length. Current TSs allow the reroll repair process to be performed only once per steam generator tube.

The proposed TS change, with technical justification provided in topical report BAW-2303P, Revision 4, "*OTSG Repair Roll Qualification Report*," qualifies repair rolls for installation in both the upper and lower tubesheets. In addition, multiple repair rolls in a single tube are qualified as well as a 1-5/8 inch overlapping repair roll. Finally, ANO-1 plant specific exclusion zones are established for repair roll installation.

The ANO-1 Technical Specifications are proposed to be amended as indicated below:

- 4.18.5.4 This specification is revised to include a description of the updated reroll repair process. The specification is modified as follows:

"Degraded Tube" means a tube containing imperfections $\geq 20\%$ of the nominal wall thickness caused by degradation, except where all degradation has been spanned by the installation of a sleeve or repaired by a rerolled joint.

The reroll repair process can be used to repair tubes with defects in the upper and lower tubesheet areas as described in topical report BAW-2303P."

- 4.18.5.7 This specification is revised to delete the discussion of the reroll repair process as it relates to the tube plugging limits.

- 4.18.5.9 This specification is revised to account for reroll repairs in both tubesheets rather than the upper tubesheet only.

- 4.18 Bases is revised to describe the ANO-1 reroll repair process in accordance with topical report BAW-2303P, Revision 4.

BACKGROUND

The repair roll process has previously been qualified to repair tubes with eddy-current indications within the upper tubesheet region of the Once-Through Steam Generator (OTSG). The repair roll is an expansion installed inboard of the original roll expansion and inboard of the existing defect indication(s). The repair roll provides a frictional joint on undegraded tubing at the new joint within the tubesheet bore, which creates a new leak-limiting primary-to-secondary pressure boundary. The technical basis for the repair roll process currently in use at ANO-1 is

topical report BAW-10232P, Revision 0, *"OTSG Repair Roll Qualification Report (Including Hydraulic Expansion Evaluation)"*, issued in January 1998.

The NRC issued Operating License Amendment 190 to the ANO-1 TSs on April 10, 1998 (1CNA049802), which approved the use of the re-roll technology for the upper tubesheet region of the ANO-1 steam generators. The allowance to apply the re-roll technology was based on Revision 00 to the Framatome Technologies (FTI) topical report BAW-10232P dated January 1998. The report justifies the acceptability of repairing a tube by rolling the tube into the upper tubesheet below the defect location. A repair roll, which is installed below the degraded region of tubing, provides a mechanical joint within the tubesheet bore and creates a new primary pressure boundary within the tube. The repaired joint must be capable of withstanding the axial tube loadings imposed by normal operating and worst case faulted conditions. The repair roll leakage must also be maintained within the design limits.

The flexing of the tubesheets during the limiting transient causes the tubesheet holes in some regions to undergo extended dilation (enlarging). The effects of the tubesheet hole dilations and contact pressure must be evaluated along with the axial tube loads. A finite element model was used to calculate the tube loads and the hole differential dilation as a function of radial tube location from the center of the OTSG. Differential dilation is defined as the average change in the relative difference in the dilation of the tubesheet bore and the tube outside diameter (OD). The bounding SBLOCA maximum axial tube load was determined to be 2257 pounds and occurs at the periphery of the tube bundle. The maximum tubesheet hole differential dilation for a combined worst case radial and tangential dilation occurs near the periphery of the tubesheet.

On September 2, 1999, ANO was notified of the results of an evaluation of a SBLOCA for transient loads and the effect on tubesheet dilation predictions. This evaluation concluded that the SBLOCA transient with regards to structural joint integrity is more limiting than the main steam line break (MSLB) and the design criteria of having no re-roll joint displacement could not be assured for all locations in the tubesheet. Upon initial notification, ANO issued a condition report (CR-1-98-0695) for the potential re-roll joint integrity issue and ensured that operability of existing re-rolled tubes was substantiated. Work commenced expeditiously with FTI to establish the appropriate option to resolve the structural integrity concern and to support additional re-rolls to be installed in the ANO-1 1R15 outage as well as future outages.

