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

August 2, 2017

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

SUBJECT: WOLF CREEK GENERATING STATION – REQUEST FOR RELIEF I4R-05 FROM CERTAIN PRESSURE TEST REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE FOR REACTOR PRESSURE VESSEL LEAK-OFF LINES FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NO. MF9639)

Dear Mr. Heflin:

By letter dated April 13, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17111A865), Wolf Creek Nuclear Operating Corporation (the licensee) submitted Relief Request (RR) I4R-05 to the U.S. Nuclear Regulatory Commission (NRC) for an alternative to certain pressure testing requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI for the Wolf Creek Generating Station (WCGS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(z)(2), the licensee proposed an alternative to the pressure test requirements of ASME Code Section XI paragraph IWC-5220 for the Class 2 piping and components in the reactor pressure vessel (RPV) flange leak-off lines connected to the RPV.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the licensee has demonstrated that the proposed alternative provides reasonable assurance of structural integrity or leak tightness of the subject components and that complying with the ASME Code, Section XI requirements for pressure testing of the RPV leak-off lines would result in hardship or unusual difficulty for the licensee, without a compensating increase in the level of quality or safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the use of RR I4R-05 during the fourth 10-Year inservice inspection interval at WCGS, which began on September 3, 2015 and ends on September 2, 2025.

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 concerning this matter, please contact the Project Manager, Mr. Balwant K. Singal (301) 415-3016 or via e-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
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF I4R-05

FROM CERTAIN PRESSURE TEST REQUIREMENTS FOR THE

FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

1.0 INTRODUCTION

By letter dated April 13, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17111A865), Wolf Creek Nuclear Operating Corporation (the licensee) submitted Relief Request (RR) I4R-05 to the U.S. Nuclear Regulatory Commission (NRC) for an alternative to certain pressure testing requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI for the Wolf Creek Generating Station (WCGS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(z)(2), the licensee proposed an alternative to the pressure test requirements of ASME Code Section XI paragraph IWC-5220 for the Class 2 piping and components in the reactor pressure vessel (RPV) flange leak-off lines connected to the RPV running to isolation valve BBHV8032 on the basis that complying with the specified ASME Code, Section XI, requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except design and access provision and preservice examination requirements, set forth in ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. Inservice examination of components and system pressure tests, conducted during 10-year intervals subsequent to the first interval, are required by 10 CFR 50.55a(a) to comply with the latest edition and addenda of the ASME Code 12 months prior to the start of the interval.

In accordance with 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," alternatives to the ASME Code requirements may be used when authorized by the Director, Office of Nuclear Reactor Regulation, if the licensee demonstrates that 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. Additionally, the proposed alternative must be submitted and authorized prior to implementation.

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 proposed alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Components Affected

The affected components addressed in RR I4R-05 are the piping and components associated with the RPV flange leak-off lines, connected to the RPV running to isolation valve BBHV8032. These components are in the scope of ASME Code Class 2, Table IWC-2500-1, Examination Category C-H, Item Number C7.10, "Pressure retaining components."

The piping and components in the RPV flange leak-off lines are constructed of Type 304 stainless steel.

3.2 Applicable Code Edition and Addenda

The Code of record for the fourth 10-year inservice inspection (ISI) interval is the 2007 Edition through 2008 Addenda of the ASME Code, Section XI.

3.3 Duration of Relief Request

The relief is requested for the fourth 10-year ISI Interval, which began on September 3, 2015 and ends on September 2, 2025. Implementation of the alternative testing will begin during Refueling Outage 22, scheduled for March 2018, the last refueling outage of the first period of the fourth 10-year ISI Interval. Implementation of this alternative testing will also be performed during Periods 2 and 3 of the fourth 10-year ISI Interval.

3.4 ASME Code Requirement

The inspection requirements for the RPV flange leak-off line piping and components are delineated in ASME Code Table IWC-2500-1, Examination Category C-H, Item Number C7.10, which requires a system leakage test in accordance with IWC-5220.

IWC-5221, specifies the pressure requirements for the system leakage test:

> The system leakage test shall be conducted at the system pressure obtained while the system, or portion of the system, is in service performing its normal operating function or at the system pressure developed during a test conducted to verify system operability (e.g., to demonstrate system safety function or satisfy technical specification surveillance requirements).

IWC-5222(a) specifies pressure retaining boundary for the system leakage test:

> The pressure retaining boundary includes only those portions of the system required to operate or support the safety function up to and including the first normally closed valve (including a safety or relief valve) or valve capable of automatic closure when the safety function is required.

Table IWC-2500-1 further states that visual examination is to be performed in accordance with IWA-5240.

3.5 Basis for Relief

The licensee stated that the system design, pressure testing of piping and components in the RPV leak-off lines would result in a hardship without a compensating increase in quality and safety.

