

February 21, 2007

Mr. Rick A. Muench
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION - THIRD 10-YEAR INTERVAL
INSERVICE INSPECTION PROGRAM RELIEF REQUEST I3R-01
(TAC NO. MD0297)

Dear Mr. Muench:

By letter dated March 2, 2006 (ET 06-0010), the Wolf Creek Nuclear Operating Corporation (WCNOC) requested relief from the Nuclear Regulatory Commission (NRC) for the third 10-year inservice inspection (ISI) interval at the Wolf Creek Generating Station (WCGS). The letter requested approval for the following three relief requests (RRs): I3R-01, I3R-02, and I3R-04. This letter only addresses RR I3R-01. RRs I3R-02 and I3R-04 were addressed in previous NRC letters dated May 10 and June 16, 2006, respectively.

For RR I3R-01, by letter dated March 2, 2006, and supplemented by letters dated October 5 and December 20, 2006 (ET 06-0043 and ET 06-0058), WCNOC requested authorization to extend the risk-informed ISI (RI-ISI) program plan for WCGS to the third 10-year ISI interval.

Based on the attached safety evaluation, the NRC staff has determined that the proposed alternative in RR I3R-01 provides an acceptable level of quality and safety and, therefore, is authorized pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR). Therefore, the NRC staff grants the relief in RR I3R-01 in accordance with 10 CFR 50.55a(g)(3)(i) for the third 10-year ISI interval at WCGS. All other American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

David Terao, 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: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO RISK-INFORMED INSERVICE INSPECTION RELIEF REQUEST NO. I3R-01
FOR THE THIRD 10-YEAR INTERVAL
WOLF CREEK NUCLEAR OPERATING CORPORATION
WOLF CREEK GENERATING STATION
DOCKET NO. 50-482

1.0 INTRODUCTION

By letter dated March 2, 2006 (Reference 1, the submittal), as supplemented by letters dated October 5 and December 20, 2006 (References 2 and 10), Wolf Creek Nuclear Operating Corporation (the licensee) requested authorization from the U.S. Nuclear Regulatory Commission (NRC or the Commission) to extend the risk-informed inservice inspection (RI-ISI) program plan for Wolf Creek Generating Station (WCGS) to the third 10-year inservice inspection (ISI) interval. The March 2, 2006, letter requested approval for the following three relief requests (RRs): I3R-01, I3R-02, and I3R-04. This safety evaluation only addresses RR I3R-01. RRs I3R-02 and I3R-04 were addressed in NRC letters dated May 10 and June 16, 2006, respectively.

The WCGS RI-ISI program was initially submitted to the NRC by letter dated February 15, 2001 (Reference 3), and supplemented in a letter dated September 27, 2001 (Reference 4). The WCGS RI-ISI program was reviewed and approved by the NRC for use during the second 10-year ISI interval in an NRC letter dated December 13, 2001 (Reference 5).

The licensee considered relevant information since the development of the original program and reviewed and updated the RI-ISI program.

2.0 REGULATORY EVALUATION

Paragraph 50.55a(g) of Title 10 of the *Code of Federal Regulations* (i.e., 10 CFR 50.55a(g)), specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of Section XI of the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (the ASME Code). Paragraph 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph 50.55a(g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The licensee's RI-ISI program for the second 10-year interval, which is outlined in References 3 and 4, was developed in accordance with the methodology contained in the Electric Power Research Institute's (EPRI's) topical report (TR) EPRI TR-112657 (Reference 6, the topical report), which was reviewed and approved by the NRC staff. The licensee proposed the RI-ISI program as an alternative pursuant to 10 CFR 50.55a(a)(3)(i). In its current application for RR I3R-01 (Reference 1), the licensee has now requested NRC authorization to continue the implementation of an RI-ISI piping program for the third 10-year ISI interval at WCGS. The scope of the RI-ISI program is limited to the inspection of ASME Code Class 1 and 2 piping (Categories B-F, B-J, C-F-1, and C-F-2 welds).

