

Florida Power

CORPORATION
Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72

March 18, 1999
3F0399-01

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

Subject: License Amendment Request #235, Revision 1
Once Through Steam Generator Tube Surveillance Program,
Tube Repair Roll Process (TAC No. MA3592)

Reference: FPC to NRC letter, 3F0898-01, dated August 31, 1998, "License Amendment Request #235, Revision 0, Once Through Steam Generator Tube Surveillance Program, Tube Repair Roll Process"

Dear Sir:

Pursuant to 10 CFR 50.90, Florida Power Corporation (FPC) hereby submits a revised request for an amendment to the Crystal River Unit 3 (CR-3) Operating License No. DPR-72. The attached License Amendment Request (LAR) #235, Revision 1, proposes a repair roll process for the CR-3 Once Through Steam Generator (OTSG) tubes. This submittal completely supersedes LAR #235, Revision 0.

The technical basis for the repair roll process is contained in Framatome Technologies Incorporated (FTI) Topical Report BAW-2303P, Revision 3, as supplemented by BAW-2342P (Attachment D of this submittal). BAW-2303P, Revision 3, was previously submitted to the NRC in support of license amendments for Oconee Nuclear Stations 1, 2 and 3, and the Davis-Besse Nuclear Station (References 5, 6, and 7 of Attachment A). A non-proprietary version of the report was provided to the NRC for Davis-Besse (Reference 7 of Attachment A).

FPC intends to implement the proposed LAR during Refueling Outage 11R planned for October 1, 1999. FPC is respectfully requesting NRC approval of this LAR by August 2, 1999, to allow sufficient time for outage planning prior to the next refueling outage for CR-3.

This letter establishes no new regulatory commitments.

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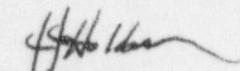
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This LAR contains a report which is proprietary to FTI (Attachment D). An Affidavit from FTI is also included in Attachment D. The Affidavit sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses the considerations listed in 10CFR2.790(b)(4). Accordingly, FPC requests that the report contained in Attachment D be withheld from public disclosure. Attachment E contains a non-proprietary version of the report.

If you have any questions regarding this submittal, please contact Mr. Sid Powell, Manager, Nuclear Licensing at (352) 563-4883.

Sincerely,



J.J. Holden

Director

Site Nuclear Operations

JJH/lvc/pmp

xc: Regional Administrator, Region II
NRR Project Manager
Senior Resident Inspector

Attachments:

- A. License Amendment Request, No Significant Hazards Consideration Evaluation, and Environmental Impact Evaluation
- B. Proposed Technical Specification Change Pages, Strikeout/Shaded
- C. Proposed Technical Specification Change Pages, Revision Bars
- D. FTI Proprietary Version, BAW-2342P, Revision 0, "OTSG Repair Roll Qualification Report, Addendum A"
- E. FTI Non-Proprietary Version, BAW-2342, Revision 0, "OTSG Repair Roll Qualification Report, Addendum A"

STATE OF FLORIDA

COUNTY OF CITRUS

John J. Holden states that he is the Director, Site Nuclear Operations for Florida Power Corporation; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

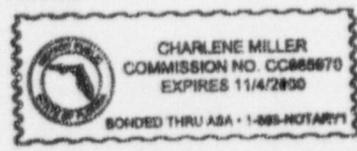
John J. Holden

John J. Holden
Director
Site Nuclear Operations

Sworn to and subscribed before me this 18th day of March, 1999, by
John J. Holden.

Charlene Miller

Signature of Notary Public
State of Florida



(Print, type, or stamp Commissioned
Name of Notary Public)

Personally Produced
Known ✓ -OR- Identification _____

**FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72**

ATTACHMENT A

**LICENSE AMENDMENT REQUEST #235, REVISION 1
ONCE THROUGH STEAM GENERATOR TUBE SURVEILLANCE
PROGRAM, TUBE REPAIR ROLL PROCESS**

**License Amendment Request,
No Significant Hazards Consideration Evaluation, and
Environmental Impact Evaluation**

ATTACHMENT A

LICENSE AMENDMENT REQUEST (LAR) #235, REVISION 1 ONCE THROUGH STEAM GENERATOR TUBE SURVEILLANCE PROGRAM, TUBE REPAIR ROLL PROCESS

