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

March 26, 2020

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 ANO 2-PT-002 END-OF-INTERVAL SYSTEM LEAKAGE TEST FOR EXTENDED REACTOR COOLANT PRESSURE BOUNDARY PIPING (EPID L-2019-LLR-0073)

Dear Sir or Madam:

By letter dated July 25, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19206A779), Entergy Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative, ANO2-PT-002, for the fourth 10-year inservice inspection interval at Arkansas Nuclear One, Unit 2 (ANO-2). The licensee's request describes an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," subparagraph IWB-5222(b). Proposed Alternative ANO2-PT-002 would use Class 2 system pressure for the system leakage test conducted at or near the end of each inspection interval for certain Class 1 piping components 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 the ASME Code requirements. Therefore, the NRC staff authorizes the use of the licensee's proposed Alternative ANO2-PT-002 at ANO-2 to visually examine the extended reactor coolant pressure boundary for the duration of the fourth 10-year inservice inspection interval, which is scheduled to end in March 2020.

All other ASME Code Section XI, requirements for which relief 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 Project Manager, Thomas Wengert, at 301-415-4037 or by e-mail at Thomas.Wengert@nrc.gov.

Sincerely,

/RA/

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

FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR ALTERNATIVE ANO2-PT-002

ARKANSAS NUCLEAR ONE, UNIT 2

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated July 25, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19206A779), Entergy Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of Alternative ANO2-PT-002 for the fourth 10-year inservice inspection (ISI) interval at Arkansas Nuclear One, Unit 2 (ANO-2). The licensee's request describes 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," subparagraph IWB-5222(b). Proposed Alternative ANO2-PT-002 would use Class 2 system pressure for the system leakage test conducted at or near the end of each inspection interval for certain Class 1 piping components 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.

2.0 REGULATORY REQUIREMENTS

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 inspection requirements, set forth in the ASME Code, Section XI.

Section 50.55a(z) of 10 CFR, "Alternatives to codes and standards requirements," states, in part, that alternatives to the requirements of 10 CFR 50.55a(b) through (h) may be used, when authorized by the NRC if: (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(z)(2), the licensee proposed an alternative to subparagraph IWB-5222(b) of the 2001 Edition with the 2003 Addenda to ASME Code, Section XI.

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

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, IWB-5222(b)
Examination Category:	B-P
Item Number:	B15.10
Components:	Reactor Coolant Pressure Boundary:

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 fourth 10-year ISI interval is the 2001 Edition with the 2003 Addenda to ASME Code, Section XI. The requirements of subparagraph IWB-5222(b) for Examination Category B-P, Item B15.10 require 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 the Proposed Alternative

In its submittal, the licensee stated that the LTOP piping between Valves 2CV-4730-1 and 2CV-4731-2 is classified as an ASME Code Class 1 component, but it serves a Class 2 function during normal power operations. Additionally, the piping between these valves is not pressurized during normal plant operations. During plant cooldown from Mode 4 (hot shutdown) to Mode 5 (cold shutdown), this portion of the piping is placed in service when the reactor coolant system (RCS) pressure is below 350 pounds per square inch absolute (psia). During plant heatup, this portion of the piping stays in service until the RCS temperature is between 275 degrees Fahrenheit (°F) to 300 °F and is isolated prior to exceeding a pressure of 375 psia.

The licensee stated that the LTOP piping between Valves 2CV-4740-2, 2CV-4741-1, and 2CV-4698-1 is also an ASME Code Class 1 component that performs a Class 2 function during normal power operation. The isolation valve has a manual open safety function to support feed and bleed cooling operations when normal cooling methods are not available. The piping between Valves 2CV-4740-2, 2CV-4741-1, and 2CV-4698-1 is not pressurized during normal

plant operations. During plant cooldown from Mode 4 to Mode 5, this portion of the piping is placed in service when the RCS pressure is less than below 350 psia. During plant heatup, this portion of the piping remains in service until the RCS temperature is between 275 °F to 300 °F and is isolated prior to exceeding a pressure of 375 psia.

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 place the plant in an abnormal configuration or would require off-normal activities in order to pressurize the subject piping. The licensee also stated that these challenges include removal of safety relief valves, installation of fabricated adaptors, and performing the system leakage test with external pressure sources, followed by reinstallation of the removed safety relief valves. Each of these activities has an associated potential to adversely impact normal plant startup because of the critical path time and effort required to ensure system configuration is restored and tested prior to start up. The licensee noted that these activities would result in significant additional person-hours along with the associated radiological exposure.