3.0 TECHNICAL EVALUATION OF RELIEF REQUEST I3R-01

The licensee is requesting relief to use the proposed RI-ISI program plan in the third 10-year ISI interval instead of the ASME Code, Section XI, program for piping. An acceptable RI-ISI program plan is expected to meet the five key principles discussed in NRC Regulatory Guide (RG) 1.178 (Reference 7), NRC Standard Review Plan 3.9.8 (Reference 8), and EPRI TR-112657 (Reference 6), as stated below.

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change (Key Principle One).
2. The proposed change is consistent with the defense-in-depth philosophy (Key Principle Two).
3. The proposed change maintains sufficient safety margins (Key Principle Three).
4. When proposed changes result in an increase in Core Damage Frequency (CDF) or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement (Key Principle Four).
5. The impact of the proposed change should be monitored by using performance measurement strategies (Key Principle Five).

The licensee's implementation of these key principles in its RI-ISI program is addressed below:

Key Principle One

Because an alternative ISI program may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) and, therefore, an exemption request is not required, the NRC staff concludes that the first key principle is met in that the proposed alternative meets the current regulations.

Key Principles Two and Three

The second and third key principles require assurance that (1) the alternative program is consistent with the defense-in-depth philosophy and (2) sufficient safety margins are maintained, respectively. Assurance that the second and third principles are met is based on the application of the approved methodology and not on the particular inspection locations selected.

As described in Reference 3 and approved by the NRC staff in Reference 5, the RI-ISI program is a living program that requires periodic updating and that, as a minimum, requires that risk ranking of piping segments will be reviewed on an ASME Code-period basis. In Reference 1, the licensee describes the aspects considered during the program update review, in accordance with Nuclear Energy Institute (NEI) 04-05, "Living Program Guidance to Maintain Risk-Informed Inservice Inspection Programs for Nuclear Plant Piping Systems" (Reference 9), and then the results of the review. The licensee stated that the living program evaluation resulted in the following three issues being addressed:

- Adding all four trains of Class 2, 4-inch nominal pipe size auxiliary feedwater (AFW) lines from the outboard isolation valve to the main feedwater piping connection to the RI-ISI program;
- Using new upper bound values of $1.44E-2$ and $1.44E-3$ for conditional core damage probability and conditional large early release probability, respectively, in the risk analysis to reflect the addition of the AFW lines; and
- Examining all 14 Examination Category B-F piping welds that are potentially susceptible to primary water stress-corrosion cracking (PWSCC).

In addition, the licensee indicated in References 3 and 4 that it will update the RI-ISI program based on the final EPRI material reliability program guidance for assessing for the thermal stratification, cycling, and striping degradation mechanism as warranted.

Based on its review, the NRC staff finds the above licensee re-evaluation of the RI-ISI program to be consistent with the methodology approved for use in the second 10-year ISI interval. Therefore, based on this, the NRC staff concludes that the second and third key principles are met.

Key Principle Four

The fourth principle requires an estimate of the change in risk, which is dependent on the location of inspections in the proposed ISI program compared to the location of inspections that would be required by the ASME Code, Section XI. In its submittal for RR I3R-01, the licensee stated that all of the cases evaluated for the original risk impact analysis were re-evaluated using the new information (from the living program evaluation discussed above), resulting in a decrease in overall plant risk. In its supplemental letter (Reference 2), the licensee clarified that the RI-ISI analysis performed in preparation for renewing the RI-ISI program utilized Revision 2 of the probabilistic risk assessment (PRA) model, which was the model revision used for the original RI-ISI submittal.

The TR EPRI, TR-112657 (Reference 6), requires that a change in risk measurement must consider the discontinuance of ASME Code-required inspections, as well as any new inspections resulting from the application of its methodology. Relief was granted in Reference 5 from selected requirements in the ASME Code, 1989 Edition, no Addenda, the licensee's code of record when the relief was requested (i.e., the second 10-year interval). The licensee reported that the code of record for the third ASME Code 10-year interval is the 1998 Edition of ASME Code, Section XI through the 2000 Addenda. The licensee reported that, as part of the ASME Code third interval update, the ASME Code classification was

reviewed for all piping. The 1998 ASME Code, Section XI through the 2000 Addenda reduced the inspection exemption for AFW lines from 4 inches to 1½ inches. This change removed the ASME Code inspection exemptions from a total of 147 welds in the AFW and main feedwater (MFW) systems.

