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Ron Gaston
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10 CFR 50.55a

2CAN112001

November 24, 2020

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

SUBJECT: Request for Alternative to 10 CFR 50.55a(g)(6)(ii)(D) Examination Requirements – Relief Request ANO2-ISI-022

Arkansas Nuclear One, Unit 2
NRC Docket No. 50-368
Renewed Facility Operating License No. NPF-6

References:

1) Entergy Operations, Inc. (Entergy) letter to U.S. Nuclear Regulatory Commission (NRC), "Request for Alternative to 10 CFR 50.55a(g)(6)(ii)(D) Examination Requirements," (ADAMS Accession No. ML090400962), dated February 9, 2009

2) NRC Letter to Entergy, Arkansas Nuclear One, Unit 2 (ANO-2) – Request for Alternative ANO2-ISI-002 for the Remainder of the Current (Third) 10-Year ISI interval and the Fourth ISI Interval Until the Reactor Vessel Head is Replaced (TAC No. ME0629)" (ADAMS Accession No. ML092300551), dated August 27, 2009

Effective June 3, 2020, the Nuclear Regulatory Commission (NRC) updated the requirements of 10 CFR 50.55a, "Codes and Standards," Section (g)(6)(ii)(D) to require licensees of PWRs to implement American Society of Mechanical Engineers (ASME) Code Case (CC) N-729-6, "Alternative Examination Requirements for Pressurized Water Reactor (PWR) Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds, Section XI, Division 1," with conditions on its use.

Arkansas Nuclear One, Unit 2 (ANO-2) is currently categorized as having a high susceptibility to primary water stress corrosion cracking (PWSCC) with regards to it the reactor vessel closure head (RVCH) with nozzles having pressure-retaining partial-penetration welds. ANO-2 is currently committed to perform volumetric inspections of the partial penetration welds in the

RVCH each refueling outage due to its categorization in accordance with Code Case N-729-6. Specifically, the bottom end of the ANO-2 control element drive mechanism (CEDM) nozzles contain threads that cannot be effectively examined in accordance with the N-729-6 requirements. Pursuant to 10 CFR 50.55a(a)(z)(1), Entergy Operations, Inc. (Entergy) requests approval of the proposed alternative to the requirements of the Code Case N-729-6 for the fifth (5th)10-year inservice inspection (ISI) interval, which commenced on March 26, 2020, and the sixth (6th) ISI interval, or until the end of the current operating license for ANO-2. This request is the same as the previous interval request for alternative, as documented in Reference 1 and approved by the NRC in Reference 2. The request is provided in the Enclosure to this letter.

In accordance with 10 CFR 50.55a(a)(z)(1), the proposed alternative to the referenced requirements may be approved by the NRC provided an acceptable level of quality and safety are maintained. Entergy believes the proposed alternative meets this requirement.

This relief request includes one new regulatory commitment. Attached to the Enclosure contains a copy of the commitment for completeness.

Entergy requests approval of the proposed alternative by September 1st, 2021, in order to support the ANO-2 fall 2021 refueling outage.

If you have any questions or require additional information, please contact Riley Keele at 479-858-7826.

Respectfully,

ORIGINAL SIGNED BY RON GASTON

Ron Gaston

RWG/ble

Enclosure:
Request for Alternative ANO2-ISI-022

Attachment to Enclosure
List of Regulatory Commitments

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Arkansas Nuclear One
NRC Project Manager – Arkansas Nuclear One

Enclosure

2CAN112001

REQUEST FOR ALTERNATIVE

ANO2-ISI-022

REQUEST FOR ALTERNATIVE
ANO2-ISI-022

I. ASME COMPONENTS AFFECTED

Arkansas Nuclear One, Unit 2 (ANO-2) has ninety (90) American Society of Mechanical Engineers (ASME) Class 1 reactor vessel closure head (RVCH) penetration nozzles comprised of eighty-one (81) Control Element Drive Mechanism (CEDM) nozzles, eight (8) Incore Instrument (ICI) nozzles, and one (1) vent line nozzle. This request pertains to the CEDM nozzles only.

II. APPLICABLE CODE EDITION AND ADDENDA

ASME Code, Section XI, 2007 Edition with the 2008 Addenda is the current code of record for ANO-2.

III. CODE CASE N-729-6 REQUIREMENTS

10 CFR 50.55a(g)(6)(ii)(D)(1) requires that examinations of the RVCH be performed in accordance with ASME Code Case (CC) N-729-6, "Alternative Examination Requirements for Pressurized Water Reactor (PWR) Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds, Section XI, Division 1," (Reference 1), subject to the conditions specified in paragraphs 10 CFR 50.55a(g)(6)(ii)(D)(2) through (8).