LICENSE DOCUMENT INVOLVED: Improved Technical Specifications (ITS)

PORTIONS: ITS Section 5.6.2.10, "Steam Generator (OTSG) Tube Surveillance Program"
ITS Section 5.7.2, "Special Reports"

BACKGROUND:

Crystal River Unit 3 (CR-3) is a Babcock and Wilcox (B&W) designed pressurized water reactor with Model 177 FA Once Through Steam Generators (OTSGs). For this design, the primary coolant enters the steam generators at the top of the tubes (the hot leg) and exits the bottom of the tubes (the cold leg), where the primary coolant is directed back to the reactor coolant pumps and the reactor vessel. The functions of the OTSGs are to provide a pressure boundary between the reactor coolant and the secondary side fluid; confine the fission products and activation products within the reactor coolant system; provide heat transfer capability and a heat sink to remove the reactor coolant heat produced during power operations; and provide normal and auxiliary feedwater flow paths and heat transfer capability for normal and emergency cooldown.

The OTSG tubes are mill annealed Alloy 600 (Inconel) which have been sensitized as a result of the full vessel post-fabrication heat treatment. The original tube-to-tubesheet joint consists of a roll expansion of one to two inches in length with a seal weld (fillet) between the tube and the primary side tubesheet cladding. The upper tubesheets are 24 inches thick carbon steel with a minimum primary side Inconel clad of 5/16 inch in the "A" OTSG and 15/32 inch in the "B" OTSG. Each OTSG has 15,531 tubes with a nominal outer diameter of 0.625 inches and a nominal wall thickness of 0.034 inches.

Industry experience has demonstrated that the roll transition and expansion region of Alloy 600 OTSG tubing can be susceptible to primary water stress corrosion cracking (PWSCC) and intergranular attack (IGA). This is particularly true in the upper tubesheet, which is approximately 50° Fahrenheit warmer than the lower tubesheet.

During the 1997 CR-3 outage, fifty-one (51) tubes in each OTSG were plugged due to indications in upper tubesheet roll expansion and roll transition area (Reference 1). Axial and volumetric indications in the upper tubesheet were identified and dispositioned using rotating coil eddy-current technology. These indications appeared to be originating from the tube inner diameter, indicating that the most likely modes of degradation are PWSCC and/or IGA. The 1997 inservice inspection was the first extensive assessment of the upper tubesheet roll transition area for the CR-3 OTSGs. An operational assessment, performed in the spring of 1998, predicts

that approximately 100 tubes in each OTSG are expected to have indications of degradation in the upper roll region by the next inservice inspection (Reference 2).

Currently, the approved repair methods for CR-3 are to plug or sleeve the defective tubes. This LAR proposes a method of repair for indications in the upper tubesheet by installing a repair roll. The repair roll creates a new pressure boundary by installing a repair roll joint below the existing tube-to-tubesheet joint containing tube defects in the upper tubesheet. The new pressure boundary joint will be the repair roll tube-to-tubesheet expansion joint that is closest to the secondary face of the tubesheet (See Figure 1).

FPC participated in the development of Framatome Technologies Incorporated (FTI) Topical Report BAW-2303P, Revision 3, "OTSG Repair Roll Qualification Report." BAW-2303P, Revision 3, provides the technical justification to install a repair roll in the upper tubesheet region of degraded tubes. Duke Power Company previously submitted this proprietary report to the NRC (Reference 3). Additionally, First Energy Corporation submitted a non-proprietary version of the report to the NRC by letter dated March 13, 1998 (Reference 4). FPC proposes to implement the methodology and process established within this report as a repair method for tubes with defects within the upper tubesheet pressure boundary.

Recently, the B&W Owners Group has identified that the pressurizer surge line break, which is categorized as a small break loss-of-coolant accident (SBLOCA), will result in a maximum possible tube load of 2,097 lbs. As a result of these analyses, FPC requested FTI to provide an addendum to BAW-2303P (BAW-2342P, Attachment D). This addendum evaluated the load carrying capabilities of the OTSG tube repair roll joints, to determine areas acceptable for a 1 inch repair roll and those areas requiring a 1.625 inch repair roll.

