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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 17. 1999

Mr. C. Randy Hutchinson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 - NOTICE OF ENFORCEMENT DISCRETION RE: STEAM GENERATOR TUBE INDICATION LEFT IN SERVICE FOLLOWING PLANT START-UP (TAC NO. MA7354, NOED 99-6-009)

Dear Mr. Hutchinson:

By letter dated December 16, 1999 (1CAN129905), you requested that the Nuclear Regulatory Commission (NRC) exercise discretion not to enforce compliance with Technical Specifications (TS) 3.1.1.2, "Reactor Coolant System - Steam Generator," and 3.0.3, "Limiting Condition For Operation (General)," for Arkansas Nuclear One, Unit 1 (ANO-1). Your letter documented information previously discussed with the NRC in a telephone conference on December 15, 1999, from 6:30 p.m. to 7:45 p.m. eastern standard time (EST). The principal staff members who participated in that telephone conference included Mr. Stuart Richards, Project Director, Project Directorate IV & Decommissioning; Mr. Robert Gramm, Section Chief, Project Directorate IV & Decommissioning; Mr. Christopher Nolan, Project Manager, Project Directorate IV & Decommissioning; Mr. Edmund (Ted) Sullivan, Acting Branch Chief, Materials & Chemical Engineering Branch; Mr. Emmett Murphy, Senior Technical Reviewer, Materials & Chemical Engineering Branch; Mr. Patrick Milano, Senior Technical Reviewer, Materials & Chemical Engineering Branch; and from Region IV, Mr. Kenneth Brockman, Director, Division of Reactor Projects; Mr. Phillip Harrell, Branch Chief, Division of Reactor Projects; Mr. Russell Bywater, Senior Resident Inspector, ANO, Division of Reactor Projects; Mr. Lawrence Ellershaw, Senior Reactor Inspector, Division of Reactor Safety; Mr. Jeffrey Shackelford, Senior Reactor Analyst, Division of Reactor Safety.

In your request, you stated that with ANO-1 operating at 100 percent power, members of your plant technical staff generated a condition report (CR) that questioned the integrity of an individual steam generator tube that was currently inservice in the "A" steam generator. This CR documented that during a review of eddy current data taken during the last refueling outage, it was identified that steam generator tube R110/L60 contained two axial cracks in the upper roll transition (URT) area that exceeded the tube plugging limit. However, you failed to repair this tube through means of either rerolling or plugging. TS 4.18.5.b indicates that the steam generator shall be demonstrated operable following a steam generator inspection after completing repair activities for all tubes that have indications that exceed the plugging limit. As a result, the "A" steam generator was considered inoperable due to the failure to take action after completion of the surveillance. Therefore, TS 3.1.1.2, "Reactor Coolant System - Steam Generator," was entered. This TS has no associated required action for an inoperable steam generator. Therefore, TS 3.0.3 was entered, as appropriate, to address this condition. TS 3.0.3 requires, within one hour, that action be taken to place the unit in an operating condition in which the TS does not apply through the initiation of a plant shutdown.

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You requested that the NRC issue a Notice of Enforcement Discretion (NOED) pursuant to the NRC's policy regarding exercise of discretion for an operating facility, set out in Section VII.c of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, and be effective immediately and remain in effect until such time that the NRC staff acts on your proposed exigent TS change request to be submitted within 48 hours of authorization of the NOED. The NOED would indicate the NRC staff's intention not to enforce compliance with TS 3.0.3 and TS 3.1.1.2 for the two axial indications located in the URT of tube R110/L60 in the "A" steam generator for ANO-1. This letter documents our telephone conversation on December 15, 1999, at 7:35 p.m. EST when we orally issued this NOED.

