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

February 13, 2017

Mr. Adam C. Heflin
President, Chief Executive Officer,
and Chief Nuclear Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION – REQUEST FOR RELIEF I3R-13 FROM CERTAIN AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE INSERVICE INSPECTION REQUIREMENTS FOR CLASS 1 AND CLASS 2 PIPING WELDS DURING THE THIRD 10-YEAR INTERVAL (CAC NO. MF8308)

Dear Mr. Heflin:

By application dated August 23, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16243A039), as supplemented by letter dated November 30, 2016 (ADAMS Accession No. ML16340B019), the Wolf Creek Nuclear Operating Corporation (the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1." Relief Request 13R-13 pertains to examination coverage of the Class 1 and Class 2 piping welds at the Wolf Creek Generating Station (WCGS).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iii), the licensee requested relief from the required examination coverage and to use alternative requirements for inservice inspection (ISI) of the piping welds on the basis that the ASME Code requirement is impractical. The licensee proposed that the limited coverage examinations already performed, be accepted for meeting ASME Code requirements.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that it is impractical for the licensee to comply with the ASME Code, Section XI requirements; that the proposed inspection provides reasonable assurance of structural integrity or leak tightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i) and grants this relief request at WCGS for the third 10-year ISI interval, which commenced on September 3, 2005, and ended on September 2, 2015.

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 In service Inspector.

If you have any questions concerning this matter, please call Mr. Balwant K. Singal of my staff at (301) 415-3016 or by electronic mail at Balwant.Singal@nrc.gov.

Sincerely,

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosure
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF I3R-13

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

1.0 INTRODUCTION

By application dated August 23, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16243A039), as supplemented by letter dated November 30, 2016 (ADAMS Accession No. ML16340B019), the Wolf Creek Nuclear Operating Corporation (WCNOC, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1. Relief Request 13R-13 pertains to examination coverage of the Class 1 and Class 2 piping welds at the Wolf Creek Generating Station (WCGS).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iii), the licensee requested relief from the required examination coverage and to use alternative requirements for inservice inspection (ISI) of the piping welds on the basis that the ASME Code requirement is impractical. The licensee proposed that the limited coverage examinations already performed be accepted for meeting ASME Code requirements.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME Code that become effective subsequent to editions specified in paragraphs 50.55a(g)(2) and 50.55a(g)(3) of 10 CFR, and that are incorporated by reference in paragraph 50.55(a)(1)(ii) of 10 CFR, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(4)(ii), "Applicable ISI Code: Successive 120-month intervals," inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals, must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in paragraph 50.55a(a) of 10 CFR, 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in

Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 17 (ADAMS Accession No. ML13339A689), when using Section XI, that are incorporated by reference in paragraph 50.55(a)(3)(ii) of 10 CFR 50.55a), subject to the conditions listed in paragraph 50.55a(b) of 10 CFR. However, a licensee who's inservice inspection interval commences during the 12 through 18-month period after July 21, 2011, may delay the update of their Appendix VIII program by up to 18 months after July 21, 2011.

Pursuant to 10 CFR 50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," if the licensee has determined that conformance with the ASME Code requirement is impractical for its facility, the licensee must notify the NRC and submit, as specified in 10 CFR 50.4, "Written communications," information to support the determinations. Determinations of impracticality, in accordance with 10 CFR 50.55a, must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with 10 CFR 50.55a must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

Pursuant to 10 CFR 50.55a(g)(6)(i), "Impractical ISI requirements: Granting of relief," the Commission will evaluate determinations under 10 CFR 50.55a(g)(5) that ASME Code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, and will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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 the NRC to authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Background

By letter dated February 21, 2007 (ADAMS Accession No. ML070260538), the NRC approved implementation of the risk-informed inservice inspection (RI-ISI) program for the Class 1 piping welds (Examination Category B-F and B-J) and the Class 2 piping welds (Examination Category C-F-I and C-F-2) for the third 10-year ISI interval at WCGS. The licensee developed the RI-ISI program in accordance with the NRC approved methodology of the Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure (PWRMRP-05)" December 1999 (ADAMS Accession No. ML013470102).

3.2 Component Affected

The affected components are ASME Code Class 1 and 2 piping welds (as identified in Tables 1 and 2 of Attachment 1 to letter dated August 23, 2016) and are listed below.

Weld Number	ASME Code Class	Examination Category/Item Number	System	Description	Material
BB-02-F019	1	R-A/R1.11	RCS[1]	Pipe to valve weld	Austenitic SS[2]
BB-02-FW301	1	R-A/R1.11	RCS	180 degree fitting to flange weld	Austenitic SS
BG-21-F013B	1	R-A/R1.11	RCS	Pipe to valve weld	Austenitic SS
EJ-04-F048A	1	R-A/R1.11	RCS	Pipe to valve weld	Austenitic SS
EP-01-MW7152	2	R-A/R1.11	RHRS[3]	Pipe to valve weld	Austenitic SS
EP-02-MW7162	2	R-A/R1.11	RHRS	Pipe to valve weld	Austenitic SS
EP-01-MW7165	2	R-A/R1.11	RHRS	Pipe to valve weld	Austenitic SS

The four Class 1 welds in the RCS piping consist of three pipe to valve welds and one fitting to flange weld, and the three Class 2 welds in the RHRS piping are all pipe to valve welds.