The CR-3 ITS currently has an operating leak rate limit of 150 gallons per day, per License Amendment No. 158 (Reference 5), dated October 28, 1997.

SUMMARY OF CHANGES TO THE ITS:

FPC is proposing to implement a new repair process for the CR-3 OTSG tubes called repair roll. This process is used to re-establish the pressure boundary within the upper tubesheet for OTSG tubes containing defects in the existing roll joints, allowing these tubes to remain in service.

The inservice inspection and reporting requirements for tubes that receive a repair roll are also proposed in this LAR.

Several editorial and format changes are being proposed for clarification.

ITS 5.6.2.10, "STEAM GENERATOR (OTSG) TUBE SURVEILLANCE PROGRAM"

Description of Specification Change

Revise ITS 5.6.2.10.4.a.8 and ITS 5.6.2.10.4.a.10 for clarification. Add ITS 5.6.2.10.4.a.11 to describe the approved repair methods, including the currently approved method for sleeve installation and the proposed repair roll methods (single roll and double roll). The changes to Pages 5.0-17 and 5.0-17A will read as follows:

8. **Plugging/Repair Limit** means the extent of pressure boundary degradation beyond which the tube shall either be removed from service by installation of plugs or the area of degradation shall be removed from service (a new pressure boundary established) using an Approved Repair Technique. The plugging/repair limit is 40% through-wall for all pressure boundary degradation.
10. **Tube Inspection** means an inspection of the OTSG tube pressure boundary.
11. **Approved Repair Technique** means a technique, other than plugging, that has been accepted by the NRC as a methodology to remove or repair degraded or defective portions of the pressure boundary and to establish a new pressure boundary. Following are the Approved Repair Techniques:
 - a) Sleeve installation in accordance with the B&W process (or method) described in report BAW-2120P. No more than five thousand sleeves may be installed in each OTSG.
 - b) Installation of repair rolls in the upper tubesheet in accordance with the Framatome Technologies Incorporated processes (or methods) described in reports BAW-2303P and BAW-2342P. The repair process (either single roll or double roll) may be performed once per tube. The repair roll area will be examined using eddy-current methods following installation. The repair roll must be free of imperfections and degradation for the repair to be considered acceptable.

The repair roll in each tube will be inspected during each subsequent inservice inspection while the tube with a repair roll is in service. The repair roll will be considered a specific limited area and will be excluded from the random sampling. No credit will be taken for meeting the minimum sample size.

If primary-to-secondary leakage results in a shutdown of the plant and the cause is determined to be degradation in a repair roll, 100% of the repair rolls in that OTSG shall be examined. If that inspection results in entering Category C-2 or C-3 for specific limited area inspection, as detailed in Table 5.6.2-3, 100% of the repair rolls shall be examined in the other OTSG.

Reason for Request

The changes to ITS 5.6.2.10.4.a.8 and ITS 5.6.2.10.4.a.10 are to clearly define the portions of OTSG tubes which are required to be inspected. The addition of ITS 5.6.2.10.4.a.11 is intended to establish a single paragraph in which Approved Repair Techniques will be listed. ITS 5.6.2.10.4.a.11.b describes the proposed repair roll process and associated inservice inspection. The repair roll process will ensure that primary-to-secondary leakage and tube structural integrity is maintained for these new tube-to-tubesheet joints while allowing these tubes to remain in service.

Evaluation of Request

When an OTSG tube has pressure boundary degradation $\geq 40\%$ through-wall, the tube must either be removed from service via plugging the tube, or repairing the degraded portion of the pressure boundary. The options available for OTSG tube repair include sleeving and installation of a repair roll. As the OTSGs age, additional repair technologies may be developed and considered for use. Referring to these repair technologies generally as "Approved Repair Techniques" and simply listing them as they are approved for use will reduce subsequent changes needed to the ITS.

ITS 5.6.2.10.4.a.11 is being added to include a definition of Approved Repair Technique. This definition is intended to encompass all techniques used to leave tubes in service. This definition requires the techniques to be reviewed, and their use approved, by the NRC prior to use at CR-3. The phrase "the entire OTSG tube as far as possible" is deleted from ITS 5.6.2.10.4.a.10 because it does not adequately describe the necessary inspection. The tube inspection is intended to include the pressure boundary.