By letter dated September 19, 1999 (1CAN099904), Entergy Operations requested an exigent technical specification change to allow continued installation of re-rolls for one cycle of operation through the end of Cycle 16 in conjunction with additional inspection criteria. Approval of the exigent TS change was requested prior to planned heatup from the 1R15 refueling outage, scheduled for October 6, 1999. However, since the published comment period would not permit NRC Staff approval of the TS amendment by the requested date, Entergy Operations chose to withdraw the exigent TS change request and plug the defective steam generator tubes identified at 1R15.

The original evaluation of the loading events contained in BAW-10232P concluded that the MSLB accident provided the bounding conditions for re-roll repairs in the B&W plants. The acceptance criteria for both structural and leakage performance was therefore based on this

transient. The SBLOCA was subsequently identified to have tubesheet dilation effects that were greater than that created by the MSLB event.

In 1999 the B&W Owners Group (B&WOG) initiated a project to fully analyze the effects of Main Steam Line Break (MSLB) and Small Break Loss of Coolant Accident (SBLOCA) on tube stresses and tube-to-tubesheet hole differential dilations. In response to the B&WOG initiative, Framatome Technologies, Inc. (FTI) developed the attached topical report BAW-2303P, Revision 4, *"OTSG Repair Roll Qualification Report."* The purpose of this report is to provide a technical justification to:

- 1) Qualify repair rolls for installation in both the upper and lower tubesheets.
- 2) Qualify multiple repair rolls in a single tube.
- 3) Re-qualify installed repair rolls in the upper tubesheet to accommodate the identification of more limiting Small Break Loss of Coolant Accident (SBLOCA) tube loading.
- 4) Permit installation of overlapping rerolls.

The technical justification for this proposed technical specification change is topical report BAW-2303P, Revision 4. This report has been submitted for NRC review and approval for Oconee Nuclear Station, dated September 12, 2000, and is also provided as an attachment to this submittal. This report provides analysis and qualification of the reroll process which bounds the MSLB and SBLOCA transients. However, BAW-2303P, Revision 4, does not consider the Large Break Loss of Coolant Accident (LBLOCA). The LBLOCA was excluded as a result of the ongoing evaluation of topical report BAW-2374, July 2000, *"Justification for Not Including Postulated Breaks in Large-Bore Reactor Coolant System Piping in the Licensing Basis for Existing and Replacement Once-Through Steam Generators."* This report has been submitted separately for NRC review and approval (B&WOG letter to the NRC dated July 7, 2000). Approval of this topical report is also requested in conjunction with the approval and issuance of this ANO-1 Technical Specification change.

DISCUSSION OF CHANGE

The types of tube degradations expected to be found in the upper tubesheet region are tube end cracks (TEC) near the tube to tubesheet weld at the top of the tubesheet, roll transition cracks as a result of the original roll and installed rerolls, and ODIGA patches that were formed during sulfur intrusion earlier in the OTSG life. The TEC indications are primarily axial in extent and are found in the area near the weld. Tube cracks that extend into the carbon steel from the cladding and any cracks with circumferential extent are required to be repaired or removed from service as discussed in ANO-1 License Amendment 201 and evaluated in topical report BAW-2346P, *"Alternate Repair Criteria for Tube End Cracking in the Tube to Tubesheet Roll Joint of OTSGs,"* Revision 0. Axial flaws that extend from the cladding into the carbon steel or circumferential flaws can be repaired by re-roll. Roll transition indications occur at the interface on the original roll to the nominal tube diameter. These indications are typically axially oriented, however, they may be circumferential in nature. The reroll repair process will be an acceptable

means to repair roll transition indications found in the upper or lower tubesheet. ODIGA patches are unique in that they are primarily volumetric and have not indicated a concern for loss of load carrying capability or leakage contributions. Even though ODIGA patches in the upper tubesheet can be repaired by a reroll process, they pose little or no safety concern for tube wall degradation. Entergy Operations has requested that this degradation mechanism be separately excluded from repair as discussed in our letter dated August 29, 2000 (1CAN080005). However, should an ODIGA indication within the tubesheet require repair, the reroll process would apply.