On September 10, 1999, Entergy Operations, Inc. (Entergy) initiated a plant shutdown of ANO-1 to begin refueling outage 1R15. During the 1R15 outage, Entergy conducted an inservice inspection of the once-through steam generators (OTSGs) in accordance with TS 4.18, "Steam Generator Tubing Surveillance." The inservice inspection included a non-destructive examination by eddy-current testing (ECT) of the OTSG tubing. During a review of ECT data collected during the last refueling outage for ANO-1, it was determined that a tube containing two parallel axial indications that exceeded the plugging limit was not repaired as required. During the in-process evaluation of the ECT data conducted in 1R15, two small parallel axial indications in tube R110/L60 were identified. One indication was sized as 0.04 inch in length with a 59 percent average and 97 percent maximum through-wall depth, and the other was sized as 0.05 inch in length with a 74 percent average and 97 percent maximum through-wall depth.

During a review of the resolution analysis compare sheets for this tube, Entergy noted that the indications were identified in two different locations; one was called at the tube end and the other at the URT. The indication at the URT was given an appropriate coding of "repairable" by the primary and secondary production analysts but at an incorrect location of upper tube end (UTE)-3. The primary and secondary resolution analysts agreed on the repairable call but kept it at the incorrect location. During the licensee's independent oversight process, an analyst reviewed the indication and corrected the flaw location to UTE-1. However, the independent analyst made an error by changing the call from repairable to "non-repairable." This error was confirmed by the licensee in a reevaluation following ANO-1's return to power operations that found the correct classification was repairable as originally determined.

You stated that the results of the preliminary investigation into the events surrounding this issue indicated that this was the result of an isolated human performance error rather than a procedural or process breakdown. You stated that Entergy evaluated all cases in which the independent oversight process changed a tube repair code such that the tube would be left in service and no other errors were identified. A complete investigation is in progress and will be completed as a component of the resolution of this condition report.

CR No. ANO-1-1999-0577 was written at 9:43 a.m. EST on December 15, 1999, to document this concern. This CR was brought to the attention of the ANO-1 Control Room in order to assess the impact of this issue on the operability of the "A" steam generator. Failure to repair a tube with a flaw that exceeds the plugging limit constitutes a failure to comply with the surveillance requirements of the ANO-1 TSs. TS 4.18.5.b states that, "The steam generator shall be determined operable after completing the corresponding actions (plug, reroll, or sleeve all tubes exceeding the plugging limit and all tubes containing non-TEC [tube end cracks] through-wall cracks) required by Table 4.18-2." The plugging limit is defined as the imperfection depth at or beyond 40 percent of the nominal tube wall thickness for which the tube shall be sleeved, rerolled, or removed from service because it may become unserviceable prior to the next inspection. There is no action associated with the failure to comply with surveillance requirement 4.18.5.b, however, the surveillance specification implies that operability of the "A" steam generator cannot be demonstrated without the performance of a valid surveillance. As a result, the "A" steam generator was declared inoperable at 9:43 a.m. EST and TS 3.1.1.5, "Reactor Coolant System - Reactor Coolant Loops," was entered at that time. TS 3.1.1.5.A states that, "With the reactor coolant average temperature above 280°F, the reactor coolant loops listed below shall be operable: 1) Reactor Coolant Loop (A) and at least one associated reactor coolant pump, and 2) Reactor Coolant Loop (B) and at least one associated reactor coolant pump...." The action associated with this TS requires the restoration of the required loops to operable status within 72 hours or reduce the reactor coolant average temperature to less than or equal to 280°F within the next 12 hours.

Based on discussions with the NRC staff and a further review by your plant technical staff, Entergy indicated that TS 3.1.1.2 should have been entered as the appropriate specification covering this condition. TS 3.1.1.2.A states that, "Two steam generators shall be operable whenever the reactor coolant average temperature is above 280°F." There is no specified action associated with this limiting condition for operation. Therefore, TS 3.0.3, "Limiting Condition for Operation (General)," was entered, as appropriate, to address this condition. TS 3.0.3 states that, "When a Limiting Condition for Operation is not met, except as provided in the associated Action requirements, within one hour action shall be initiated to place the unit in an OPERATING CONDITION in which the Specification does not apply by placing it, as applicable, in: 1. At least HOT STANDBY within the next 6 hours, 2. At least HOT SHUTDOWN within the following 6 hours, and 3. At least COLD SHUTDOWN within the subsequent 24 hours...." TS 3.1.1.2 and TS 3.0.3 were entered at 3:46 p.m. EST.