Installation of Inconel 690 sleeves at CR-3 in accordance with FTI Topical Report BAW-2120P was evaluated and accepted by the NRC for use at CR-3 (Reference 6). The sentences in ITS 5.6.2.10.4.a.11.a were relocated from other areas of the ITS.

Installation of repair rolls in accordance with BAW-2303P, Revision 3, and BAW-2342P, Revision 1, is being proposed by this LAR. The augmented inspection is added to ensure an appropriate level of monitoring is performed on the repair roll areas. The repair roll is considered a specific limited area and meets the definition in the ITS.

Excluding the repair roll inspections from the minimum sample size requirements and random tube inspection results category is consistent with the current ITS 5.6.2.10.2.d requirements for a specific limited area. The upper tubesheet repair rolls are distinguished from the remainder of the tube bundle by unique physical construction. Not taking credit for these inspections for the minimum sample size ensures that a larger population of tubes will be examined during the inservice inspection. Not including the repair roll inspection results in the overall inspection results classification will prevent bias of the random inspection results due to a specific limited area in the OTSGs. This inspection requirement provides an adequate methodology for assessing the extent of the primary-to-secondary leakage caused by the degradation of the repair roll.

Description of Repair Roll Process

The repair roll is a process whereby a new primary-to-secondary pressure boundary joint is established below the degraded joint by creating a new roll joint within the tube at a point closer to the secondary face of the tubesheet. The new pressure boundary joint is established to remove the area of degradation from pressure boundary service. The repair roll process was previously qualified by FTI for B&W OTSGs with Inconel Alloy 600 material tubes in the upper tubesheet. FTI Topical Report BAW-2303P, Revision 3, "OTSG Repair Roll Qualification Report," provides the technical basis for the qualification of the repair roll process.

The repair roll qualification is based on establishing a mechanical joint capable of carrying normal operating and accident condition structural loads, with leakage integrity, without taking credit for support from the original tube expansion and tube seal weld. The single repair roll joints (1 inch), and double repair roll joints (1.625 inch), were qualified to carry structural loads and minimize potential leakage for the applicable OTSG tubes.

BAW-2303P considered the limiting design basis accident to be a Main Steam Line Break (MSLB) accident for determining the maximum OTSG tube loads. The repair roll methodology described in BAW-2303P was qualified in accordance with the guidance of draft NRC Regulatory Guide (RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," dated August 1976. A test pressure of 3 times normal operating differential pressure and 1.43 times MSLB differential pressure was applied to the sample tubes. The margin of safety against tube rupture under normal operating conditions, recommended in RG 1.121, should be equal to or greater than 3 at any tube location where defects have been detected and be consistent with the margin of safety determined by the stress limits specified in NB-3225 of Section III of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers. Normal structural loads imposed on the tube-to-tubesheet roll primarily are derived from the differential pressure between the primary and secondary sides of the tubes. Cyclic loading from transients (e.g., startup/shutdown) was also considered in the qualification of the roll joints.

Recently, FTI evaluated RCS accident analyses to identify the maximum OTSG tube tensile loads. Based on these analyses and evaluations, the pressurizer surge line break, which is categorized as a SBLOCA, will produce the most limiting tensile tube load. This new load is considered in FTI BAW-2342P.

A series of tests and analyses were performed to establish the capabilities and leakage integrity of the repair roll joint. The process verification testing included tensile strength and leakage testing and the effects of thermal and fatigue cycling of the repair roll joint. Tests were also performed to determine tube elongation rate and effect of the repair roll process on tube axial loads.

As described in BAW-2342P, tubesheet bowing will cause the bore diameter around the tubes to change. An increase in diameter will decrease the contact stress between the repair roll joint and the tubesheet, which reduces the pullout strength. This was evaluated by FTI (utilizing axial tube loads associated with the most limiting OTSG tensile loads) for the effect on strength

of the repair roll. Based on the effects of tubesheet bow that could reduce the joint strength below what is required to sustain all required loads, BAW-2342P, Revision 0 (Attachment D), defines where the single repair roll and double repair roll methodologies may be used. The single repair roll methodology (1 inch roll) described in BAW-2303P, Revision 3, will be implemented for tubes located at ≤ 45 inches and ≥ 56 inches radial position from the OTSG centerline. The double repair roll methodology (1.625 inch roll) will be implemented for tubes located at > 45 inches to < 56 inches radial position from the OTSG centerline.

