

ATTACHMENT 1

TECHNICAL SPECIFICATION

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## 4.17 STEAM GENERATOR TUBING SURVEILLANCE

### Applicability

Applies to the surveillance of tubing of each steam generator.

### Objective

To ensure integrity of the steam generator tubing through a defined inservice surveillance program, and to minimize exposure of personnel to radiation during performance of the surveillance program.

### Specification

#### 4.17.1 Examination Methods

Inservice inspection of steam generator tubing shall include non-destructive examination by eddy-current testing or other equivalent techniques. The inspection equipment shall provide a sensitivity that will detect defects with a penetration of 20 percent or more of the minimum allowable as-manufactured tube wall thickness.

#### 4.17.2 Acceptance Criteria

The steam generator shall be considered operable after completion of the specified actions. All tubes examined exceeding the repair limit shall be repaired by sleeving or rerolling or removed from service (e.g., plugged, stabilized).

#### 4.17.3 Selection and Testing

The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 4.17.1. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in Specification 4.17.4 and the inspected tubes shall be verified acceptable per Specification 4.17.5. The tubes selected for each inservice inspection shall include at least 3% of the total number of tubes in both steam generators, with one or both steam generators being inspected. The tubes selected for these inspections shall be selected on a random basis except:

- a. The first sample inspection during each inservice inspection of each steam generator shall include:
  1. All tubes that previously had detectable wall penetrations (>20%) and have not been plugged or sleeve repaired in the affected area.
  2. At least 50% of the tubes inspected shall be in those areas where experience has indicated potential problems.
  3. A tube adjacent to any selected tube which does not permit passage of the eddy current probe for tube inspection.
- b. Tubes in the following Group(s) may be excluded from the first sample if all tubes in a Group in both OTSG are inspected. No credit will be taken for these tubes in meeting minimum sample size requirements.

- d. % Degradation means the percentage of the tube or sleeve wall thickness affected or removed by degradation.
  - e. Defect means an imperfection of such severity that it exceeds the repair limit. A tube or sleeve containing a defect is defective.
  - f. Repair Limit means the imperfection depth beyond which the tube shall be either removed from service by plugging or repaired by sleeving or rerolling because it may become unserviceable prior to the next inspection; it is equal to 40% of the nominal tube or sleeve wall thickness.
- The Babcock and Wilcox process (or method) equivalent to the method described in report, BAW-1823P, Revision 1 will be used for sleeving repairs.
- g. 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 4.17.4.
  - h. Tube Inspection means an inspection of the steam generator tube from the point of entry completely to the point of exit.

#### 4.17.6 Reports

- a. The number of tubes plugged or repaired in each steam generator shall be reported to the NRC within 30 days following the completion of the plugging or repair procedure.
- b. The results of the steam generator tube inservice inspection shall be reported to the NRC within 3 months following completion of the inspection. This report shall include:
  - 1. Number and extent of tubes inspected.
  - 2. Location and percent of wall-thickness penetration for each indication of a degraded tube.
  - 3. Identification of tubes plugged or repaired.
- c. Results of steam generator tube inspections which fall into Category C-3 and require prompt notification of the NRC shall be reported pursuant to Specification 6.6.2.1.a prior to resumption of plant operation. The written followup of this report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

#### Bases

The program of periodic inservice inspection of steam generators provides the means to monitor the integrity of the tubing and to maintain surveillance in the event there is evidence of mechanical damage or progressive deterioration due to design, manufacturing errors, or operating conditions. Inservice inspection of the steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures may be taken.

Repair or removal from service will be required for any tube with service-induced metal loss in excess of 40% of the tube or sleeve nominal wall thickness or with a through wall crack. Additional corrective actions may be required to stabilize a circumferentially cracked tube.

The initial sample of tubes inspected in a steam generator includes tubes from three groups. First, lane tubes are inspected to assure their integrity. Second, all other inservice tubes with degradation, inspected in previous inspections, are inspected to assure tube integrity and determine degradation growth, if any. Third, a random sample of 3% of the total number of tubes in both steam generators is inspected. The results of the latter inspection dictate the extent of further examinations.

An objective of this Specification is to provide an inspection plan which will insure, with a high degree of confidence, that no more than 30 defective tubes will remain in a steam generator after an initial C-3 category inspection.

Following an 18% random inspection (C-3 category inspection) an unaffected area is identified. The unaffected area will be logically and consistently defined based on generator design, defect location and characteristics. The criteria for accepting an area as unaffected depend on the number of defects found in the sample inspected in that area and are established such that there is a 0.05 or smaller probability of accepting the area as unaffected if it contains 30 or more defective tubes.

Experience with Babcock and Wilcox steam generators has indicated that tubes near the open inspection lane are susceptible to forms of degradation unique to that area. Therefore, tubes within one, two, or three rows of the inspection lane have been defined as a special group. If all of these tubes are inspected in both steam generators, no credit will be taken for them in meeting minimum sample size requirements and the results of their inspection will not be used in classifying the results of the general inspection into C-1, C-2 or C-3 categories, unless the mechanism of tube degradation is random in nature. Random degradation mechanisms are those which based on location, steam generator design and operation, and operating experience cannot logically and consistently be shown as limited to a local area.