On the basis of your review, the degradation mechanism associated with the axial indications in the URT was determined to be primary water stress corrosion cracking (PWSCC) in the URT. Entergy stated that the upper roll areas of the OTSGs have been inspected during refueling outages 1R13, 1R14, and 1R15, and indications have been detected by ECT in roll transitions during each of these outages using a 0.115 inch diameter rotating pancake coil and/or a Plus-Point coil. You stated that one tube was pulled and evaluated during the 1R13 outage that confirmed the degradation was from PWSCC with an axial orientation. The cracking was believed to be caused by residual hoop stresses. Entergy also stated that it considered the axial size determination from the ECT to bound the actual length. This was based on a 1999 Babcock and Wilcox Owners Group project that compared the results using a Plus-Point probe to that from destructive examinations. In most cases, the Plus-Point probe oversized the actual flaw length.

In the December 16, 1999, letter, Entergy stated that there has been no evidence of leakage through a URT flaw in the operating history of ANO-1. Further, a leak (bubble) test was performed at the end of cycle 14 with no leakage identified from this degradation mechanism. The current Reactor Coolant System (RCS) primary-to-secondary operational leakage is at about the minimum detectable level. Based on the size of the indications measured by ECT, Entergy estimated that the accident-induced leakage that could result from each flaw in tube R110/L60, assuming through-wall cracking over the entire flaw length, would be negligible. After allowing for crack growth of 0.042 inch during the remainder of the cycle, Entergy also calculated the leak rate using the Opcon leaker module. The crack growth rate was based on bounding data from an Electric Power Research Institute (EPRI) study for PWSCC in tube hardrolls in foreign and domestic steam generators, including recirculating steam generators. Including growth, the estimated leak from a 0.1 inch flaw at the end of cycle (EOC) and 100 percent through-wall over the entire length would be 0.0026 gpm. The combined leakage from both flaws was estimated at 0.0052 gpm, which when combined with expected leakage associated with other flaws in the OTSGs at EOC, yields a total leak rate estimate that is less than 0.9 gpm under accident conditions. You identified the main steam line break scenario as the limiting accident analysis for this condition. The total estimated leakage from the OTSGs is within the current inputs and assumptions of the existing analysis. You stated that the Opcon Code had been benchmarked against a Framatome code for estimating leakage from through-wall tube cracks. The NRC staff believes that there is typically large uncertainties associated with these leakage prediction codes. However, since these indications are contained within the tubesheet region, there would be some constraint against leakage provided by the tubesheet if leakage were to occur. In addition, the predicted accident leakage of 0.0052 gpm is significantly smaller than the 1 gpm limit assumed in the accident analyses. Therefore, the NRC staff finds the leak rate assessment to be reasonable and that continued operation with tube R110/L60 left in service is acceptable for the period of time until an exigent license amendment request is submitted and reviewed by the NRC staff.

Entergy stated that this issue was evaluated to demonstrate that the noncompliance associated with TS 3.0.3 and TS 3.1.1.2 for "A" steam generator tube R110/L60 does not present a potential detriment to the public health and safety and that no significant hazards consideration is involved and no adverse consequences to the environment have been created. You indicated that from testing performed on simulated flaws within the tubesheet, it has been shown that the axial indications within the upper tubesheet left in service 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 structural reinforcement provided by the tubesheet has been demonstrated from hydrostatic testing. Tubes containing flaws in the tubesheet region that have been taken to burst pressure always fail outside the tubesheet region. In addition, leakage under accident conditions would be limited due to the small size of the flaws and would be low enough to ensure offsite dose limits are not exceeded. The NRC staff has reviewed your evaluation and agrees that no significant hazards consideration is involved and that no adverse consequences to the environment have been created.