In its letter dated April 13, 2017, as stated, in part, the licensee provided the following description of the system configuration:

> The ASME Code Section XI, 2007 Edition through 2008 Addenda requires that Class 2 pressure boundary piping shall be pressure tested once each inspection period. The reactor vessel flange seal leak detection piping is separated from the reactor coolant pressure boundary by a metallic O-ring seal. The pressure openings for the leak detection piping are located on the reactor vessel flange mating surface. The inboard pressure opening is located between the inner and outer O-rings. The outboard pressure opening is located on the outboard side of the outer O-ring in the reactor vessel flange. Failure of the inner O-ring is the only condition under which the reactor vessel flange leak-off line could be pressurized to any significant pressure. Therefore, the reactor vessel flange leak-off line is not expected to be pressurized during the system pressure test following a refueling outage or during normal operation. The leak-off line located outboard of the outer O-ring is outside of both O-ring sealing boundaries. The isolation valve for the outboard leak-off line, BBV0079, is normally closed. The isolation valve for the inboard leak-off line between the two O-rings, BBV0080, is normally open during plant operations.

In its letter dated April 13, 2017, as stated in part, the licensee further described the challenges for performing a pressure test at normal operating pressure:

> The configuration of this piping poses personnel and equipment safety concerns if pressure testing is performed at Reactor Coolant System (RCS) operating pressure:
>
> - Plugs would need to be installed in the reactor vessel flange face to act as a pressure boundary for each test, and then removed after the test.
>
> - The installation of the plugs and subsequent use would incur additional radiological dose due to additional time for personnel at the reactor vessel flange.

- The plugs would also present a foreign material exclusion issue for the handling of a very small diameter plug over the reactor vessel that would be required to be installed to complete a leakage test at pressure.

- The use of an alternative test rig to test those isolated portions of piping to full RCS operating pressure would have to include application of a compatible pressurized medium. This would result in personnel stationed near pressurized vent or drain valves, exposing them to unnecessary personal safety hazards in the event of a leak from the non-class test pressure rig connections. A break at any connection of the rig under such conditions (temporary non-code connections under RCS test pressure) would pose a substantial personnel safety hazard.

In its letter dated April 13, 2017, the licensee discussed two additional possibilities for conducting the pressure test. One involves externally pressurizing the leak-off line with the RPV closure head installed. The licensee determined that this approach is not feasible, giving the following rationale as stated, in part:

> The closure head contains two concentric grooves that hold the inner and outer O-rings. The O-rings are held in place by a series of retainer clips that are housed in recessed cavities in the flange face. If a pressure test were to be performed with the closure head installed, the O-ring would be pressurized in a direction opposite to its design function. This test pressure would result in a net inward force on the inner O-ring that would tend to push it into the recessed cavity that houses the retainer clips. The thin O-ring material could be damaged by the inward force.

The final approach discussed by the licensee was to not install or purposely fail the inner O-ring. The licensee explained that this would require a new O-ring set to be installed each time the test is conducted, resulting in additional time needed during the outage and additional radiation exposure to personnel involved with the removal and reinstallation of the RPV closure head.

3.6 Proposed Alternative

The licensee proposes to use reduced pressure testing as an alternative to the requirement of IWC-5221. Visual examination of the accessible areas of the leak detection system piping will be performed while the system is subjected to the static pressure from the head of water when the reactor cavity is filled to its normal refueling water level (i.e., 23 feet of water or greater), for at least 4 hours. The licensee stated that the static head developed during this test would detect pressure boundary leakage.

The licensee stated that piping located beneath the refueling cavity is inaccessible while the refueling cavity is flooded. The examination of the inaccessible piping will be in accordance with IWA-5241(b), supplemented with subsequent VT-2 visual examination for boric acid residue indicative of leakage from the leak-off piping. The examination will occur when the piping can be made accessible later in the refueling outage, after the draining of the refueling cavity and access to the RPV nozzle gallery is made available. This supplemental VT-2 visual examination will include the opening of the mirror insulation that covers a portion of the inaccessible leak-off piping in the nozzle gallery to allow direct performance of the VT-2 visual examination. The licensee stated that it did not identify any degradation during the test conducted in the prior

refueling outage, for which relief was granted to use the same alternate methodology described in this RR.

In addition to the tests to be performed during the refueling outage, the licensee stated that leakage of the inner O-ring could be identified during the operating cycle by an increase in the temperature of the leak-off line above ambient temperature. This leak detection piping has a temperature indicator arid a high temperature alarm in the control room, which is monitored by the operator. This piping also acts as a leak-off line to collect leakage, which is routed to the reactor coolant drain tank.

3.7 NRC Staff Evaluation

3.7.1 Hardship

The NRC staff reviewed the information provided by the licensee in RR I4R-05 to determine if pressure testing the RPV leak-off lines to the requirements of IWC-5220 would represent a hardship or unusual difficulty in accordance with the intent of 10 CFR 50.55a(z)(2).