The OTSG tube region at the location where new re-roll repairs are to be installed will be inspected by normal eddy current measurement techniques. The portion of the tube from the repair to the primary face of the tubesheet is the "outboard" side. The portion of the tube from the repair to the secondary face of the tubesheet is the "inboard" side. After repair roll installation, bobbin profiles are used to confirm diametrical expansion. Inspection with a rotating coil is used to verify that the new effective roll expansion is free of degradation. The means for identifying candidate tubes for repair will be the same as that planned for the normal candidate selection process for re-roll repairs.

The current ANO-1 Technical Specifications for the reroll repair process restricts installation to the upper tubesheet area only. Additionally, the current specification limits the use of the process to once per steam generator tube using a 1 inch roll length. Approval of this amendment request will allow ANO-1 to optimize the use of the reroll repair process in the once-through steam generators. Two types of repair rolls have been developed for installation, a single 1-inch roll expansion and an overlapping roll that consists of two 1-inch roll expansions with an effective minimum length of 1-5/8 inches. There is an additional 1/4-inch roll transition region on each end of the roll expansion. A new leak-limiting pressure boundary is created inboard (toe transition) of the degraded region of the tube.

Both the single repair roll and the overlapping repair roll may be installed in the upper tubesheet or the lower tubesheet. Multiple repair rolls may be installed in a single tube. All repair rolls installed under previous submittals meet the repair roll qualifications of the attached FTI topical report (BAW-2303P, Rev. 4).

Exclusion areas (tubesheet locations not qualified for repair roll installation) have been established for the ANO-1 steam generators, as shown in Appendix A for BAW-2303P, Revision 4. The limiting condition for repair roll installation at ANO-1 is primarily due to dilations greater than 0.5 mils. The limiting SBLOCA at ANO-1 is a surge line break at the hot leg nozzle. Locations predicted to undergo dilation in excess of 0.5 mils were designated as exclusion zones because the condition has not been tested. Repair rolls can be installed in the designated upper and lower tubesheet locations with a leak rate of 3.0E-06 gpm assigned to the calculation of post accident leakage for each repair roll that serves as a pressure boundary.

Although the FTI topical report states that a repair roll is being qualified to slip under specified faulted conditions, proposed reroll repairs in qualified locations (i.e. outside of the ANO-1 specific exclusion zones, as shown in Appendix A of BAW-2303P) are not predicted to slip during faulted accident transients.

The repair roll test program involved the evaluation of OTSG transient conditions to develop a set of bounding conditions for application to single repair rolls and overlapping repair rolls. The transient conditions analyzed were:

- 1) Axial tube loads as a function of tubesheet radial position.
- 2) Tube-to-tubesheet hole differential dilations as a function of tubesheet radial position.
- 3) Tube-to-tubesheet hole differential dilations as a function of depth into the tubesheet.

Slip tests and leak tests were performed to determine the integrity of repair roll joints. The purpose of the leak testing was to quantify leak rates for repair rolls for accident conditions. The purpose of the slip tests was to verify that the repair roll could withstand axial loads during normal operation and accident conditions without benefit from the original roll or the tube-to-tubesheet weld. Repair rolls will actually slip only if the tube is severed outboard of the repair roll. Testing was conservatively performed with the assumption that the tube is severed at the heel transition (360 degree and 100% through-wall circumferential defect). The joint strength margin (actual load / limiting load) was calculated for each tubesheet depth and radial position for the cooldown transient to ensure margin against slip for non-faulted conditions. All locations showed a joint strength margin less than 0.65 with an acceptable margin being less than 1.0. Test results are contained in the attached report BAW-2303P, Revision 4.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

Entergy Operations, Inc. is proposing that the Arkansas Nuclear One Unit 1 (ANO-1) Operating License be amended to revise the requirements associated with the reroll repair process for Once Through Steam Generators (OTSGs). Current ANO-1 Technical Specifications limit application of the reroll repair process to the upper tubesheet area. The process is further limited by existing specifications to be performed only once per steam generator tube using a 1-inch roll length. The proposed amendment will allow application of the reroll repair process to the upper and lower tubesheet areas, remove the limitation of only one reroll per OTSG tube, and permit the installation of overlapping rerolls. These conclusions are evaluated in BAW-2303P, Revision 4, "*OTSG Repair Roll Qualification Report*."