The full length of the repair roll in a tube will establish a new pressure boundary for the defective or degraded tubes. Upon completion of the repair roll, the original tube-to-tubesheet joint will no longer be considered part of the pressure boundary and will be outside of the inspection area of interest.

In addition to the ITS requirements proposed in this LAR, the following limitations on BAW-2303P, Revision 3, applicability will be applied at CR-3 for administering the repair roll process:

1. The repair roll process will only be applicable to the upper tubesheet.
2. The single repair roll methodology (1 inch roll) described in BAW-2303P, Revision 3, will be implemented for tubes located at ≤ 45 inches and ≥ 56 inches radial position from the OTSG centerline.
3. Consistent with the conclusions of BAW-2342P, Revision 0, the double repair roll methodology (1.625 inch roll) will be implemented for tubes located at > 45 inches to < 56 inches radial position from the OTSG centerline. The double repair roll methodology, as detailed in BAW-2303P, Revision 3, will be applied with the exception that the double repair roll for CR-3 will not incorporate the original roll (See Figure 1).
4. The physical length of the expander will control the repair roll length. The repair roll will be located approximately 2.25 inches to 4 inches from the primary clad side of the upper tubesheet and will be situated entirely below the existing roll (there will be no overlap with the existing roll).

Risk Assessment

FPC has evaluated the risk implications of using the proposed repair roll process on severe accident vulnerabilities, including OTSG tube structural integrity and pressure-retaining characteristics. The risk of severe accidents causing degradation or post-accident leakage of the OTSG tubes repaired by this process is not increased. This is because the proposed repair process effectively removes the area of degradation from service and creates a new pressure boundary with the same design capabilities as the original pressure boundary.

Description of Specification Change

Revise ITS 5.6.2.10.4.a.4, ITS 5.6.2.10.4.a.5, and ITS 5.6.2.10.4.a.6 to read as follows:

4. **Degraded Tube** means a tube containing degradation $\geq 20\%$ through-wall but $< 40\%$ through-wall in the pressure boundary.
5. **% Degradation/% Through-wall** means the percentage of the tube (pressure boundary) wall thickness affected or removed by degradation.
6. **Defective Tube** means a tube containing degradation $\geq 40\%$ through-wall in the pressure boundary. Any tube which does not permit the passage of the eddy-current inspection probe shall be deemed a defective tube.

Reason for Request

This proposed change is to clarify these definitions described in the ITS. The current description of a degraded tube is confusing in that the term imperfection is defined in ITS 5.6.2.10.4.a.2 as "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." Thus, removal of the term "imperfection" in the definition of a "degraded tube" will eliminate a possible contradiction regarding indications below or above 20% through-wall.

The addition of % Through-wall to the definition of % Degradation is to identify that these terms are identical in meaning.

Revision of ITS 5.6.2.10.4.a.6 is provided to simplify this paragraph. The phrase "except where the imperfection has been spanned by the installation of a sleeve" is redundant wording and is being deleted. ITS 5.6.2.10.4.a.1 defines tubing or tube as "that portion of the tube or sleeve which forms the primary system to secondary system pressure boundary." The phrase delineating that these limits apply in the "pressure boundary" remains in these definitions. This inclusion is intended to ensure that both the parent tube and sleeve pressure boundary degradation are categorized as either degraded or defective.

Evaluation of Request

The current definitions of imperfection, degraded tube, and defective tube as shown in ITS 5.6.2.10 are confusing, and in some cases, contradictory.

These changes will clarify the contents of the technical specification and improve specificity; thus, resulting in the following simplified terminology when communicating the results of tube inspections:

- Imperfection: Indications $< 20\%$ through-wall or manufacturing artifacts
- Degraded Tube: Tubes with service-induced degradation $\geq 20\%$ through-wall but $< 40\%$ through-wall
- Defective Tube: Tubes with service-induced degradation $\geq 40\%$ through-wall

Description of Specification Change

Revise the first paragraph of ITS 5.6.2.10.4.b to read as follows:

- b. The OTSG shall be determined OPERABLE after completing the corresponding actions (plug or repair all tubes exceeding the plugging/repair limit) required by Table 5.6.2-2 (and Table 5.6.2-3 if the provisions of Specification 5.6.2.10.2.d are utilized).

