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Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Technical Specification Change Request Establishing Alternate Repair Criteria For Outer Diameter Intergranular Attack In The Upper Tubesheet Of The Unit 1 Steam Generators

Gentlemen:

Attached, for your review and approval, is a proposed amendment to Arkansas Nuclear One Unit 1 (ANO-1) Technical Specifications. The proposed amendment request establishes an alternate repair criteria (ARC) for the upper tubesheet region of the ANO-1 steam generators. The basis for this change is a report prepared for the Babcock and Wilcox Owners Group (B&WOG) BAW-10226P, "Alternate Repair Criteria For Volumetric Outer Diameter Intergranular Attack In The Tubesheets Of Once Through Steam Generators." Entergy Operations has chosen to provide the lead plant submittal for the B&WOG for the use of the ARC.

This is the second submittal in support of an ARC application for ANO-1. Entergy Operations' letter of August 13, 1997 (1CAN089702), submitted the first in series of three submittals to the Nuclear Regulatory Commission (NRC) which would justify the use of an ARC for outer diameter intergranular attack (ODIGA) flaws in tubes within the tubesheet. The third submittal was to include the proposed technical specification changes and the no significant hazards consideration. Since the final report was completed within weeks of the material that was planned for the second submittal, it was determined to be more efficient to make only one additional submittal transmitting the final topical report and the proposed technical specification change request with its associated no significance hazards consideration.

The attached technical specification change was developed utilizing the applicable guidance found in NRC Generic Letter 95-05, "Voltage-Based Repair Criteria For Westinghouse Steam Generator Tubes Affected By Outside Diameter Stress Corrosion Cracking." The significant difference between the ARC proposed for the tubesheet volumetric IGA in the once through steam generators and the support plate stress corrosion cracking ARC for the Westinghouse

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plants is that the flaws within the tubesheet cannot burst and are not anticipated to leak under accident conditions. These conclusions were reached based upon deterministic testing performed by Framatome Technologies, Inc. (FTI) for the B&WOG in support of this change request. These factors and the unique aspects of IGA within the tubesheet as compared to stress corrosion cracking (SCC) at the support plates has resulted in deviations from the guidance in Generic Letter 95-05.

The attached report, BAW-10226P, contains information proprietary to FTI. An affidavit setting forth the basis on which the information may be withheld from public disclosure by the NRC and addressing the considerations listed in 10CFR2.790(b)(4) was attached to the August 13, 1997 submittal. As indicated in that letter, a non-proprietary version of the report was to be submitted at a later date. The non-proprietary version will be provided in January 1998.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 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.

Entergy Operations requests that the effective date for this change be within 30 days of issuance. Although this request is neither exigent nor emergency, your prompt review is requested prior to the next ANO-1 refueling outage (1R14) which is currently scheduled to begin March 28, 1998. If this amendment is not processed by the 1R14 outage, over 400 tubes with volumetric IGA indications within the upper tubesheet will require repair or removal from service by plugging. As demonstrated in the topical report supporting this change, these tubes do not represent a challenge to the future safe operation of ANO-1.

If you have any questions on the attached material, or the information which was previously submitted to you on this subject, please contact my staff at 501-858-4619. To facilitate the NRC's review, Entergy Operations and the B&WOG are prepared to meet with the NRC staff to discuss the technical consideration necessary to use the subject ARC.

Very truly yours,

C. Randy Hutchinson

CRH/dej
Attachments

To the best of my knowledge and belief, the statements contained in this submittal are true.