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards considerations using the criteria in 10CFR50.92(c).

OTSG tubesheet areas where reroll installation is excluded are specified in Appendix A of topical report BAW-2303P, Revision 4. The following discussion applies to areas of the OTSG tubesheets where installation of reroll repairs is permitted:

Criterion 1 - Does Not Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.

Two types of repair rolls have been developed for installation in the OTSGs, a single 1-inch roll expansion and an overlapping roll consisting of two 1-inch roll expansions. The overlapping roll provides a minimum of 1-5/8 inch effective roll expansion. There is an additional 1/4-inch roll transition region on each end of the roll expansion and a new leak-limiting pressure boundary is created by the repair roll. Applicable OTSG transient conditions were evaluated to develop a set of bounding test conditions for application to both types of repair rolls. Testing included examination of the effects of crevice deposits, cyclic loading, tube yield strength, differential dilations, axial loads and internal pressure.

Test results conclude that the single 1-inch minimum repair roll is structurally adequate to prevent tube slip during all non-faulted operating transients. A small amount of slippage is acceptable provided the tube does not slip out of the tubesheet and tube bow due to post-faulted transient heatup does not result in tube failure. Exclusion areas are established in the tubesheets to provide assurance that tube will not slip out of the tubesheet. The 1-5/8 inch minimum overlapping roll is structurally acceptable based on the bounding evaluation of the single 1-inch repair roll.

Bounding leak rates are applied based on tubesheet depth and radial position. A post-slip leak rate is applied to any location where there is potential for repair roll slip during a postulated accident. The bounding leak rates are very conservative because the leakage is based on test samples with a full circumferential sever outboard of the repair roll. The majority of the degradation in the tubesheets is comprised of short, axial cracks for which the leakage would be much less under axial tensile loads than for the tested severed tube. In addition, repair rolls will actually slip only if the tube is severed outboard of the repair roll. Since the majority of the degradation in the region of the roll joints has been identified as small axial cracks, the probability of the repair roll maintaining structural integrity is very high and the potential for a joint to slip is very low. The leakage from each repair roll that serves as a pressure boundary is added to the leakage from all other sources and the total leakage must be within current accident analysis limits.

The application of the reroll repair process as described in topical report BAW-2303P, Revision 4 will not alter the conditions assumed in the current ANO-1 accident analysis for OTSG tube failures under postulated accident conditions. In addition, the condition of the OTSG tubes in this region are monitored during regular inspection intervals to assess for evidence of degradation. Any degradation noted will be addressed in the operational assessment and appropriate actions taken.

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

Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.

The reroll process establishes a new pressure boundary for the associated tube in the tubesheet region inboard of the flaw. The new roll transition may eventually develop primary water stress corrosion cracking (PWSCC) and require additional repair. Industry experience with roll transition cracking has shown that PWSCC in roll transitions are normally short axial cracks, with extremely low leak rates. The standard MRPC eddy current inspection during the refueling outages have proven to be successful in detecting these defects.

In the unlikely event the rerolled tube failed and severed completely at the heel transition of the reroll region, the tube would retain engagement in the tubesheet bore, preventing any interaction with neighboring tubes. In this case, leakage is minimized and is well within the assumed leakage of the design basis tube rupture accident. In addition, the possibility of rupturing multiple steam generator tubes is unaffected. Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

Criterion 3 - Does Not Involve a Significant Reduction in the Margin of Safety.