The licensee stated that the examination of the above welds have been governed by the WCGS risk-informed inservice inspection (RI-ISI) program. In the RI-ISI program, the licensee classified these welds as Examination Category R-A, Item Number R1.11 (elements subject to thermal fatigue) in accordance with EPRI TR-112657, Revision B-A (Table 1 of ASME Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B Section XI, Division 1").

In Tables 1 and 2 of Attachment 1 to letter dated August 23, 2016, the licensee documented the nominal pipe size, wall thickness, operating pressure and temperature, and materials of construction for each weld.

- The pipes and the welds are made of austenitic SS.
- The fitting and valve bodies are made of either forged or cast austenitic stainless steel, as noted in footnote of Table 2.

3.3 Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 1998 Edition through 2000 Addenda of the ASME Code, Section XI.

3.4 Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval, which started on September 3, 2005, and ended on September 2, 2015.

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[1] Reactor Coolant System
[2] Stainless Steel
[3] Residual Heat Removal System

3.5 ASME Code Requirement

The ASME Code requirements applicable to the Class 1 welds originate in Table IWB-2500-1, and the Class 2 welds originate in Table IWC-2500-1 of Section XI to the ASME Code. Alternative to these requirements is the RI-ISI program for WCGS that was developed by the licensee in accordance with the NRC-approved methodology in EPRI TR-112657, Revision B-A, and that was authorized by the NRC staff in the safety evaluation dated February 21, 2007. In both the ASME Code requirements and the NRC safety evaluation, the welds under this request are required to be volumetrically examined during each 10-year ISI interval, and 100 percent coverage of the required examination volume must be achieved. The extent of required examination coverage is reduced to essentially 100 percent by ASME Code Case N-460. This code case has been incorporated by reference into 10 CFR 50.55a by inclusion in RG 1.147, Revision 17.

3.6 Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the ASME Code required examination volume due to limitations, which include configuration and geometry of the welds and/or the associated components and metallurgical constraints. In Table 3 and the weld diagrams of Attachment 1 to letter dated August 23, 2016, the licensee described and illustrated the limitations that prevented ultrasonic scanning of the weld. Examples include a valve body that limits access to valve side of the weld, and a fitting that limits access to flange side of the weld, and that restricts the ultrasonic scanning.

The licensee stated that the burden caused by compliance includes major modification of plant components, which include redesign and replacement of the welds and associated components.

3.7 Bases for Relief

The licensee stated that it performed the ultrasonic testing (UT) to the maximum extent possible utilizing personnel qualified and procedures demonstrated in accordance with Appendix VIII of ASME Code Section XI.

In its letter dated November 30, 2016, the licensee provided the percentage of coverage for the "Best Effort" examinations. The licensee stated that for the welds in this relief request with single sided access, extends the beam path into the far side of the weld centerline to examine to the extent practical the other side of weld as a "Best Effort" examination. However, no credit was claimed for the "Best Effort" examination because a UT procedure must be qualified with flaws on the inaccessible side of the weld. Currently, there are no qualified single-side examination procedures and the existing UT technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld. No unacceptable indications were identified.

In its letter dated August 23, 2016, the licensee stated that there were 15 other austenitic stainless steel pipe welds with the degradation mechanism of thermal fatigue that were examined during the third 10-year ISI interval. The operating conditions and environment would be similar to the welds in this relief request. No indication of degradation due to thermal fatigue, or any other mechanism, has been identified during the examinations.

In the letter dated November 30, 2016, the licensee provided the cumulative fatigue usage (CFU) factor calculated for the Class 1 welds covered by this relief request. There was no CFU factor calculated for the Class 2 welds because it is not required.

The licensee stated that the welds in this relief request have been subjected to system leakage testing and no sign of leakage has been identified.

3.8 Proposed Alternative

In Table 3 of Attachment 1 to letter dated August 23, 2016, the licensee reported the percent coverage achieved for each weld examined. This is summarized below.

Class 1 welds:

BB-02-F019	50 percent
BB-02-FW301	50 percent
BG-21-F013B	50 percent
EJ-04-F048A	50 percent

Class 2 welds:

EP-01-MW7152	50 percent
EP-02-MW7162	50 percent
EP-01-MW7165	50 percent

The licensee proposed that the limited coverage examinations achieved, as described above, be accepted as alternative coverage in lieu of the ASME Code required, essentially 100 percent coverage, to meet the ASME Code requirements.

3.9 NRC Staff Evaluation

The NRC staff has evaluated Relief Request I3R-13 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the Code required inspections would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject weld. The NRC staff finds that if these three criteria are met, the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief will not "endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility") will also be met.