Reason for Request

This change will clarify the CR-3 ITS.

Evaluation of Request

Changing the references to plugged or repaired is consistent with previous changes presented in this LAR. The phrase "plug or sleeve all tubes exceeding the plugging/sleeving limit and all tubes containing through-wall cracks" was restated as shown above. The portion pertaining to through-wall cracks was redundant, since an area with a through-wall crack would exceed the defined plugging/repair limit by definition.

Description of Specification Change

ITS Table 5.6.2-2, OTSG Tube Inspection, and ITS Table 5.6.3-3, Specific Limited Area Inspection, references to "plug or sleeve" are being changed to "plug or repair."

Reason for Request

These changes will clarify the CR-3 ITS. As tube repair techniques are developed and submitted to the NRC for approval, fewer changed ITS pages will be required in the future.

Justification for Request

ITS 5.6.2.10.4.a is being changed to include a definition of Approved Repair Technique. This definition is intended to encompass all techniques used to keep tubes in service such as sleeving, repair roll, welded tube repair, etc. This definition requires the techniques to be reviewed, and their use approved, by the NRC prior to field use at CR-3.

ITS 5.7.2, "SPECIAL REPORTS"

Description of Specification Change

Revise ITS 5.7.2.c.1 and ITS 5.7.2.c.2; revise, relocate and label the paragraph from Page 5.0-29A regarding reports of OTSG tube inspections resulting in Category C-3 as

ITS 5.7.2.d; label the paragraph for the 90-day report as ITS 5.7.2.e, and revise and label subparagraph 4 of the 90-day report as follows:

- 5.7.2.c.1** **Number of tubes plugged and repaired,**
- 5.7.2.c.2** **Crack-like indications and assessment of growth for indications in the first span,**
- 5.7.2.c.3** **Results of in-situ pressure testing, if performed,**
- 5.7.2.d** **Results of OTSG tube inspections that fall into Category C-3 shall be reported to the NRC in accordance with 10CFR50.72.**
- 5.7.2.e** **The complete results of the OTSG tube inservice inspection shall be submitted to the NRC within 90 days following the completion of the inspection. The report shall include:**
- 5.7.2.e.4** **Identification of tubes plugged or repaired and specification of the repair methodology implemented for each tube.**

Reason for Request

This change clarifies the reporting requirements by requiring all tubes plugged and repaired to be reported. Identifying the OTSG inservice inspection 90-day report in a separate paragraph is intended to clarify this section of the ITS.

Justification for Request

Identification of the OTSG inservice inspection 90-day report requirement as a distinct paragraph (ITS 5.7.2.e) is appropriate, since this special report is usually submitted separately from the MODE 4 report described in current ITS 5.7.2.c. Additionally, placing this paragraph and the requirements after the paragraph on inspection results that fall into Category C-3 is practical, because the paragraph describes reporting to the NRC in accordance with 10CFR50.72. Thus, these reporting requirements will now be presented in chronological order of expected occurrence (i.e., MODE 4, plant operation, and 90-day reporting requirements).

NO SIGNIFICANT HAZARDS CONSIDERATION:

An evaluation of this proposed License Amendment Request (LAR) has been performed in accordance with 10 CFR 50.91(a)(1) regarding significant hazard considerations, using the standards in 10 CFR 50.92(c). A discussion of these standards as they relate to this LAR follows:

1. *Involve a significant increase in the probability or consequences of an accident previously evaluated?*

The repair roll process is a method to create a new primary-to-secondary pressure boundary joint in the upper tubesheet of Babcock & Wilcox (B&W) Once Through Steam Generators (OTSGs) manufactured with Inconel Alloy 600 tubes. The repair roll process creates a new roll joint in the OTSG tubes at a point closer to the secondary face of the tubesheet than the existing roll joint. The new pressure boundary is established by the repair roll to remove degradation of the existing roll joint from pressure boundary service. The repair roll process has been qualified as an acceptable repair methodology for use in the upper tubesheet of the Crystal River Unit 3 (CR-3) OTSGs. The proposed License Amendment Request (LAR) proposes to implement the qualified OTSG tube repair roll process, and also addresses several editorial and format changes which do not impact the current CR-3 accident analyses.