The repair roll is applicable to repairing axial, volumetric, or circumferential indications. Testing was conservatively performed with the assumption that the tube is severed at the heel transition (360 degree and 100% through-wall circumferential defect). The joint strength margin (actual load / limiting load) was calculated for each tubesheet depth and radial position for the cooldown transient to ensure margin against slip for non-faulted conditions. All locations showed a joint strength margin less than 0.65 with an acceptable margin less than 1.0.

A tube with degradation can be kept in service through the use of the reroll process. The new roll expanded interface created with the tubesheet satisfies all of the necessary structural and leakage requirements. Since the joint is constrained within the tubesheet bore, there is no additional risk associated with tube rupture. Therefore, the analyzed accident scenarios remain bounding, and the proposed modifications to the reroll process do not reduce the margin of safety.

Therefore, based upon the reasoning presented above and the previous discussion of the amendment request, Entergy Operations has determined that the requested change does not involve a significant hazards consideration.

ENVIRONMENTAL IMPACT EVALUATION

10 CFR 51.22(c) provides criteria for and identification of licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration, (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released off-site, or (3) result in a significant increase in individual or cumulative occupational radiation exposure. Entergy Operations, Inc. has reviewed this license amendment and has determined that it 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 proposed license amendment. The basis for this determination is as follows:

1. The proposed license amendment does not involve a significant hazards consideration as described previously in the evaluation.
2. As discussed in the significant hazards evaluation, this change does not result in a significant change or significant increase in the radiological doses for any Design Basis Accident. The proposed license amendment does not result in a significant change in the types or a significant increase in the amounts of any effluents that may be released off-site.
3. The proposed license amendment does not result in a significant increase to the individual or cumulative occupational radiation exposure because the leakage from each repair roll that serves as a pressure boundary is added to the leakage from all other sources and the total leakage must be within the technical specification limits. Therefore, this change does not impact the existing limits for primary to secondary leakage and could not increase occupational radiation exposure.

PROPOSED TECHNICAL SPECIFICATION CHANGES

4.18.5 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 the inside or outside of a tube.
4. Degraded Tube means a tube containing imperfections $\geq 20\%$ of the nominal wall thickness caused by degradation, except where all degradation has been spanned by the installation of a sleeve or repaired by a rerolled joint.

The reroll repair process can be used to repair tubes with defects in the upper and lower tubesheet areas as described in topical report, BAW-2303P.

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 limit except where the imperfection has been spanned by the installation of a sleeve. A tube containing a defect in its pressure boundary is defective.
7. Plugging Limit means the imperfection depth at or beyond 40% of the nominal tube wall thickness for which the tube shall be sleeved, rerolled, or removed from service because it may become unserviceable prior to the next inspection. This does not apply during Cycle 16 to ODIGA indications within the defined region of the upper tubesheet. These indications shall be assessed for continued plant operation in accordance with topical report BAW-10235P, Revision 1.

Axially-oriented TEC indications in the tube that do not extend beyond the adjacent cladding portion of the tube sheet into the carbon steel portion are not included in this definition. These indications shall be assessed for continued plant operation in accordance with topical report BAW-2346P, Rev. 0.

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 4.18.4.c.
9. Tube Inspection means an inspection of the steam generator tube from the point of entry completely to the point of exit. For tubes that have been repaired by the reroll process within the tubesheets, that portion of the tube outboard of the new roll can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed.

Bases

The surveillance requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the RCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

In general, steam generator tubes that are degraded beyond the repair limit can either be plugged, sleeved, or rerolled. The steam generator (SG) tubes that are plugged are removed from service by the installation of plugs at both ends of the associated tube and thus completely removing the tube from service. When the tube end cracking (TEC) alternate repair criteria is applied, axially-oriented indications found not to extend from the tube sheet cladding region into the carbon steel region may be left in service under the guidelines of topical report BAW-2346P, Rev. 0. When the upper tubesheet outer diameter intergranular attack (ODIGA) alternate repair criteria is applied, indications found within the defined region of the upper tubesheet may be left in service under the guidelines of topical report BAW-10235P, Revision 1. The defined region begins one inch above the upper tubesheet secondary face and ends at the nearest tube roll transition. Following a SG inspection, an operational assessment is performed to ensure primary-to-secondary leak rates will be maintained within the assumptions of the accident analysis.