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for Logan **County and the State of Arkansas, this** 12th **day of** December **1997.**

Sandy Siebenmorgen

Notary Public
My Commission Expires May 11, 2000

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ATTACHMENT

TO

1CAN129702

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 Arkansas Nuclear One, Unit 1 (ANO-1) Technical Specifications (TS) have been revised utilizing the guidance provided in NRC Generic Letter 95-05. The following changes are proposed:

3.1.6.3.b This specification is revised to lower the leakage limit through any one steam generator to less than 150 gallon per day (0.104 gpm) from the current limit of 500 gallons per day (0.347 gpm). The 500 gallon per day limit has been reduced in the current technical specification to 144 gallons per day (0.1 gpm) for the remainder of Cycle 14. This temporary reduction was associated with amendment 189 to the ANO-1 technical specifications. The reference to the Cycle 14 limit is deleted since this change request is not anticipated to be approved until after the completion of Cycle 14.

4.18.3.a This specification is revised to add specification 4.18.3.a.4 which identifies new voltage-based repair criteria and requires those indications left in service as a result of applying the new criteria to be inspected by bobbin and rotating coil probes during subsequent refueling outages.

4.18.3.b The existing specification 4.18.3.b is renumbered 4.18.3.c to facilitate the addition of a new specification. The new 4.18.3.b requires a 100% bobbin coil inspection of the upper tubesheet when the tubesheet voltage-based repair criteria are utilized. The specification excludes the results of this 100% inspection from the first random sample results.

4.18.5.a The existing specification 4.18.5.a.7 Plugging Limits, is modified by adding the following sentences: This definition does not apply to the upper tubesheet volumetric indications to which the voltage-base repair criteria are being applied. Refer to specification 4.18.5.a.10 for the repair limit applicable to these indications. A new specification 4.18.5.a.10 is added. This specification defines the repair limits for upper tubesheet predominately volumetric outer diameter intergranular attack (ODIGA) indications located 2.75 inches from the secondary face of the tubesheet to, but not including, the roll transition. The repair limit is based upon a bobbin indication of greater than 1.18 volts, minus an allowance for growth over the next operating cycle, and a determination that the indication is volumetric based upon rotating coil examination.

4.18.5.b The reference to the Cycle 14 allowance to leave upper tubesheet ODIGA flaws in service with potential through-wall depths in excess of the plugging limit is deleted since this change request is not anticipated to be approved until after the completion of Cycle 14. If this change request is acted upon prior to the end of Cycle 14 this provision should be retained.

4.18.6 For implementation of the tubesheet voltage-based repair criteria, new NRC reporting criteria are added including notification if leakage is detected during in-situ leak

testing of tubesheet volumetric indications, and if tubesheet indications previously left in service show signs of growth beyond that seen in the previous cycle.

4.18 Bases The Bases are revised to include discussions of the voltage-based repair criteria.

BACKGROUND

The inservice inspection of the ANO-1 steam generators is conducted in accordance with ANO-1 Technical Specification (TS) 4.18. Specification 4.18.2 states: "Inservice inspection of steam generator tubing shall include non-destructive examination by eddy-current testing or other equivalent techniques." Specification 4.18.3 requires that a minimum sample size be examined in accordance with specification 4.18.5. Specification 4.18.5.b. notes: "The steam generator shall be determined operable after completing the corresponding actions (plug or sleeve all tubes exceeding the plugging limit and all tubes containing through-wall cracks) required by Table 4.18-2." Table 4.18-2 specifies the expansion criteria for sampling of the steam generator tubes and requires "defective" tubes to be plugged or sleeved. Specification 4.18.5 defines Defect as: "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." Plugging Limit is defined in the same specification as: "the imperfection depth at or beyond which the tube shall be restored to serviceability by the installation of a sleeve or removed from service because it may become unserviceable prior to the next inspection; it is equal to 40% of the nominal tube wall thickness."

The bases for specification 4.18 states: "The surveillance requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the RCS will be maintained."

Intergranular attack (IGA) is known to be present above the 15th tube support plate (TSP) within the ANO-1 once through steam generators (OTSGs) as verified by destructive examination from previous tube pulls. IGA is a damage mechanism caused by corrosion of the material grain boundaries. The corrosion resulted from contaminants introduced on the tubing during the early years of plant operation. The contaminant causing IGA of the ANO-1 tubing is sulfur as a result of thermal decomposition of ion exchange resins. The ANO-1 IGA can be categorized as volumetric or "patch-like," with no specific orientation. Since discovery, there has been no evidence of leakage from IGA flaws at ANO-1.