Impracticality of Compliance

As described and demonstrated in the letters dated August 23 and November 30, 2016, and Table 3 and weld diagrams provided in Attachment 1 to letter dated August 23, 2016, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume were the pipe to valve and the fitting to flange configurations and/or the metallurgical constraints. The licensee performed the UT from one side of the welds because scanning from the other side of the welds was not possible (single-sided scan). The NRC staff confirms that each weld's particular design configuration prevented the licensee to scan the welds from both sides. Therefore, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

Burden of compliance

The licensee proposed that making the welds accessible for inspection from both sides would require replacement or significant design modification to the welds and their associated components. The NRC staff finds that replacing or reconfiguring the components of the subject welds is the only reasonable means to achieve dual sided coverage of these welds and that replacement or reconfiguration of the pipe, valve, fitting, and flange constitutes a burden on the licensee.

Structural integrity and leak tightness

The NRC staff considered whether the licensee's proposed alternative provided reasonable assurance of structural integrity and leak tightness of the subject weld based on: (1) the examination coverage achieved and (2) safety significance of unexamined volumes - unachievable coverage (e.g., the presence or absence of known active degradation mechanisms and essentially 100 coverage achieved for similar welds in similar environments subject to similar degradation mechanisms).

Examination Coverage Achieved

In evaluating the licensee's proposed alternative, the NRC staff assessed if the licensee obtained as much coverage as reasonably possible and the manner in which the licensee reported the coverage achieved. Based on the review of the information submitted by the licensee in support of the relief request, the NRC staff determined that:

- The welds were examined using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage;

- The coverage was calculated in a reasonable manner;

- The UT procedures used were qualified as required by the regulation;

- The coverage was limited by physical access (i.e., the configuration of one side of the weld did not permit access for scanning); and

- No unacceptable indications were identified.

Therefore, the NRC staff determined that the licensee made every effort to obtain as much coverage as reasonably possible with the ASME Code required UT.

Safety Significance of Unexamined Volumes - Unachievable Coverage

In addition to the coverage analysis described above, the NRC staff evaluated the safety significance of the unexamined volumes of welds - unachievable coverage. Based on the review of the information submitted by the licensee in support of the relief request, the NRC staff determined that

- The licensee's UT has covered, to the extent possible, the regions (i.e., the weld root and the heat affected zone (HAZ) of the base material near the inside diameter surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation.

- For the stainless steel welds, the NRC staff notes that the coverage obtained was limited to the volume up to the weld centerline (near-side), because claiming coverage for the volume on the opposite side of the weld centerline (far-side) requires meeting the 10 CFR 50.55a(b)(2)(xv)(A)(2) far-side UT qualifications, which has not been demonstrated in any qualification attempts to date. The far-side volume was inspected by the "Best Effort" examination, no indications were identified, and no credit was taken for the coverage achieved from the "Best Effort" examination.

- At each of the welded locations for the Class 1 welds covered by this relief request, the licensee's calculated CFU factor does not exceed the limit of Section III of the ASME Code. The CFU factor determined for each weld was based on the actual plant operating cycles. Therefore, this provide reasonable assurance that the potential for initiation and growth of fatigue cracks is low and of least concern at the weld metal location and its HAZ that are typically susceptible to higher stresses.

- During WCGS's third 10-year ISI interval, there have been 15 austenitic stainless steel pipe welds subject to similar operating conditions and environment with degradation mechanism of thermal fatigue inspected, and no unacceptable indications were detected.

Therefore, the NRC staff determined that based on the coverage achieved by the qualified UT, the supplemental "Best Effort" examinations, the examination of the weld root and its HAZ to the extent possible, and bounding CFU, it is reasonable to conclude that if significant service induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee performed.

The NRC staff also noted that, in addition to the required volumetric examinations, these welds have received the required system leakage test according to the ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P) during each refueling outage, and IWC-2500 (IWC-2500-1, Examination Category C-H) each inspection period. Despite reduced coverage of the required examination volume, the NRC staff concludes that this inspection will provide additional assurance that any pattern of degradation, if it were to occur, would be detected and the licensee will take appropriate corrective actions.

Therefore, the NRC staff concludes that the volumetric examinations performed to the extent possible, provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements for these welds would be a burden on the licensee.

4.0 CONCLUSION

As set forth above, the NRC staff determines that it is impractical for the licensee to comply with the ASME Code, Section XI requirement; that the proposed inspection provides reasonable assurance of structural integrity or leak tightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or

the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants this relief request at WCGS for the third 10-year ISI interval, which commenced on September 3, 2005, and ended on September 2, 2015.

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

Principal Contributor: Ali Rezai, NRR/DE/EPNB

Date: February 13, 2017

SUBJECT: WOLF CREEK GENERATING STATION – REQUEST FOR RELIEF I3R-13 FROM CERTAIN AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE INSERVICE INSPECTION REQUIREMENTS FOR CLASS 1 AND CLASS 2 PIPING WELDS DURING THE THIRD 10-YEAR INTERVAL (CAC NO. MF8308), DATED FEBRUARY 13, 2017

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ADAMS Accession No.: ML17026A385 ***Memo dated January 8, 2017**

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