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

April 18, 2022

ANO Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
N-TSB-58
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – APPROVAL OF REQUEST FOR ALTERNATIVE ANO2-PT-003 END-OF-INTERVAL SYSTEM LEAKAGE TEST FOR EXTENDED REACTOR COOLANT PRESSURE BOUNDARY PIPING (EPID L-2021-LLR-0049)

Dear Sir or Madam:

By letter dated June 29, 2021 (Agencywide Documents Access and Management System Accession No. ML21180A435), Entergy Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of Alternative ANO2-PT-003 for the fifth 10-year inservice inspection (ISI) interval at Arkansas Nuclear One, Unit 2 (ANO-2). The licensee proposed an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," IWB-5222(b). The licensee proposed to perform visual examinations of specific Class 1 reactor coolant pressure boundary (RCPB) piping components under Class 2 system pressure testing conditions at ANO-2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(z)(2), the licensee requested to use an alternative on the basis that complying with certain ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed alternative provides reasonable assurance of structural integrity of the subject components at ANO-2. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2) and is in compliance with ASME Code requirements. Therefore, the NRC staff authorizes the use of Alternative ANO2-PT-003 at ANO-2 to visually examine the extended RCPB for the duration of the fifth 10-year ISI interval, which is scheduled to end on March 25, 2030.

All other ASME Code, Section XI requirements for which an alternative was not specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the ANO Project Manager, Thomas Wengert, at 301-415-4037 or by e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

Jennifer L. Dixon-Herrity

Digitally signed by Jennifer L. Dixon-Herrity
Date: 2022.04.18 10:01:20 -04'00'

Jennifer L. Dixon-Herrity, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
Safety Evaluation

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM

REQUEST FOR ALTERNATIVE ANO2-PT-003

ARKANSAS NUCLEAR ONE, UNIT 2

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated June 29, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21180A435), Entergy Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of Alternative ANO2-PT-003 for the fifth 10-year inservice inspection (ISI) interval at Arkansas Nuclear One, Unit 2 (ANO-2). The licensee proposed an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," IWB-5222(b). The licensee proposed to perform visual examinations of specific Class 1 reactor coolant pressure boundary (RCPB) piping components under Class 2 system pressure testing conditions.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and Standards," paragraph (z)(2), the licensee requested to use the proposed alternative on the basis that complying with the specified ASME Code requirements would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," which states, in part, that ASME Code Class 1, 2, and 3 components will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI.

Section 50.55a(z) of 10 CFR, "Alternatives to codes and standards requirements," states, that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a or portions thereof may be used when authorized by the NRC and that proposed alternatives must be submitted and authorized prior to implementation. The licensee must demonstrate that:
(1) "The proposed alternative would provide an acceptable level of quality and safety; or

(2) “Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.”

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 Licensee’s Request for Alternative

3.1.1 ASME Code Components Affected

ASME Code Class:	Class 1
Reference:	ASME Code, Section XI, 2007 Edition with 2008 Addenda, IWB-5222(b)
Examination Category:	B-P
Item Number:	B15.20
Components:	RCPB

1. Low Temperature Overpressure Protection (LTOP) piping between Valves 2CV-4730-1 and 2CV-4731-2
2. LTOP piping between Valves 2CV-4740-2, 2CV-4741-1, and 2CV-4698-1

3.1.2 Applicable ASME Code Requirements

The current Code of record for ANO-2 during the fifth 10-Year ISI interval is the ASME Code, Section XI, 2007 Edition through the 2008 Addenda. Subparagraph IWB-5222(b) requires that the pressure-retaining boundary be extended to all Class 1 pressure-retaining components within the system boundary during the system leakage test conducted at or near the end of each inspection interval.

3.1.3 Licensee’s Basis for Request and Proposed Alternative

In its submittal, the licensee stated that performing the leakage test of the Class 1 boundary beyond the inboard isolation valves at or near the end of each inspection interval would require the removal and reinstallation of safety relief valves, the installation of fabricated adapters, and performance of the system leakage test with the applied external pressure sources, which would put the plant in an abnormal configuration and would require off-normal activities to pressurize the subject piping. The licensee also stated that these activities and off-normal configurations have the potential to adversely impact normal plant startup due to the critical path time and effort required to ensure system configuration is restored and tested prior to start up. The licensee identified additional risks associated with these activities, including damage to permanent plant equipment and seat leakage at downstream isolation valves, causing unnecessary delays. The licensee also noted that these activities would result in significant additional effort and radiological exposure of personnel.

The licensee further stated that the subject piping is extremely difficult to test during the Class 1 leakage test but can easily be aligned to the Class 2 system and tested under Class 2 test

conditions during each inspection period. Class 2 pressure is lower than Class 1, but it is representative of conditions for which the subject piping is exposed to during both normal and accident conditions. Additionally, the licensee noted that, if the inboard valve leaked (thereby pressurizing the subject piping) and a through-wall flaw that could only be detected at the higher pressure did exist, the flaw would be discovered during the Class 1 leakage test, which is performed during each refueling outage when the inboard valve is closed. In its alternative request, the licensee provided the following descriptions of the components subject to this request:

> The [LTOP] piping downstream of valve 2CV-4730-1 serves a Class 2 function to maintain Reactor Coolant System (RCS) integrity during normal power operation. The valve has a manual open safety function that enables LTOP relief valve 2PSV-4732 to provide overpressure protection during conditions of low temperature operation. This portion of the piping between valves 2CV-4730-1 and 2CV-4731-2 is normally not pressurized during normal plant operation. During plant cool down from Mode 4 to Mode 5, this portion of piping is placed in service when RCS pressure is < [less than] 350 psia [pounds per square inch absolute]. Likewise, during plant heat-up, this portion of piping remains in service until RCS temperature is between 275 °F [degrees Fahrenheit] to 300 °F and isolated prior to exceeding an RCS pressure of 375 psia. …
>
> The piping downstream of valve 2CV-4740-2 performs a Class 2 function by maintaining RCS integrity during normal power operation. The valve has a manual open safety function that enables LTOP relief valve 2PSV-4742 to provide overpressure protection during conditions of low temperature operation. In addition, this isolation valve has a manual open safety function to support feed and bleed cooling operations when normal cooling methods are unavailable. The portion of piping between valves 2CV-4740-2, 2CV-4741-1, and 2CV-4698-1 is not pressurized during normal plant operation. During plant cooldown from Mode 4 to Mode 5, this portion of piping is placed in service when RCS pressure is < 350 psia. Likewise, during plant heat-up, this portion of piping remains in service until RCS temperature is between 275 °F to 300 °F and isolated prior to exceeding an RCS pressure of 375 psia.

The licensee further stated that performing the system leakage test at or near the end of the inspection interval of the Class 1 piping between the inboard and the outboard isolation valves would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee proposed to perform a system leakage test complying with the Class 2 system conditions during the last inspection period of the fifth 10-year ISI interval, which is scheduled to end on March 25, 2030.

3.2 NRC Staff Evaluation

The LTOP piping between Valves 2CV-4730-1 and 2CV-4731-2, and between Valves 2CV-4740-2, 2CV-4741-1, and 2CV-4698-2, including the valves, are ASME Code Class 1 and, therefore, are subject to pressure testing in accordance with subsubarticle IWB-5220. The subject piping is outboard of the first isolation valve and is designed for RCPB conditions but is exposed only to Class 2 system conditions during normal operation and under accident conditions. This system would only experience Class 1 system conditions if there was a leak in the inboard isolation valve.

Performing the ASME Code-required system leakage test would require removal of safety relief valves, installation of fabricated adapters, application of an external pressure source, and reinstallation of the safety valves. The NRC staff finds that these modifications would ultimately put the plant in an abnormal configuration, may create a safety concern for personnel due to the lack of RCS double-valve isolation, and would result in additional radiological exposure to personnel. Accordingly, the NRC staff concludes that compliance with the provisions of subparagraph IWB-5222(b) of ASME Code, Section XI for these components, under the circumstances discussed above, would result in hardship without a compensating increase in the level of quality and safety.

The licensee proposed to perform a pressure test that complies with Class 2 requirements on the subject Class 1 piping between the inboard and outboard isolation valves during the last inspection period of the fifth 10-year ISI interval. Specifically, the proposed system leakage test would expose the extended Class 1 boundary to a lower test pressure than the ASME Code-required RCS pressure corresponding to 100 percent power. However, the proposed test pressure would correspond to the expected LTOP operating pressure for each of the subject piping components. The NRC staff acknowledges that performing the leakage test at a significantly lower pressure for the components in the extended Class 1 boundary will limit the capability to detect leakage in the Class 1 pressure boundary. However, considering that the conditions for the proposed system pressure test are representative of the conditions during plant heat-up or cooldown, the NRC staff finds that the alternative testing provides assurance that the piping system will be able to perform its intended function.

A significant mitigating factor in approving the licensee's proposed alternative is the absence of any known degradation mechanism, such as intergranular stress corrosion cracking, primary water stress corrosion cracking, or thermal fatigue, that can potentially affect the welds in the subject segments. The NRC staff finds that this absence of any known degradation mechanism and the relatively small amount of piping involved minimizes the likelihood of the existence of a defect that could challenge the structural integrity of the piping, even if pressurized to RCS pressure consistent with its Class 1 designation.

The NRC staff notes that the inboard isolation valves may leak slightly and potentially pressurize these piping segments to Class 1 system pressure during the RCS leak test at the end of every refueling outage or during normal operation. While not ideal, this would effectively expose the piping between the isolation valves to the RCS pressure and permit through-wall flaws to be identified by evidence of leakage, while still effectively mitigating the risk associated with the flaw by preventing any large loss of coolant through the closed inboard isolation valve. Therefore, the NRC staff concludes that the risk associated with authorizing the proposed alternative would be very low.

Based on the information set forth above, the NRC staff determines that compliance with the Code requirements for the referenced piping components would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff further determined that in the absence of a known degradation mechanism, the licensee's proposed alternative provides reasonable assurance that the subject piping system can perform its intended function, while maintaining personnel radiation exposure as low as reasonably achievable. Therefore, the NRC staff finds that the licensee's proposed alternative is acceptable.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides reasonable assurance of structural integrity of the subject components at ANO-2. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2) and is in compliance with ASME Code requirements. Therefore, the NRC staff authorizes the use of Alternative ANO2-PT-003 at ANO-2 to visually examine the extended RCPB for the duration of the fifth 10-year ISI interval, which is scheduled to end on March 25, 2030.

All other ASME Code, Section XI requirements for which an alternative was not specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: A. Young

Date: April 18, 2022

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – APPROVAL OF REQUEST FOR ALTERNATIVE ANO2-PT-003 END-OF-INTERVAL SYSTEM LEAKAGE TEST FOR EXTENDED REACTOR COOLANT PRESSURE BOUNDARY PIPING (EPID L-2021-LLR-0049) DATED APRIL 18, 2022

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