During the 1R13 refueling outage, an eddy current technique was employed to depth-size the IGA. This technique was qualified per Appendix H of the EPRI "PWR Steam Generator Tube Examination Guidelines." Compliance with the EPRI guideline was considered an acceptable method to qualify non-destructive examination (NDE) techniques for the detection and sizing of damage mechanisms. This technique was used to depth-size all IGA flaws within the upper tubesheet (UTS). During this inspection, greater than 25% of all indications detected within the UTS region by the bobbin coil examination technique were examined using the rotating pancake coil (RPC) technique to characterize these flaws. All UTS IGA

indications with a depth size of ≥40% through-wall (TW), as determined by the qualified sizing technique, were removed from service by plugging during this inspection.

During 1R13, three tubes with bobbin indications within the UTS were removed from the steam generator. Two of the three tubes contained flaws that would have required repair. The third tube was near the repair limit and may have been preventively repaired. The tubes were selected because they contained multiple indications with depths representative of the average indication depths as sized by eddy current. The tubes were burst in the laboratory without the presence of a tubesheet. All three tubes burst at approximately 10,000 psi, only slightly below virgin tube burst pressure. After bursting the tubes the flaws were examined and sized. If a flaw was not opened by the burst of the tube, it was bent open for destructive examination (DE). The DE results were not consistent with the previous qualification data of the bobbin coil for sizing IGA flaws in the UTS. The reason for the inconsistency in sizing IGA in the UTS is indeterminate. As a result of this condition, it is possible that tubes were left in service with through-wall defects greater than the technical specification plugging limit.

When non-compliance was determined at 2012 CDT on April 8, 1997, the time clock for TS 4.0.3 was entered allowing 24 hours to seek regulatory relief. ANO verbally requested notification of enforcement discretion at 1400 CDT on April 9, 1997. Verbal approval of this enforcement discretion request was received at 1535 CDT on April 9, 1997. This discretion was in effect until May 7, 1997, or until the Staff acted on a proposed technical specification change request to be submitted by Entergy Operations, whichever occurred first.

Entergy Operations submitted an exigent TS change on April 11, 1997 (1CAN049703), to allow a one time exception to the surveillance requirements of Section 4.18.5.b. This exception allowed tubes with IGA indications within the upper tube sheet with potential through-wall depths greater than the plugging limit to remain in service for the remainder of Cycle 14 (spring 1998). The April 11, 1997, submittal was supplemented on May 2, 1997, by letter 1CAN059702 which reduced the leakage limit through the steam generator tubes from 500 gallons per day (gpd) to 144 gpd for the remainder of Cycle 14. In response to this request, the NRC issued Amendment No. 189 to the ANO-1 license dated May 7, 1997. This amendment allowed the unit to continue operation through the remainder of Cycle 14 with tubes that had potential through-wall defects in excess of the 40% plugging limit.

Prior to 1R13 the B&WOG was working on the development of an ARC for volumetric ODIGA flaws anywhere in the OTSG. In response to the events at ANO, the B&WOG expedited its schedule and focused its initial work on volumetric ODIGA indications within the tubesheet. The B&WOG plans were discussed with the NRC in a meeting at the NRC offices in Rockville, Maryland on June 16, 1997. During this meeting, it was noted that ANO-1 would serve as the lead plant for NRC review of proposed technical specification changes associated with the implementation of the ARC. It was agreed that submittal of the ARC information as it was developed would facilitate a more timely NRC staff review. A series of three submittals were proposed with the last submittal containing the final topical report and the application for a technical specification change including the no significance hazards consideration. The first submittal was transmitted on August 13, 1997, via letter

1CAN089702. This initial version of the report included a general OTSG description and discussion of plant chemistry, flaw morphology of pulled tubes, non-destructive examination (NDE) of pulled tubes and a demonstration that laboratory developed ODIGA is fully representative of field ODIGA. This initial information was critical to the final document in that the leakage testing would be performed primarily on laboratory samples since the field data was limited and none of the volumetric ODIGA flaws removed to date from OTSGs have leaked under accident loads.