The qualification of the OTSG tube repair roll methodology is based on establishing a mechanical joint length that will carry all structural loads imposed on the OTSG tubes while maintaining the required margins during normal and accident conditions. A series of tests and analyses were performed to establish the minimum acceptable length of the OTSG tube repair roll. Tests performed included leak, tensile, fatigue, ultimate load and eddy-current measurement uncertainty. The analyses evaluated plant operating and faulted load conditions, in addition to OTSG tubesheet bow effects. OTSG tube leakage remains bounded by the evaluation presented in the CR-3 Final Safety Analysis Report (FSAR) for a main steam line break (MSLB). The proposed change also includes a description of the required inspection program for the OTSG tube repair rolls. The additional inspection requirements do not change any accident initiators. The proposed inspections following OTSG tube repair roll installation, and during future inservice inspections, assure continuous monitoring of these tubes such that inservice degradation of tubes repaired by the repair roll process will be detected. Based on the qualification testing and analyses performed, as well as the industry experience with the use of OTSG tube repair roll processes, there are no new safety issues associated with the use of repair roll methodology. Therefore, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. *Create the possibility of a new or different kind of accident from previously evaluated accidents?*

The repair roll creates no new failure modes or accident scenarios. The new pressure boundary joint created by the repair roll process has been demonstrated, by testing and analysis, to provide structural and leakage integrity equivalent to the original design and

construction for all normal operating and accident conditions. Furthermore, the testing and analysis demonstrate the repair roll process creates no new adverse effects for the repaired tube and does not change the design or operating characteristics of the OTSGs. In the unlikely event that a tube with a repair roll should fail and sever completely at the transition of the repair roll region, the tube would remain engaged in the tubesheet bore, preventing interaction with other surrounding tubes. In this case, leakage is bounded by the steam generator tube rupture (SGTR) accident analysis. Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. *Involve a significant reduction in a margin of safety?*

The repair roll process effectively removes the defective/degraded area of the tube from service. The repair roll interface created with the tubesheet satisfies the necessary structural, leakage and heat transfer requirements. The mechanical joint is constrained within the tubesheet bore; thus, there is no additional risk associated with tube rupture. The accident leakage is shown to be less than one gallon per minute primary-to-secondary leakage. Therefore, the FSAR analyzed accident scenarios remain bounding, and the use of the repair roll process does not reduce the margin of safety.

ENVIRONMENTAL IMPACT EVALUATION:

10 CFR 51.22(c)(9) provides criteria for 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:

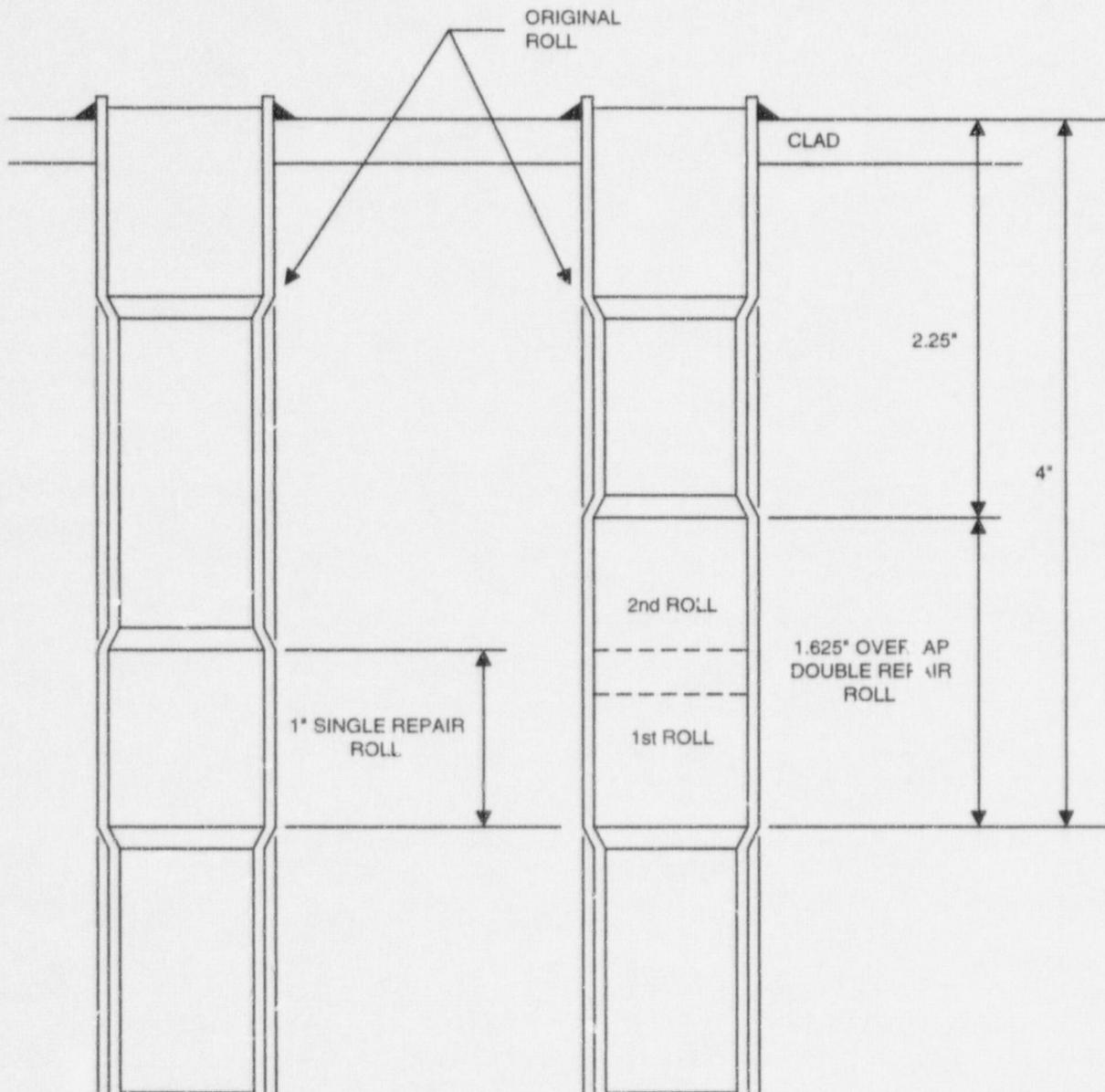
- (i) involve a significant hazards consideration,
- (ii) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and
- (iii) result in a significant increase in individual or cumulative occupational radiation exposure.

FPC has reviewed this proposed LAR and concludes it meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(c), no environmental impact statement or environmental assessment needs to be prepared in connection with this request.

REFERENCES:

1. FPC to NRC letter, 3F1297-22, dated December 5, 1997, "Special Report 97-05 Once Through Steam Generator (OTSG) Notifications Required Prior to MODE 4, and Complete Results of OTSG Tube Inservice Inspection Performed During the Current Outage (90-Day Report)"
2. FPC to NRC letter, 3F0598-08, dated May 18, 1998, "An Operational Assessment of Steam Generator Tube Degradation at Crystal River Unit 3"
3. Duke Power Company to NRC letter, dated November 3, 1997, "Request for Technical Specification Amendment, Steam Generator Tubing Surveillance" [Repair Roll License Amendment Request, revisions and answers to NRC request for additional information, BAW-2303P, Revision 3]
4. First Energy Corporation to NRC letter, dated March 13, 1998, Non-Proprietary Version of BAW-2303, OTSG "Repair Roll Qualification Report"
5. NRC to FPC letter, 3F097-40, dated October 28, 1997, "Crystal River Unit 3 - Staff Evaluation and Issuance of Amendment Re: Steam Generator Tube Intergranular Attack Degradation (TAC No. M98262)" [License Amendment No. 158 to Facility Operating License DPR-72]
6. NRC to FPC letter, 3N0991-05, dated September 11, 1991, "Crystal River Unit 3 - Issuance of Amendment Re: (TAC No. 76640)" [License Amendment 136 to Facility Operating License DPR-72]

TYPICAL REPAIR ROLL PLACEMENT



INFORMATION ONLY

Figure 1: CR-3 OTSG Tube Repair Roll Process