CC N-729-6 Requirements

CC N-729-6 requires that components shall be examined as specified in Table 1 of the code case. Table 1, Item B4.20 requires examination of all nozzles. Paragraph 2500 of CC N-729-6 states, in part:

"… If obstructions or limitations prevent examination of the volume or surface required by Figure 2 for one or more nozzles, the analysis procedure of Mandatory Appendix I shall be used to demonstrate the adequacy of the examination volume or surface for each such nozzle. If Mandatory Appendix I is used, the evaluation shall be submitted to the regulatory authority having jurisdiction at the plant site."

This request is an alternative to the use of ASME CC-N-729-6, Appendix I.

IV. REASON FOR REQUEST

Pursuant to 10 CFR 50.55a(z)(1), Entergy Operations, Inc. (Entergy) requests an alternative to the requirements of CC N-729-6 for the fifth (5^{th}) 10-year inservice inspection (ISI) interval and the sixth (6^{th}) ISI interval, or until the end of the current operating license for ANO-2. Entergy plans to inspect the RVCH CEDM penetration nozzles at ANO-2 using the ultrasonic testing (UT) method to the extent possible. However, a UT inspection from the inside diameter (ID) of the CEDM nozzles at ANO-2 can only be performed from 2 inches above the

root of the J-groove weld down to a point approximately 1.544 inches above the bottom of the nozzle. This 1.544 inch "blind zone" is due to limitations resulting from CEDM nozzle configuration (1.344 inches) and inspection probe design (0.200 inches). These limitations are discussed below. The difficulties associated with these limitations are discussed in Reference 2.

Nozzle Configuration Limitation

Guide cones are attached to the bottoms of the ANO-2 CEDM nozzles via threaded connections. Specifically, the guide cone screws into the end of the CEDM nozzle with a welded set screw and two tack welds at the cone-nozzle interface to secure the guide cone to the nozzle. The length of the threaded connection region is 1.25 inches. Additionally, a 45° chamfer exists immediately above the threaded connection region. The length of the chamfer region is 0.094 inches.

Due to the threaded connection and chamfer region at the bottom of each CEDM nozzle, a meaningful UT examination in that area cannot be performed. Specifically, the chamfer region geometry causes sporadic signals while, once the guide cone is reached, sound cannot pass into the CEDM nozzle base material because of the gap that exists between the guide cone and the nozzle at the threaded connection. Therefore, UT of the bottom 1.344 inches (1.25 + 0.094) of the CEDM nozzles is not possible.

Inspection Probe Design Limitation

The inspection probe to be used to inspect the ANO-2 CEDM nozzles typically consists of multiple individual transducers. Various probe configurations may be utilized to perform the inspections.

The inspection probe is designed so that the ultrasonic transducers are slightly recessed into the transducer holder. This recess must be filled with water to provide an acoustic coupling between the transducer and the nozzle wall. Because of this design, the complete diameter of the transducer must fully contact the inspection surface before ultrasonic information can be collected. Because UT probes have a diameter of 0.250 inch, these transducers, in theory, are able to collect meaningful UT data down to a point approximately 0.125 inch (1/2 diameter) above the chamfer. However, when the lower edge of the transducer recess drops below the chamfer, the water between the transducer and the nozzle cannot be maintained, and the acoustic coupling is lost. Based on prior UT inspection experience and a review of UT data from previous inspections, meaningful data down to a point 0.200 inches above the chamfer can be collected.

V. PROPOSED ALTERNATIVE AND BASIS FOR USE

UT Examination

The ID of each CEDM nozzle (i.e., nozzle base material) will be ultrasonically examined from the applicable point above the root of the J-groove (i.e., per CC N-729-6, 1.5 inches for nozzles with an incidence angle less than or equal to 30°, and 1.0 inch for nozzles with an incidence angle greater than 30° on a horizontal plane perpendicular to the nozzle axis) to 1.544 inches above the bottom of the nozzle.

The data acquisition techniques used are expected to be essentially the same as those used in previous examination activities.

In addition, an assessment to determine if leakage has occurred into the interference fit zone will be performed.