Since the final report was completed within weeks of the material that was planned for the second submittal, it was determined to be more efficient to only make one additional submittal transmitting the final topical report and the proposed technical specification change request with its associated no significance hazards consideration. The final topical report, BAW-10226P, "Alternate Repair Criteria For Volumetric Outer Diameter Intergranular Attack In The Tubesheet Of Once Through Steam Generators," in support of this technical specification change is attached.

The attached technical specification change was developed utilizing the applicable guidance found in NRC Generic Letter 95-05, "Voltage-Based Repair Criteria For Westinghouse Steam Generator Tubes Affected By Outside Diameter Stress Corrosion Cracking." The significant difference between the ARC proposed for the tubesheet volumetric ODIGA in the OTSGs and the support plate stress corrosion cracking ARC for the Westinghouse plants is that flaws within the tubesheet cannot burst and, based upon the voltage-based repair criteria, are not anticipated to leak under accident conditions. These factors and the unique aspects of IGA within the tubesheet, as compared to SCC at the support plates, has resulted in some deviations from the guidance in Generic Letter 95-05.

JUSTIFICATION OF CHANGE

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 voltage-based repair limit proposed to be added to SR 4.18 implements the criteria derived from BAW-10226P, "Alternate Repair Criteria for Volumetric Outer Diameter Intergranular Attack in the Tubesheets of Once Through Steam Generators." The voltage-based repair limits are not applicable to other forms of OTSG tube degradation nor are they applicable to ODIGA that occurs at other locations within the OTSGs. Additionally, the repair criteria applies only to indications where the degradation mechanism is dominantly volumetric.

BAW-10226P evaluated the potential for tube burst and accident induced leakage as a result of applying the voltage-based repair criteria to volumetric ODIGA within the tubesheet. To assess the potential for burst and leakage, numerous tasks were performed. The flaw morphology and eddy current characteristics of volumetric ODIGA were defined based on tube pull data from several B&W plants. Based upon laboratory examination, the characteristics of the volumetric ODIGA morphology are essentially the same for all the plants

in which tubes were pulled. The characteristic "thumbnail" profile, lack of significant corrosion of the base material, and minimal pitting in the affected area were present regardless of location or elevation within the OTSG. It was concluded from these evaluations that volumetric IGA can be treated generically for those plants which had tubes evaluated as part of the study. It was concluded from a review of eddy current data from the pulled tubes that the eddy current response of ODIGA from different plants and locations within the OTSG are very similar. The eddy current data from the tubes examined had low bobbin voltage signals and similar lissajous shapes. They were also distinguishable as volumetric by utilizing the axial and circumferential channels of an RPC probe, and typically show an irregular cone formation on the pancake coil strip chart profile.

To supplement the pulled tube data base, laboratory grown ODIGA flaws were utilized. The ability of laboratory ODIGA to simulate in-generator ODIGA was evaluated comparing the laboratory ODIGA to similarly sized field flaws. This was accomplished by destructively examining laboratory ODIGA specimens and comparing their morphology to the significant features of field ODIGA patches. The eddy current response was evaluated by comparing critical parameters of the laboratory ODIGA to the same parameters for field ODIGA from pulled tubes. The results indicated that the laboratory ODIGA is the same morphology and exhibits similar eddy current response. As a result of these findings, it was concluded that the laboratory ODIGA is fully representative of service-induced volumetric ODIGA. Therefore, the laboratory flaws could be used to supplement the pulled tube ODIGA database for the alternate repair criteria development.