You indicated that, although no specific compensatory actions were implemented with respect to this NOED request, ANO-1 has a robust monitoring program to detect and mitigate the effects of primary to secondary steam generator tube leakage. In addition, procedures are in place to direct the response of plant operators in the event that steam generator tube leakage is detected. Finally, the ANO-1 plant operations staff has been trained on these procedures and has been sensitized to this scenario as a result of this issue. The methodology for monitoring the secondary system for leakage includes the use of process monitors to check radiation levels in the condenser off-gas, N-16 gama levels from the OTSGs, chemistry samples, and RCS mass balances to detect and calculate leakage. Additionally, ANO-1 has a procedural limit of 0.069 gpm (100 gpd) that is more restrictive than the 0.104 gpm (150 gpd) limit allowed by TS 3.1.6.3.b. The N-16 gama detectors provide continuous monitoring and alarm indication in the Control Room. This system has a dual alarm setpoint system. One alarm is set at slightly above the baseline reading to detect small changes in activity. This alarm can be adjusted by plant operators. The second alarm has a fixed setpoint which when reached requires mitigating actions on the part the operations staff. The NRC staff has reviewed the existing compensatory actions for steam generator tube leakage and determined that they are sufficient for this condition.

You indicated that your NOED request was reviewed by your Plant Safety Committee at approximately 5:04 p.m. EST on December 15, 1999.

Based on these considerations, the NRC staff concluded that Criterion 1(a) of Section B.2 and the applicable criteria in Section C.4 to NRC Inspection Manual Chapter 9900, "Technical Guidance, Operations - Notices of Enforcement Discretion," were met. Criterion 1(a) states that, "For an operating plant, the NOED is intended to...avoid undesirable transients as a result of forcing compliance with the license condition and, thus, minimize potential safety consequences and operational risks...." Criteria 1(a) was satisfied when you demonstrated that the worst case postulated leakage resulting from these indications was bounded by the assumptions in your current accident analysis. In addition, the compensatory measures in place to monitor leakage were determined to be sufficiently robust to reasonably conclude that any leakage resulting from these indications could be identified and mitigated prior to its progression to an extent that could affect public health and safety. You have committed to submit an exigent TS amendment request by December 17, 1999, 7:35 p.m. EST as a one-time change to allow continued operation of ANO-1 with the "A" steam generator tube R110/L60 in service with these two axial indications in the URT until the next refueling outage.

On the basis of the staff's evaluation of the December 16, 1999, request from Entergy, we have concluded that a NOED is warranted because we are clearly satisfied that this action involves minimal or no safety impact, is consistent with the enforcement policy and staff guidance, and has no adverse impact on public health and safety or the environment. Entergy's assessment of primary-to-secondary leakage during normal operations and accident conditions is believed to be conservative and will remain within the leakage requirements for steam generator integrity assumed in the main steam line break accident analysis. Therefore, it is our intention to exercise discretion not to enforce compliance with TSs 3.0.3 and 3.1.1.2 for operability of the "A" steam generator while tube R110/L60 remains unplugged on ANO-1. This discretion is for the period from 7:35 p.m. EST p.m on December 15, 1999, until the staff has had sufficient time to review an exigent license amendment that will address operations with tube R110/L60 remaining in service in the "A" steam generator for ANO-1 which was submitted on December 16, 1999. The staff plans to complete its review of the license amendment within 4 weeks of the date of this letter.

As stated in the Enforcement Policy, action will be taken, to the extent that violations were involved, for the root cause that led to the noncompliance for which this NOED was necessary.

Sincerely,

ORIGINAL SIGNED BY R. GRAMM FOR:

Stuart A. Richards, Director
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

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Sincerely,

Robert A Gramm for/

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Docket No. 50-313

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