The affected area will be 100% inspected to assure all defective tubes therein are identified and either removed from service or repaired by sleeving. NRC concurrence in this determination is required prior to completion of the inspection.

Degraded steam generator tubes can 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. An additional repair method for degraded steam generator tubes consists of rerolling the tubes to create a new roll area and pressure boundary for the tube. The rerolling method will ensure that the area of degradation will not serve as a pressure boundary, thus permitting the tube to remain in service. The degraded tube between the minimum required repair roll length and the tube end can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed.

This inspection plan enables exposures to be maintained as low as reasonably achievable to the personnel involved in the inspection and assured that generator areas with significant numbers of degraded tubes are adequately inspected.

ATTACHMENT 2

TECHNICAL SPECIFICATION MARKUP

4.17 STEAM GENERATOR TUBING SURVEILLANCE

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This inspection plan enables exposures to be maintained as low as reasonably achievable to the personnel involved in the inspection and assures that generator areas with significant numbers of degraded tubes are adequately inspected.

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An additional repair method for degraded steam generator tubes consists of rerolling the tubes to create a new roll area and pressure boundary for the tube. The rerolling method will ensure that the area of degradation will not serve as a pressure boundary, thus permitting the tube to remain in service. The degraded tube between the minimum required repair roll length and the tube end can be excluded from future periodic inspection requirements because it is no longer part of the pressure boundary once the repair roll is installed.

## ATTACHMENT 3

### TECHNICAL JUSTIFICATION

#### Background

During the current Oconee Unit 1 refueling outage, the hot leg tubesheet rolls were inspected with a plus point and 0.115 diameter pancake eddy current probe to determine if tube degradation was present. The initial inspection scope included a 20 percent sample of the hot leg tubesheet rolls in both steam generators. The inspection scope was increased to 100 percent of the hot leg tubesheet rolls once primary water stress corrosion cracking (PWSCC) was confirmed.

Currently, the 100 percent inspection of the hot leg tubesheet rolls is almost complete. The inspection has discovered approximately 900 tubes in the 1B steam generator which have indications that are potentially the result of PWSCC, inner diameter intergranular corrosion (IGA), or deposits on the tubes. In order to confirm the existence of tube corrosion, several steam generator tube sections will be removed from the steam generator. Should these examinations conclude that the eddy current indications are corrosion, the tubes will require repair or removal from service. Oconee plans to repair the tubes by utilizing a process which rerolls the upper portion of the tube. The reroll process is being utilized because plugging the tubes will reduce the thermal efficiency of the 1B steam generator and could approach the current tube plugging limit of 15 percent.

If repairs are necessary, Duke intends to begin repair of the steam generator tubes using the reroll process on approximately October 23, 1997. Since the reroll process is not contained in the Oconee Technical Specifications as an approved repair method, NRC approval of this submittal must be obtained prior to exceeding 250°F in the Reactor Coolant System on Oconee Unit 1.

#### Description of Technical Specification change

The Technical Specifications will be revised to indicate that a steam generator tube can be repaired by rerolling. This revision will be made to the steam generator tubing surveillance section of the Technical Specifications. In addition, an editorial change will be made to the Technical Specifications to clarify that a Babcock and Wilcox topical report applies to sleeving repairs.

## TECHNICAL JUSTIFICATION

Technical Justification

The current Technical Specifications for steam generator tubing surveillance allow for the repair of the steam generator tubes by use of a sleeving process. This amendment request will revise the Technical Specifications to allow a rerolling repair process to be used to repair steam generator tube defects. The rerolling process will create a new roll area and pressure boundary for the steam generator tube. The rerolling method will ensure that the area of degradation will not serve as a pressure boundary, thus permitting the tube to remain in service. The rerolling process has been qualified by Framatome Technologies, Inc. (FTI). Additional details about the rerolling process, requirements, and verification are contained in the FTI report which is provided as Attachment 3A. This report is proprietary to FTI and is clearly marked as proprietary.

The qualification of the mechanical joint is based on establishing a mechanical roll length which will carry all of the structural loads imposed on the tubes. A series of tests and analyses were performed to establish this length. Tests that were performed included leak, tensile, fatigue, ultimate load, and eddy current measurement uncertainty. The analyses evaluated plant operating and faulted loads in addition to tubesheet bow effects. Testing and analysis evaluated the tube springback and radial contact stresses due to temperature, pressure, and tubesheet bow. Based on the FTI qualification, as well as the history for similar industry repair rolls, there are no new safety issues associated with a reroll repair.