The NRC staff considered the licensee's first proposed option of inserting a threaded plug in the flange face to act as a pressure boundary for each test, then removing the plug after each test. The NRC staff reviewed this methodology for the potential of personnel dose, foreign material exclusion, and occupational safety hazards and determined that workers could accumulate more than the reasonably achievable radiological dose while working in the proximity of the RPV closure flange. Further, the NRC staff determined that mishandling or misplacement of the small-diameter plug could introduce foreign material to a location that affects the operability of the reactor systems. Finally, the NRC staff recognized that testing the system in this manner would require temporary non-code connections at RCS test pressure, which would represent an occupational danger to personnel in the event of a connection leakage or other test anomaly.

The NRC staff considered the licensee's second proposed option of externally pressurizing the leak-off line with the RPV closure head installed. Based on the review of the design of the O-rings, the NRC staff determined that the O-rings are only intended for outward force. Testing in this manner could damage the O-rings and result in a failed test.

The NRC staff considered the licensee's third proposed option of intentionally failing or not installing the inner O-ring for the pressure test. The NRC staff agreed with the licensee's determination that replacing and reinstalling the O-ring for each test would require additional time during the refueling outage and would expose workers to more than the reasonably achievable radiological dose.

Based on the above, the NRC staff concludes that pressure testing the RPV flange leak-off lines to the requirements of IWC-5220 would represent a hardship or unusual difficulty in accordance with the intent of 10 CFR 50.55a(z)(2).

3.7.2 Adequacy of Proposed Alternative

The NRC staff reviewed the proposed alternative to IWC-5220 described in RR I4R-05 to determine if it is adequate to ensure the structural integrity of the affected components.

The NRC staff evaluated the system pressure that can be achieved by static pressure from the head of water when the reactor cavity is filled to its normal refueling water level and concludes

that this pressure is the highest that can be reasonably achieved in the RPV leak-off lines without major modifications to the system design. The NRC staff also reviewed the licensee's proposed approach to detect leakage using the static pressure from the head. The licensee proposed to follow the visual examination requirements of ASME Code, Section XI, IWA-5241. The NRC staff concludes that this methodology would be adequate to detect leakage from existing flaws in welds or other connections. For accessible lines, maintaining the static pressure for at least 4 hours is sufficient for leakage to become visually evident. For inaccessible portions of the system beneath the refueling cavity, the NRC staff concludes that a supplemental visual examination for boric acid residue after the system has been drained down will provide additional assurance that leakage would be identified.

The NRC staff reviewed the operating experience for the RPV leak-off line at WCGS and found no prior history of leakage for the system components. The NRC staff also noted that no degradation was detected during the leakage test performed by the licensee in the previous refueling outage. In the event that an O-ring does leak during the operating cycle, the temperature indicator and alarm in the control room will provide adequate notice to the operator.

Based on its review the NRC staff concludes that the ASME Code, Section XI requirements for pressure testing of the RPV leak-off lines represent a hardship or unusual difficulty for the licensee, without a compensating increase in the level of quality or safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the licensee has demonstrated that the proposed alternative provides reasonable assurance of structural integrity or leak tightness of the subject components and that complying with the ASME Code, Section XI requirements for pressure testing of the RPV leak-off lines would result in hardship or unusual difficulty for the licensee, without a compensating increase in the level of quality or safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, NRC staff authorizes the use RR I4R-05 at WCGS during the fourth 10-Year ISI Interval at WCGS, which ends on September 2, 2025.

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.

Principal Contributors: Greg Oberson, NRR/DE/EPNB
Roger Kalikian, NRR/DE/EPNB

Date: August 2, 2017

SUBJECT: WOLF CREEK GENERATING STATION – REQUEST FOR RELIEF I4R-05 FROM CERTAIN PRESSURE TEST REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE FOR REACTOR PRESSURE VESSEL LEAK-OFF LINES FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NO. MF9639) DATED AUGUST 2, 2017

DISTRIBUTION:

PUBLIC
LPL4 r/f
RidsACRS_MailCTR Resource
RidsNrrDeEpnb Resource
RidsNrrDorlLpl4 Resource
RidsNrrLAPBlechman Resource
RidsNrrPMWolfCreek Resource
RidsRgn4MailCenter Resource
RKalikian, NRR/DE/EPNB
GOberson, NRR/DE/EPNB
JBowen, EDO RIV

ADAMS Accession No.: ML17202E919 ***Memo dated**

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA	NRR/DE/EPNB/BC	NRR/DORL/LPL4/BC
NAME	BSingal	PBlechman	DAlley*	RPascarelli
DATE	07/24/17	07/24/17	07/15/17	08/02/17

OFFICIAL RECORD COPY