Degraded steam generator tubes can also be repaired by the installation of sleeves which span the area of degradation and serve as a replacement pressure boundary for the degraded portion of the tube, thus permitting the tube to remain in service.

Degraded steam generator tubes can also be repaired by the rerolling of the tube in the upper or lower tubesheet to create a new roll area and pressure boundary for the tube. The rerolling methodology establishes a new pressure boundary inboard of the degradation, thus permitting the tube to remain in service. The degraded tube outboard of the new roll area can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed in the tubesheet. The rerolling repair process will be used to repair defects in the upper and lower tubesheet in accordance with BAW-2303P, Revision 4.

All tubes which have been repaired using the reroll process will have the new roll area inspected during future inservice inspections. Defective or degraded tube indications found in the new roll and any indications found in the original roll need not be included in determining the Inspection Results Category for the generator inspection.

The reroll repair process can be used to repair tubes with defects in the upper and lower tubesheet areas. Installation of multiple repair rolls in a single tube is acceptable. The new roll area must be free of detectable degradation in order for the repair to be considered acceptable. After the new roll area is initially deemed acceptable, future degradation in the new roll area will be analyzed to determine if the tube is defective and needs to be removed from service or repaired. The reroll repair process is described in the topical report, BAW-2303P, Revision 4.

MARKUP OF CURRENT ANO-1 TECHNICAL SPECIFICATIONS

(FOR INFO ONLY)

4.18.5 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 the inside or outside of a tube.
4. Degraded Tube means a tube containing imperfections $\geq 20\%$ of the nominal wall thickness caused by degradation, except where all degradation has been spanned by the installation of a sleeve or repaired by a rerolled joint.

The reroll repair process can be used to repair tubes with defects in the upper and lower tubesheet areas as described in topical report, BAW-2303P.

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 limit except where the imperfection has been spanned by the installation of a sleeve. A tube containing a defect in its pressure boundary is defective.
7. Plugging Limit means the imperfection depth at or beyond 40% of the nominal tube wall thickness for which the tube shall be sleeved, rerolled, or removed from service because it may become unserviceable prior to the next inspection. This does not apply during Cycle 16 to ODIGA indications within the defined region of the upper tubesheet. These indications shall be assessed for continued plant operation in accordance with topical report BAW-10235P, Revision 1.

Axially-oriented TEC indications in the tube that do not extend beyond the adjacent cladding portion of the tube sheet into the carbon steel portion are not included in this definition. These indications shall be assessed for continued plant operation in accordance with topical report BAW-2346P, Rev. 0.

~~The reroll repair process will only be used to repair tubes with defects in the upper tubesheet area. The reroll repair process will be performed only once per steam generator tube using a 1 inch roll length. The new roll area must be free of detectable degradation in order for the repair to be considered acceptable. The reroll repair process is described in the topical report, BAW-10232P, Revision 00.~~

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 4.18.4.c.

9. Tube Inspection means an inspection of the steam generator tube from the point of entry completely to the point of exit. For tubes that have been repaired by the reroll process within the ~~upper~~ tubesheets, that portion of the tube ~~above~~ outboard of the new roll can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed.

Bases

The surveillance requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the RCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

In general, steam generator tubes that are degraded beyond the repair limit can either be plugged, sleeved, or rerolled. The steam generator (SG) tubes that are plugged are removed from service by the installation of plugs at both ends of the associated tube and thus completely removing the tube from service. When the tube end cracking (TEC) alternate repair criteria is applied, axially-oriented indications found not to extend from the tube sheet cladding region into the carbon steel region may be left in service under the guidelines of topical report BAW-2346P, Rev. 0. When the upper tubesheet outer diameter intergranular attack (ODIGA) alternate repair criteria is applied, indications found within the defined region of the upper tubesheet may be left in service under the guidelines of topical report BAW-10235P, Revision 1. The defined region begins one inch above the upper tubesheet secondary face and ends at the nearest tube roll transition. Following a SG inspection, an operational assessment is performed to ensure primary-to-secondary leak rates will be maintained within the assumptions of the accident analysis.