The licensee also stated that while the subject piping is extremely difficult to test during the Class 1 leakage test, it is easily aligned to the Class 2 system and can be tested at Class 2 test conditions each inspection period. Although Class 2 pressure is lower than Class 1, it is representative of conditions for which the subject piping is exposed during both normal and accident conditions. Additionally, if the inboard valve leaked (thereby pressurizing the subject piping) and a through-wall flaw did exist that could only be detected at the higher pressure, the flaw would be discovered during the Class 1 leakage test, which is performed during each refueling outage when the inboard valve is closed.

The licensee further stated that performing the system leakage test at or near the end of inspection interval of the Class 1 piping between the inboard and the outboard isolation valves including the isolation valves identified in Section 3.1.1 of this safety evaluation would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee proposes to perform a system leakage test complying with the Class 2 system conditions during the last inspection period of the fourth 10-year ISI interval, which was scheduled to end in March 2020.

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-4698-1 including the valves, are ASME Code Class 1. During normal operation, the pressure for these components is that of its connecting system, unless the inboard isolation valve leaks. In order to perform the ASME Code-required system leakage test for these components in the extended Class 1 pressure boundary, an alternative method of pressurizing these to the RCS operating pressure corresponding to 100 percent power would be required. The NRC staff believes that the provision for pressurization for the system leakage test would require considerable person-hours effort and would result in additional radiological exposure to personnel. Furthermore, pressurization by this method would preclude the RCS double-valve isolation and may cause safety concerns for the personnel performing the examination. 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 above discussed circumstances, would result in hardship without a compensating increase in the level of quality and safety.

The licensee's requested alternative, ANO2-PT-002, proposes to test the Class 1 piping between the inboard and the outboard isolation valves including the isolation valves identified in Section 3.1.1 of this safety evaluation. Specifically, the licensee proposes to perform a pressure test that complies with the Class 2 requirements to be conducted during the same inspection interval. The licensee proposes to perform the system leakage test of the subject piping segments between the inboard and outboard isolation valves to the requirements of the interconnecting Class 2 system leakage test during the same inspection interval. The licensee's proposed alternative 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 operating pressure for each of the subject piping components for the LTOP system.

The NRC staff believes that performing the leakage test at significantly lower pressure for the components in the extended Class 1 boundary will have limited capability to detect leakage in the Class 1 pressure boundary. Considering that the proposed system pressure test for these components will be done at the same conditions they are exposed to when the system is placed into operation during plant startup or shutdown, the proposed test would, however, provide assurance that the piping system is able to perform its intended function at the time of the test.

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 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 the licensee's proposed alternative 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 the ASME Code requirements. Therefore, the NRC staff authorizes the use of Alternative ANO2-PT-002 at ANO-2 to visually

examine the extended reactor coolant pressure boundary for the duration of the fourth 10-year ISI interval, which is scheduled to end in March 2020.

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

Principal Contributor: R. Kalikian

Date: March 26, 2020

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – APPROVAL OF REQUEST FOR ALTERNATIVE ANO 2-PT-002 END-OF-INTERVAL SYSTEM LEAKAGE TEST FOR EXTENDED REACTOR COOLANT PRESSURE BOUNDARY PIPING (EPID L-2019-LLR-0073) DATED MARCH 26, 2020

DISTRIBUTION:
PUBLIC
PM File Copy
RidsNrrLAPBlechman Resource
RidsNrrDorlLpl4 Resource
RidsNrrDnrlNphp Resource
RidsNrrPMANO Resource
RidsACRS_MailCTR Resource
RidsRgn4MailCenter Resource
RKalikian, NRR

ADAMS Accession No. ML20083J968 *by e-mail

OFFICE	NRR/DORL/LPL4/PM*	NRR/DORL/LPL4/PM*	NRR/DORL/LPL4/LA*
NAME	JDrake	TWengert	PBlechman
DATE	03/24/2020	03/24/2020	03/24/2020
OFFICE	NRR/DNRL/NPHP/BC*	NRR/DORL/LPL4/BC*	
NAME	MMitchell	JDixon-Herrity	
DATE	01/22/2020	03/26/2020	

OFFICIAL RECORD COPY