As described in Section 3.2.1 of EPRI TR-112657 (Reference 6), the RI-ISI program scope is determined by the ASME Code inspection program scope. The licensee reported that the above 147 welds were added to the RI-ISI program scope and, therefore, included in the risk ranking. The 126 welds in the MFW system are located in pipe segments with a low-risk ranking. The EPRI TR-112657 methodology does not require inspections of any of these welds, but the risk increase associated with discontinuing the inspections of the welds must be included in the change in risk estimates. In its last supplemental letter for RR I3R-01 (Reference 10), the licensee stated that 7.5 percent of these Class 2 welds, or 10 welds, would be inspected under an ASME Code inspection program, resulting in a Δ CDF of 5.0E-12. The 21 welds in the AFW system are located in pipe segments with high and medium risk rankings, and nine of these welds have been selected for inspection in the RI-ISI program. The risk categorization of these segments placed them in 25-percent and 10-percent sampling schemes, for high and medium risk rankings, respectively. The same (ASME Code Class 2) piping would be under a 7.5-percent sampling scheme under the traditional ASME Code, Section XI, program. Therefore, for this “incremental scope” of piping, the number of required inspections under the RI-ISI program exceeds that required under the traditional ASME Code, Section XI program, resulting in a Δ CDF of -1.9E-8 (Reference 10). The licensee also provided a discussion of its qualitative consideration of external events and shutdown modes in Reference 10, concluding that the overall impact on Δ CDF remains well within the acceptance criteria.

The licensee states in Reference 10 that all Level A and a majority of Level B Facts and Observations (F&Os) from the Westinghouse Owner’s Group (WOG) peer review of 2001 have been addressed in Revision 3 of the WCGS PRA model. As stated above, Revision 2 of the PRA model was used to perform both the original analysis and the re-analysis of the RI-ISI program, and the licensee confirmed that the consequence risk ranking of the piping segments was the same when a sensitivity study was performed with Revision 3. The open Level B F&Os (11 of 25) have been determined by the licensee to have no impact or no appreciable impact on the RI-ISI program analysis. The NRC staff reviewed the WOG peer review Level A and B F&Os and their resolutions, provided to the NRC staff in Reference 2, and concluded that the licensee did adequately address them.

Given the above considerations, and considering that estimates of the change in CDF and large early release frequency are calculated in the final phase of the RI-ISI methodology, and are intended only to provide additional assurance that aggregate changes in risk will be acceptable (Reference 6), needed accuracy of the change in risk calculations does not warrant developing a new ASME Code program for the new code of record simply to be used as a new baseline and then discarded. Therefore, the NRC staff finds the comparison of the risk estimate between the RI-ISI program proposed in the submittal (Reference 1) and the ASME Code program based on the code of record from which relief was granted in Reference 5 is appropriate and acceptable. No deviations from the risk acceptance criteria were identified by the NRC staff, and the NRC staff finds that the process provides assurance that the fourth key principle is met.

Key Principle Five

With regard to the fifth key principle, Section 3.6.6.1 of EPRI TR-112657 (Reference 6) states in part that the service history and susceptibility review and ongoing industry events reviews assure that the industry trends are being monitored to assure that if an unexpected or new mechanism is identified, or a new component is identified as susceptible to an existing degradation mechanism, the RI-ISI program will be updated to reflect that change. The program update will incorporate any additional inspections mandated by the NRC, as well as those inspections deemed appropriate by the industry groups addressing the specific issues. In addition to monitoring industry experience, as addressed above in the discussion on key principles two and three, the licensee used the review and update guidance in NEI-4-05 (Reference 9) to update its RI-ISI program for the third 10-year interval.