To evaluate the structural integrity of volumetric ODIGA in the tubesheet region of the OTSG, burst rupture, tensile rupture, and fatigue failure modes were evaluated. Because of the constraint of the OTSG tube radial displacement within the tubesheet, burst pressures below that of an unflawed tube is precluded. Testing of axial loads up to 1.7 times main steam line break (MSLB) load during leak testing showed no indication of any tensile rupture concerns. Fatigue is addressed through previous preventive sleeving campaigns, the application of an exclusion zone of 2.75 inches from the secondary face of the tubesheet, and examination of all indications left in service as a result of applying the voltage-based repair criteria at each scheduled inspection. Therefore, the volumetric ODIGA does not pose a structural threat to burst or tensile rupture under postulated MSLB conditions or a fatigue failure.

Hot leak testing was performed at the bounding MSLB temperature, pressure, and load. Testing was performed on 29 samples with volumetric ODIGA with bobbin indications ranging from 0.04 to 1.62 volts. None of these flaws showed signs of leakage under these loads. An additional 8 laboratory samples and 11 tube pull indications were included on the basis of bounding electrodischarge machining (EDM) testing. The EDM patches were fabricated in the same heat of material used to manufacture the laboratory ODIGA specimens. The EDM patches were machined to depths ranging from approximately 84 to 95% through-wall, with patch diameters of 0.30 and 0.50 inches. The severity of the EDM patches bound the potential effects of having a real ODIGA patch in a tube that is of similar depth and diameter. These EDM patches bound the extents (length, width and depth) of all pulled tube

volumetric ODIGA flaws and thus provide the basis for including these flaws and small laboratory IGA patches into the leak rate database, without actually leak testing the patches. None of the EDM patches showed signs of leakage as a result of applying accident loads. Therefore, it was concluded that volumetric ODIGA flaws with eddy current indications up to 1.62 volts will not leak under accident conditions, and that this is an acceptable threshold value to use to assume zero accident leakage.

To establish a repair limit the threshold value is further reduced, as appropriate, to account for eddy current measurement uncertainty and growth over one fuel cycle to determine a voltage-based repair limit. Repair of all indications greater than the repair limit precludes the possibility of structural failure or primary to secondary leakage during the next planned operating cycle.

This adjustment can be expressed by the following equation:

$$V_{RL} = V_{Threshold} - V_{NDE} - V_{Growth}$$

where

V_{RL} = Repair limit (volts)

$V_{Threshold}$ = Threshold voltage (volts)

V_{NDE} = EC measurement uncertainty (volts)

V_{Growth} = Growth over one fuel cycle (volts)

The leak test results discussed above support a threshold voltage of 1.62 volts.

Eddy current uncertainty consists of three constituents. The first component is an allowance for probe wear. During implementation of the voltage-based repair criteria, probe wear will be monitored by use of a wear standard. Variations in signal amplitude up to 15% will be accepted, but variations beyond 15% will cause the probe to be replaced. The remaining components of eddy current uncertainty are the effects of varying signal noise amplitude and analysis variability. The effects of these variables were studied and quantified for a combined uncertainty due to these two components equal to 0.20 volts. Thus the combined eddy current measurement uncertainty is $(1.62*0.15) + 0.20 = 0.44$ volts.

To assure consistency with the eddy current measurement uncertainty assumptions derived in BAW-10226P, the inspections of the upper tubesheet will be performed consistent with that specified in Appendix A to the topical.

An extensive growth rate study was performed on ANO-1 previous eddy current bobbin data. The change in bobbin voltage from 1993-1996 was determined for 120 upper tubesheet indications. The results show that the average voltage change per effective full power year (EFPY) is "zero" and the variability about this average is attributed to eddy current

uncertainty. This study indicates that the volumetric ODIGA in the ANO-1 upper tubesheet is not growing. To account for potential growth in the future, growth rate studies will be conducted each outage. For conservatism the 95% upper tolerance limit of the data will be used in the establishment of the cycle specific voltage base repair limit. For example, based upon the review of 1993-1996 data the upper tolerance limit allows for a potential growth rate of 0.07 volts/EFPY. Assuming a two year cycle length, the allowance for growth is 0.14 volts.