The editorial change to Technical Specification 4.17.7.f will clarify that the Babcock and Wilcox topical report (BAW-1823P, Revision 1) applies to the sleeving repairs. This clarification is necessary to ensure that the Technical Specifications clearly state the purpose of the topical report. By making this change, potential confusion about the applicability of the topical report to plugging or rerolling process will be eliminated.

Based on the information provided in this attachment and the Bases of the Technical Specifications, Duke Energy Corporation concludes that the proposed amendment will not present an undue risk to public health and safety.

ATTACHMENT 4

NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

This proposed change has been evaluated against the standards in 10 CFR 50.92 and has been determined to involve no significant hazards, in that operation of the facility in accordance with the proposed amendment would not:

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

No. The implementation of the tube reroll does not increase the probability of occurrence of an accident or the consequences of an accident previously evaluated.

Since reroll utilizes the original tube configuration and extends the roll expanded region, all of the design and operating characteristics of the steam generator and connected systems are preserved. The reroll joint length has been analyzed and tested for design, operating, and faulted condition loadings.

At worst case, a tube leak would occur with the result being a primary to secondary system leak. Should a tube leak occur, the impact is bounded by the ruptured tube evaluation which has been analyzed previously. The potential for a tube rupture is not increased by the use of the reroll process.

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

No. Operation of the steam generators with reroll repaired tubes does not create the possibility of a new or different accident from the accidents previously evaluated.

The potential failure of the tube due to the defect which required the tube to initially be repaired is covered during the qualification of the reroll process. Qualification testing indicates that normal and faulted leakage would be well below the Technical Specification limits. Since the normal and faulted leak rates are well within the Technical Specification limit, the analyzed accident scenarios are still bounding.

The new roll transition may eventually develop PWSCC and require additional repair. Since the roll transition is located within the tubesheet, it is not possible for the degradation to result in a tube

ATTACHMENT 4

NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

rupture. Additionally, industry experience with roll transition cracking has shown that PWSCC in roll transitions is normally short axial cracks, with extremely low leak rates. Finally, since the new roll transition is completely within the tubesheet there is no possibility of the repaired tube failing and impacting adjacent tubes.

In the unlikely event the reroll repaired tube failed and severed completely at the 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 not increased.

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

No. Based on the previous response, the protective boundaries of the steam generator are preserved.

A tube with degradation can be kept in service through the use of the reroll process. The new undegraded roll expanded interface created with the tubesheet satisfies all of the necessary structural, leakage, and heat transfer 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 use of the reroll process does not reduce the margin of safety.

Duke has concluded based on the above information that there are no significant hazards involved in this amendment request.

ATTACHMENT 5

ENVIRONMENTAL IMPACT ANALYSIS

Pursuant to 10 CFR 51.22 (b), an evaluation of the proposed amendment has been performed to determine whether or not it meets the criteria for categorical exclusion set forth in 10 CFR 51.22 (c) 9 of the regulations. The proposed amendment does not involve:

- 1) A significant hazards consideration.

This conclusion is supported by the determination of no significant hazards.

- 2) A significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

This amendment will not change the types or amounts of any effluents that may be released offsite.

- 3) A significant increase in the individual or cumulative occupational radiation exposure.

This amendment will not increase the individual or cumulative occupational radiation exposure.

In summary, this amendment request meets the criteria set forth in 10 CFR 51.22 (c) 9 of the regulations for categorical exclusion from an environmental impact statement.

ATTACHMENT 6

FRAMATOME TECHNOLOGIES, INC.  
AFFIDAVIT

AFFIDAVIT OF JAMES H. TAYLOR

- A. My name is James H. Taylor. I am Manager of Licensing 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 Licensing personnel and other management within FTI as designated by the Manager of Licensing Services 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 JAMES H. TAYLOR (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 JAMES H. TAYLOR (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 JAMES H. TAYLOR (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 information

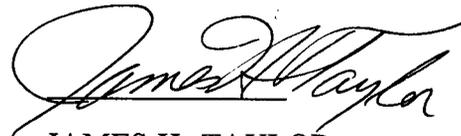
AFFIDAVIT OF JAMES H. TAYLOR (Cont'd.)

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).

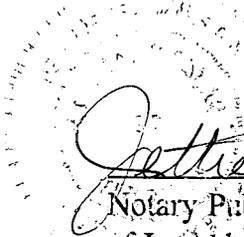
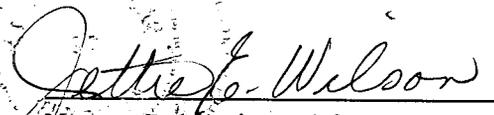
  
JAMES H. TAYLOR

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

James H. Taylor, 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.

  
JAMES H. TAYLOR

Subscribed and sworn before me  
this 16<sup>th</sup> day of October 1997.

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

My Commission Expires 4-30-99

**EXHIBIT A**

**OTSG REPAIR ROLL QUALIFICATION REPORT**

**DOCUMENT #: BAW-2303P, REV. 02**

**EXHIBIT B**

**PROPRIETARY CLASSIFICATION CRITERIA: b, c, d**