Because of recent and ongoing issues related to degradation from PWSCC in components that contain alloy 600/82/182, the licensee will volumetrically examine all piping welds that are potentially susceptible to PWSCC. At WCGS, this consists of 14 Examination Category B-F welds where piping attaches to the reactor pressure vessel and pressurizer. The licensee confirmed in Reference 2 that the 14 B-F welds are the only piping welds that utilize alloy 600/82/182 weld metal. No B-J welds utilize alloy 600/82/182 weld metal, and no other B-F welds exist. The licensee also revised the Degradation Mechanism Evaluation to delete Assumption No. 7, which stated that “[b]i-metallic welds with Inconel buttering are not considered susceptible to the PWSCC degradation mechanism.”

Based on the licensee’s description of its processes to review service history and industry events and issues, and given the above example where the licensee is conducting additional inspections in response to an industry issue, the NRC staff concludes that the RI-ISI program continues to be a living program, and that the fifth key principle is met.

Conclusion on the Five Key Principles

Based on the above discussion on the five key principles, the NRC staff finds that the five key principles of risk-informed decisionmaking are ensured by the licensee’s proposed RI-ISI program for the third 10-year interval at WCGS. Based on this, the NRC staff concludes that the proposed RI-ISI program for the third 10-year ISI inspection interval at WCGS is acceptable and, therefore, provides an acceptable level of quality and safety.

4.0 CONCLUSIONS

Based on the referenced information provided by the licensee and the above evaluation of this information with respect to the five key principles of risk-informed decisionmaking, the NRC staff has determined that the proposed alternative in the licensee’s RI-ISI program provides an acceptable level of quality and safety and is, therefore, authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI inspection interval at WCGS.

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

5.0 REFERENCES

1. Letter from Terry J. Garrett, Wolf Creek Nuclear Operating Corporation, dated March 2, 2006, to U.S. Nuclear Regulatory Commission, "Inservice Inspection Program Plan for the Third Ten-Year Interval and 10 CFR 50.55a [Relief] Requests I3R-01, I3R-02, and I3R-04" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML060720142).
2. Letter from Terry J. Garrett, Wolf Creek Nuclear Operating Corporation, dated October 5, 2006, to U.S. Nuclear Regulatory Commission, "Wolf Creek Nuclear Operating Corporation's Response to NRC Request for Additional Information Regarding 10 CFR 50.55a [Relief] Request I3R-01" (ADAMS Accession No. ML062910125).
3. Letter from Richard A. Muench, Wolf Creek Nuclear Operating Corporation, dated February 15, 2001, to U.S. Nuclear Regulatory Commission, "Relief Request for Application of an Alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI Examination Requirements for Class 1 and 2 Piping Welds" (ADAMS Accession No. ML010520367).
4. Letter from Richard A. Muench, Wolf Creek Nuclear Operating Corporation, dated September 27, 2001, to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information Regarding Relief Request for Application of an Alternative to the ASME Boiler and Pressure Vessel Code Section XI Examination Requirements for Class 1 and 2 Piping Welds (TAC No. MB1206)" (ADAMS Accession No. ML012750214).
5. Letter from U.S. Nuclear Regulatory Commission, dated December 13, 2001, to Otto L. Maynard, Wolf Creek Nuclear Operating Corporation, "Approval of Relief Request for Application of Risk-Informed Inservice Inspection Program for American Society of Mechanical Engineers Boiler and Pressure Vessel Code Class 1 and 2 Piping for Wolf Creek Generating Station (WCGS) (TAC No. MB1206)" (ADAMS Accession No. ML013200130).
6. EPRI Topical Report, TR-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Final Report, December 1999.
7. NRC RG 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking for Inservice Inspection of Piping," September 2003.
8. NRC NUREG-0800, Chapter 3.9.8, "Risk-Informed Inservice Inspection of Piping," September 2003.
9. NEI 04-05, "Living Program Guidance to Maintain Risk-Informed Inservice Inspection Programs for Nuclear Plant Piping Systems," dated April 2004.
10. Letter from Terry J. Garrett, Wolf Creek Nuclear Operating Corporation, dated December 20, 2006, to U.S. Nuclear Regulatory Commission, "Wolf Creek Nuclear

Operating Corporation's Response to the Second NRC Request for Additional Information Regarding 10 CFR 50.55a Request I3R-01" (ADAMS Accession No. ML063620090).

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Wolf Creek Generating Station

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