Therefore, assuming growth rate remains the same, for ANO-1 the repair limit for a two year cycle length would be:

$$V_{RL} = 1.62 - 0.44 - 0.14$$

$$V_{RL} = 1.04 \text{ volts}$$

Tubes containing volumetric ODIGA indications within the upper tubesheet have been removed from the ANO-1 OTSGs on four separate occasions in the past; 1978, 1982, 1984, and 1996. A total of six tubes with 17 indications have been removed and destructively examined. The results of these examinations showed the flaws to exhibit the same basic morphology. However, flaws removed prior to 1996 were larger. The data from the five tubes removed in 1982 and 1996 were used in the development of the ARC. From this data and the growth rate study, the damage mechanism appears stable and consistent with that first detected in the late 1970s. Since there have been no tubes with ODIGA indications removed from the lower tubesheet, Entergy Operations is restricting the application of the ARC to the upper tubesheet only.

In lieu of future tube pulls in support of the ARC, as recommended by Generic Letter 95-05, Entergy Operations plans to conduct in-situ leak tests to further supplement the leakage data base and to demonstrate the conservatism of the voltage-based repair criteria. During each outage the voltage-based repair criteria is applied, four of the largest accessible tubesheet volumetric ODIGA indications with bobbin voltage measurements of >1.0 volt will be in-situ leak tested. It is envisioned that as additional data is gained, either through in-situ tests or leak tests of additional laboratory samples, that a higher voltage threshold will be justified. The decision to pull tubes in the future will be based on the detection of unusual conditions which could call into question aspects of the voltage-based repair limit.

In addition to the testing documented in BAW-10226P, which shows no anticipated leakage from the volumetric ODIGA flaws within the tubesheet, historical ANO-1 plant data also supports this conclusion. There have been no known primary-to-secondary leaks in the history of ANO-1 attributed to an volumetric ODIGA indication despite the fact that many ODIGA indications have remained in service for years.

Additionally, during May 1996, the "B" OTSG tubing was subjected to a differential pressure of approximately 2100 psid for several hours as a result of a feedwater transient. No immediate increase in primary-to-secondary leak rate was noted during the event or following

startup. The primary-to-secondary leak rate did increase by approximately 18 gpd three days following startup; however, none of the leakage detected during the subsequent refueling outage was attributed to a volumetric IGA flaw. It is concluded from ANO-1's history that leakage through IGA flaws in the upper tubesheet is highly unlikely even under accident conditions.

The limiting licensing basis accident with respect to dose consequences from assumed tube leakage is the MSLB accident. This accident assumes a total leakage of 1 gpm with 1% failed fuel in the core. The proposed technical specification change limits primary to secondary leakage to 150 gallons per day through either steam generator for a combined total leakage through both steam generators of 300 gallons per day or 0.208 gallon per minute. Since there is no additional leakage anticipated as a result of applying the voltage-based repair criteria to the upper tubesheet, the existing accident dose calculations remain bounding.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

An evaluation of the proposed change has been performed in accordance with 10 CFR 50.91(a)(1) regarding no significant hazards considerations using the standards in 10 CFR 50.92(c). A discussion of these standards as they relate to this amendment request follows:

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

The steam generators are used to remove heat from the reactor coolant system during normal operation and during accident conditions. The steam generator tubing forms a substantial portion of the reactor coolant pressure boundary. A steam generator tube failure is a violation of the reactor coolant pressure boundary and is a specific accident analyzed in the ANO-1 Safety Analysis Report.