Degraded steam generator tubes can also be repaired by the installation of sleeves which span the area of degradation and serve as a replacement pressure boundary for the degraded portion of the tube, thus permitting the tube to remain in service.

Degraded steam generator tubes can also be repaired by the rerolling of the tube in the upper or lower tubesheet to create a new roll area and pressure boundary for the tube. The rerolling methodology establishes a new pressure boundary below inboard of the degradation, thus permitting the tube to remain in service. The degraded tube above outboard of the new roll area can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed in the upper tubesheet. The rerolling repair process will only be used to repair defects in the upper and lower tubesheets in accordance with BAW-102322303P, Revision 004.

All tubes which have been repaired using the reroll process will have the new roll area inspected during future inservice inspections. Defective or degraded tube indications found in the new roll and any indications found in the original roll need not be included in determining the Inspection Results Category for the generator inspection.

The reroll repair process ~~will only can~~ be used to repair tubes with defects in the upper and lower tubesheet areas. ~~The reroll repair process will be performed only once per steam generator tube using a 1-inch roll length. Thus, multiple applications of the reroll process to any individual tube is not acceptable.~~ Installation of multiple repair rolls in a single tube is acceptable. The new roll area must be free of detectable degradation in order for the repair to be considered acceptable. After the new roll area is initially deemed acceptable, future degradation in the new roll area will be analyzed to determine if the tube is defective and needs to be removed from service or repaired. The reroll repair process is described in the topical report, BAW-102322303P, Revision 004.

ENCLOSURE 1

AFFIDAVIT

**Affirming the Proprietary Nature
of**

FTI Engineering Report BAW-2303P, Revision 4

AFFIDAVIT OF JOSEPH J. KELLY

- A. My name is Joseph J. Kelly. I am Manager of B&W Owners Group Services for Framatome Technologies, Inc. (FTI), and as such, I am authorized to execute this Affidavit.
- B. I am familiar with the criteria applied by FTI to determine whether certain information of FTI is proprietary and I am familiar with the procedures established within FTI to ensure the proper application of these criteria.
- C. In determining whether an FTI document is to be classified as proprietary information, an initial determination is made by the Unit Manager, who is responsible for originating the document, as to whether it falls within the criteria set forth in Paragraph D hereof. If the information falls within any one of these criteria, it is classified as proprietary by the originating Unit Manager. This initial determination is reviewed by the cognizant Section Manager. If the document is designated as proprietary, it is reviewed again by me to assure that the regulatory requirements of 10 CFR Section 2.790 are met.
- D. The following information is provided to demonstrate that the provisions of 10 CFR Section 2.790 of the Commission's regulations have been considered:
- (i) The information has been held in confidence by FTI. Copies of the document are clearly identified as proprietary. In addition, whenever FTI transmits the information to a customer, customer's agent, potential customer or regulatory agency, the transmittal requests the recipient to hold the information as proprietary. Also, in order to strictly limit any potential or actual customer's use of proprietary information, the substance of the following provision is included in all agreements entered into by FTI, and an equivalent version of the proprietary provision is included in all of FTI's proposals:

AFFIDAVIT OF JOSEPH J. KELLY (Cont'd.)

"Any proprietary information concerning Company's or its Supplier's products or manufacturing processes which is so designated by Company or its Suppliers and disclosed to Purchaser incident to the performance of such contract shall remain the property of Company or its Suppliers and is disclosed in confidence, and Purchaser shall not publish or otherwise disclose it to others without the written approval of Company, and no rights, implied or otherwise, are granted to produce or have produced any products or to practice or cause to be practiced any manufacturing processes covered thereby.