Analysis

For the "blind zone" portions of the CEDM nozzle not examined by UT, analysis has been performed to:

a) Determine if sufficient free-span exists between the blind zone and the weld to facilitate one (1) operating cycle of crack growth without the crack reaching the weld, and

b) For nozzles or portions of nozzles not meeting the item above, determine how much propagation length is required to facilitate one cycle of crack growth without the crack reaching the weld. This length is composed of the distance between the weld and the blind zone plus some additional distance into the blind zone. The additional distance into the blind zone has previously been defined and is subject to augmented inspection as described below. This area to be inspected may include a portion of the weld.

Augmented Inspections

CEDM nozzles that have been demonstrated by analysis to have inadequate free-span to ensure a crack will not grow to the J-groove weld within one operating cycle will be inspected. These nozzles and their associated augmented inspections were identified in Reference 1. Specifically, an augmented inspection of the applicable outside diameter (OD) surface of the nozzle and applicable surfaces of the J-groove weld fillet cap will be performed on that portion of the nozzle and weld fillet cap that has been determined by analysis as necessary to prevent a crack from reaching the J-groove weld in less than one operating cycle.

Basis

Entergy previously provided the background and basis for the proposed alternative in Reference 2.

The examination volume required by CC N-729-6 specifies ultrasonic testing of the RVCH penetration nozzle (i.e., nozzle base material) from 1.5 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.5 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 1.5 inches) for nozzles with an incidence angle less than or equal to 30°; and from 1.0 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 1.0 inches) for nozzles with an incidence angle greater than 30°.

The proposed alternative provides a combination of UT examination to the extent possible, plus augmented surface examination as required to ensure that a postulated flaw in the lower portion of the nozzle that cannot be volumetrically (UT) examined will not propagate into the weld during one cycle of operation. The basis for the proposed alternative does not require that the specified UT examination volume be met; therefore, the basis for the proposed alternative remains valid with regard to the differences between the examination volumes specified in the Order and in CC N-729-6.

The frequency of examination specified by CC N-729-6 requires that the volumetric examination be completed prior to a head accumulation of 2.25 RIY (Re-Inspection Years) of operation.

The length of operating time that translates into an RIY value of 2.25 years is calculated as a function of the operating temperature of the head. Based on the temperature of the ANO-2 head during normal operation, the volumetric examination will have to be performed each refueling outage to prevent exceeding an RIY value of 2.25 between successive examinations. However, because the RIY value is subject to calculation variables, and since the examination frequency is a critical criterion in the basis for the proposed alternative, Entergy is adding a specific commitment that the proposed alternative examination will be completed each refueling outage.

VI. CONCLUSION

From 10 CFR 50.55a

> (z) Alternatives to codes and standards requirements. Alternatives to the requirements of paragraphs (b) through (h) of this section or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:
>
> (1) *Acceptable level of quality and safety*. The proposed alternative would provide an acceptable level of quality and safety;

Entergy believes the proposed alternative provides an acceptable level of quality and safety by utilizing inspections and supplemental analysis to determine the condition of the ANO-2 CEDM nozzles. This request is the same as the previous interval request for alternative documented in Reference 3 and approved by the NRC in Reference 4. Therefore, Entergy requests authorization to perform the proposed alternative to the CC requirement pursuant to 10 CFR 50.55a(z)(1) for implementation for the 5th 10-year inservice inspection (ISI) interval and the 6th ISI interval, or until the end of the current operating license for ANO-2.

VII. REFERENCES

1. 10 CFR 50.55a, "Codes and Standards"

2. Entergy letter to the U.S. Nuclear Regulatory Commission (NRC), "ANO-2 Relaxation Request #5 to NRC First Revised Order EA-03-009 for the Control Element Drive Mechanism Nozzles" (ADAMS Accession No. ML052560109), dated September 9, 2005

3. Entergy letter to the NRC, "Request for Alternative to 10 CFR 50.55a(g)(6)(ii)(D) Examination Requirements Arkansas Nuclear One, Unit 2," (2CAN020901) (ADAMS Accession No. ML090400962, dated February 9, 2009

4. NRC letter to Entergy, "Arkansas Nuclear One, Unit 2 (ANO-2) – Request for Alternative ANO2-ISI-002 for the remainder of the current (Third) 10-Year ISI interval and the Fourth ISI Interval until the reactor vessel head is replaced (TAC No. ME0629)," (ADAMS Accession No. ML092300551), dated August 27, 2009

Attachment:

List of Regulatory Commitments

Enclosure, Attachment 1

2CAN112001

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
The alternative examination proposed by the Request for Alternative will be completed each ANO-2 refueling outage for the fifth 10-year inservice inspection (ISI) interval and the sixth ISI interval, or until the end of the current operating license for ANO-2.		**X**	N/A