The purpose of the periodic surveillance performed on the steam generators in accordance with ANO-1 Technical Specification 4.18 is to ensure that the structural integrity of this portion of the reactor coolant system (RCS) will be maintained. The technical specification plugging limit of 40% of the nominal tube wall thickness requires tubes to be repaired or removed from service because the tube may become unserviceable prior to the next inspection. Unserviceable is defined in the TS as 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 break. The proposed technical specification specifies an alternate plugging limit for upper tubesheet volumetric outer diameter intergranular attack (ODIGA) indications. Based upon extensive testing and plant experience, it has been determined that upper tubesheet volumetric ODIGA flaws with a bobbin voltage indication less than that specified by the proposed technical specification can remain in service while maintaining the serviceability of the tube.

From testing performed on simulated flaws within the tubesheet, it has been shown that the patch IGA indications within the upper tubesheet, with depths up to 100% through-wall, do not represent structurally significant flaws which would increase the probability of a tube failure beyond that currently assumed in the ANO-1 Safety Analysis Report.

The dose consequences of a MSLB accident are analyzed in the ANO-1 accident analysis. This analysis assumes the unit is operating with a 1 gpm steam generator tube leak and that the unit has been operating with 1% defective fuel.

Increased leakage during a postulated MSLB accident resulting from applying the voltage-base repair criteria to upper tubesheet volumetric ODIGA is not expected. ODIGA has been present in the ANO-1 steam generators for many years with no known leakage attributed to this damage mechanism. Because of its localized nature and morphology, the flaw does not open under accident conditions. To further support this conclusion, hot leak testing at the bounding MSLB temperature, pressure, and load was performed on tubing with representative

laboratory generated flaws. The leak testing was performed on 29 samples with volumetric ODIGA with bobbin indications of 0.04 to 1.62 volts. None of these flaws showed signs of leakage as a result of these loads. Additionally, four specimens created by electrodischarge machining (EDM) with depths up to approximately 95% through-wall were tested with no leakage detected. It was, therefore, concluded that volumetric ODIGA flaws with an eddy current indication up to 1.62 volts will not leak under accident conditions, and that this is an acceptable threshold value to use to assume zero accident leakage.

This change allows volumetric ODIGA flaws within the tubesheet, which are not projected to meet or exceed the 1.62 volt threshold when considering eddy current uncertainty and an allowance for growth, to remain in service. Continued operation with these flaws present does not result in a significant increase in the probability or consequences of an accident previously evaluated for ANO-1.

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 steam generators are passive components. The intent of the technical specification surveillance requirements are being met by this change in that adequate structural and leakage integrity will be maintained. Additionally, the proposed change does not introduce any new modes of plant operation.

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 margin of safety is not reduced by the implementation of the proposed technical specification change allowing volumetric ODIGA flaws within the upper tubesheet which meet the proposed acceptance criteria to remain in service.

Testing of upper tubesheet volumetric ODIGA flaws removed from the ANO-1 OTSGs during 1R13, showed the flawed tubes to be capable of withstanding differential pressures of 10,000 psid without the presence of the tubesheet. Testing of simulated through-wall flaws of up to 0.5 inch in diameter within a tubesheet showed that the tubes always failed outside of the tubesheet. Thus the structural requirements listed in the bases of the technical specification are satisfied considering this change.

Tubes with volumetric ODIGA indications within the tubesheet which satisfy the acceptance criteria specified in the proposed technical specification change are not anticipated to leak

under accident conditions. This is due to the small size of the flaws and their morphology. This premise has been demonstrated through years of actual plant operation with no known leakage attributable to these flaws, even considering a plant transient in 1996 which exposed the "B" steam generator to a primary-to-secondary pressure differential of 2100 psid. The potential for leakage under accident conditions was the focus of testing performed on representative samples of flawed OTSG tubing. These tests confirmed for tubesheet flaws, within the bounds of the proposed technical specification change, that leakage is not expected under accident conditions. With no increased accident leakage anticipated as a result of the proposed technical specification change, the offsite dose consequences from a MSLB accident remain unchanged from that currently analyzed in the ANO-1 Safety Analysis Report.

Therefore, this change does not involve a significant reduction in the margin of safety.

In conclusion, 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.

PROPOSED TECHNICAL SPECIFICATION CHANGES