Notwithstanding the above, Purchaser may provide the NRC or any other regulatory agency with any such proprietary information as the NRC or such other agency may require; provided, however, that Purchaser shall first give Company written notice of such proposed disclosure and Company shall have the right to amend such proprietary information so as to make it non-proprietary. In the event that Company cannot amend such proprietary information, Purchaser shall prior to disclosing such information, use its best efforts to obtain a commitment from NRC or such other agency to have such information withheld from public inspection.

Company shall be given the right to participate in pursuit of such confidential treatment."

AFFIDAVIT OF JOSEPH J. KELLY (Cont'd.)

- (ii) The following criteria are customarily applied by FTI in a rational decision process to determine whether the information should be classified as proprietary. Information may be classified as proprietary if one or more of the following criteria are met:
- a. Information reveals cost or price information, commercial strategies, production capabilities, or budget levels of FTI, its customers or suppliers.
 - b. The information reveals data or material concerning FTI research or development plans or programs of present or potential competitive advantage to FTI.
 - c. The use of the information by a competitor would decrease his expenditures, in time or resources, in designing, producing or marketing a similar product.
 - d. The information consists of test data or other similar data concerning a process, method or component, the application of which results in a competitive advantage to FTI.
 - e. The information reveals special aspects of a process, method, component or the like, the exclusive use of which results in a competitive advantage to FTI.
 - f. The information contains ideas for which patent protection may be sought.

AFFIDAVIT OF JOSEPH J. KELLY (Cont'd.)


The document(s) listed on Exhibit "A", which is attached hereto and made a part hereof, has been evaluated in accordance with normal FTI procedures with respect to classification and has been found to contain information which falls within one or more of the criteria enumerated above. Exhibit "B", which is attached hereto and made a part hereof, specifically identifies the criteria applicable to the document(s) listed in Exhibit "A".

- (iii) The document(s) listed in Exhibit "A", which has been made available to the United States Nuclear Regulatory Commission was made available in confidence with a request that the document(s) and the information contained therein be withheld from public disclosure.
- (iv) The information is not available in the open literature and to the best of our knowledge is not known by Combustion Engineering, EXXON, General Electric, Westinghouse or other current or potential domestic or foreign competitors of FTI.
- (v) Specific information with regard to whether public disclosure of the information is likely to cause harm to the competitive position of FTI, taking into account the value of the information to FTI; the amount of effort or money expended by FTI developing the information; and the ease or difficulty with which the information could be properly duplicated by others is given in Exhibit "B".

E. I have personally reviewed the document(s) listed on Exhibit "A" and have found that it is considered proprietary by FTI because it contains information which falls within one or more of the criteria enumerated in Paragraph D, and it is information which is customarily held in confidence and protected as proprietary information by FTI. This report comprises


AFFIDAVIT OF JOSEPH J. KELLY (Cont'd.)

information utilized by FTI in its business which afford FTI an opportunity to obtain a competitive advantage over those who may wish to know or use the information contained in the document(s).


JOSEPH J. KELLY

State of Virginia)) SS. Lynchburg
City of Lynchburg)

Joseph J. Kelly, being duly sworn, on his oath deposes and says that he is the person who subscribed his name to the foregoing statement, and that the matters and facts set forth in the statement are true.


JOSEPH KELLY

Subscribed and sworn before me
this 22nd day of September 2000.

El was commissioned a notary public as Brenda C. Cardona,

Brenda C. Maddox
Notary Public in and for the City
of Lynchburg, State of Virginia.

My Commission Expires July 31, 2003

EXHIBITS A & B

EXHIBIT A

The B&W Owners Group Steam Generator Committee Topical Report BAW-2303P, Rev. 4, "OTSG Repair Roll Qualification Report," August 2000.

EXHIBIT B

The above listed document contains information, which is considered Proprietary in accordance with Criteria b, c, d and e of the attached affidavit.

ENCLOSURE 2

FTI Engineering Report BAW-2303P, Revision 4

OTSG Repair Roll Qualification Report

August 2000