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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF NO. 33

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

1.0 INTRODUCTION

Inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code) and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(6)(g)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the 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. The regulations require that inservice examination of components and system pressure tests be conducted during the first 10-year interval and in subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for Ginna Nuclear Power Plant, third 10-year ISI interval, is the 1986 Edition of Section XI of the ASME Code.

2.0 EVALUATION

By letter dated August 6, 1998, as supplemented February 9, 1999, Rochester Gas and Electric Corporation (the licensee) submitted its Third 10-Year Interval Inservice Inspection Program Plan Requests for Relief No. 33 for Ginna Nuclear Power Plant. The Idaho National Engineering and Environmental Laboratory (INEEL), has evaluated the information provided

by the licensee in support of its Third 10-Year Interval Inservice Inspection Program Requests for Relief No. 33 for Ginna. Based on the results of the review, the staff adopts the contractor's recommendations, but did not adopt the contractor's conclusions presented in the Technical Letter Report (TLR) attached. The licensee submitted additional information is its letter dated February 9, 1999, regarding Request for Relief No. 33. The staff has found Request for Relief No. 33 acceptable as discussed below.

The information provided by the licensee in support of the requests for relief from Code requirements has been evaluated and the basis for disposition is documented below.

Request for Relief No. 33: The 1986 Edition, Examination Category B-A, Item B1.11 requires the volumetric examination of reactor pressure vessel (RPV) circumferential shell welds in accordance with IWA-2232. IWA-2232 requires that the inspections be conducted in accordance with Article 4 of Section V and as amended by Section XI.

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Appendix VIII, Supplements 4 and 6, of the 1989 Edition for ultrasonic examination of RPV circumferential shell Welds RPV-B, RPV-C, RPV-D, RPV-E, and RPV-A.

Paragraph IWA-2232 of the 1986 Edition of Section XI specifies that the ultrasonic examination of ferritic vessel welds greater than 2 inches in thickness shall be conducted in accordance with Article 4 of Section V, as amended by IWA-2232. The licensee is proposing to use ultrasonic examination procedures and techniques that have been developed to meet the intent of Appendix VIII, Supplements 4 and 6, of the 1989 Edition for the examination of RPV shell and shell-to-flange welds. These inspection techniques have been demonstrated and qualified to meet the Performance Demonstration Initiative (PDI) program criteria.

The current regulations incorporate the 1989 Edition of Section XI for ISI activities. The 1989 Edition included mandatory Appendix VII, *Qualification of Nondestructive Examination Personnel for Ultrasonic Examination*, which specifies requirements for the training and qualification of ultrasonic nondestructive examination (NDE) personnel in preparation for employer certification to perform NDE. The 1989 Addenda to Section XI added mandatory Appendix VIII, *Performance Demonstration for Ultrasonic Examination Systems*, containing requirements for performance demonstration of ultrasonic testing (UT) procedures, equipment, and personnel used to detect and size flaws. The U. S. nuclear industry created the PDI group to manage implementation of the performance demonstration requirements of Appendix VIII.

COMPARISONS OF RPV SHELL WELD EXAMINATION TECHNIQUES		
Description (Code reference)	Standard Section V, XI RG 1.150 Procedure	FTI PDI/Appendix VII Qualification Procedure
Examination Angles (Section V, T-441 and T-441.6)	Four transducers required to perform the detection scans 0°, 45° and 60° for Code examination and a 70° L -Wave for clad to base metal interface, Reg. Guide 1.150 requirement. Additional transducers used for sizing unacceptable flaws.	Three transducers 45°S, 45°L . and 70°L. 45°L and 70°L to examine tho Inner 10% of thickness 45°S and 45°L to examine beyond 10% thickness
Calibrations (Section V,T-432 and T-434)	0°, 45°, and 60°Calibrated on each ASME calibration standard based on examination thickness range, usually 11.0", 9.0". and 5.0" block. The 70° is calibrated on one calibration standard using 1/16" or 1/8" diameter side drilled holes. Three calibration blocks ten calibrations.	One calibration standard designed to establish calibrated time base and calibration sensitivity for each transducer using 1/16. or 1/8. diameter side drilled hoes. One calibration standard, Three calibrations.
Scan Direction (Section V, T-441.4, T-441.S and T-441.6)	To the extent pradieal the examination volume is scanned in four directions, two perpendicular and two parallel to tho weld axis. The weld metal is scanned with two angles from two opposing directions and the base metal Is scanned with two angles but not necessarily from two opposing directions.	The examination volume is scanned In four directions, two perpendicular and two parallel to the weld axis. Sizing is preformed from both sides of the flew when possible.
Scan Sensitivity (Section V, T-425)	Section XI, +6dB beyond 25% of thickness. RG +14dB for the first 25%.	Minimum +20dB at the maximum thickness of the applicable examination volume.
Recording Level	Section XI, 50% DAC. Reg. Guide, 20% DAC for the first 25% of material thickness	70°L - 20%DAC(1/16" dia. SDH cal.) 45°S - 20%DAC,(1/8" dia. SDH cal) 45°L - 10% DAC, (1/8" dia. SDH cal.)
Scan Index (Section V, T-425)	Minimum 10% overlap ~WA-2232 supplements this requirement to a minimum of 50% overlap)	0.50. for detection and 0.20.,sizing
Flaw Sizing (Section V, T-441.8)	Amplitude base sizing d 50% DAC. Tip diffraction asoption for flaws determined to exceed WB-3500 acceptance standards based on amplitude sizing. Requires additional transducers, calibration, and scanning.	Tip diffraction techniques using the same transducers ers and calibrations used for the initial detection scans. FTI qualified the examination procedure for Supplement 4 and ~ skin" using the same transducers and calibrations used for detection. In addition, FTI qualified a forward scatter time-of-flight diffraction (TOFD) teehabue for the Supplement 4 examination volume as a supplemental technique.
Scan Speed (Section V, T-425)	Up to 6.0. per second	Up to 9.0 per second
Procedure Qualification	Transducers capable of detecting the calibration reflectors in the applieation calibration block.	Performance demonstration using cracks (PDT. Qualified on 12.0" thick samples containing a 12.0" wide band of manual clad 0.44" thick.
Data Analyst	Certified Level II per Code of record	A minimum of a certified Level II qualified by performance demonstration using cracks.

The licensee's supplemented its request by letter dated February 9, 1999, with a table, as noted above, that compares the Section XI requirements to its proposed PDI alternative. The NRC staff has evaluated this table. The staff concludes that the licensee's proposed PDI methodology is acceptable for demonstrating the effectiveness of ultrasonic examination systems in accordance with Appendix VIII. The licensee's proposed alternative methodology meets or exceeds the Section XI requirements, provides for better qualified examiners and higher quality examinations. The staff determined that the licensee's proposed alternative is equivalent or better, and provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i) the alternative proposed for the R. E. Ginna Nuclear Power Plant is authorized for the current interval. The licensee's Request for Relief No. 33 is granted pursuant to 10 CFR 50.55a(a)(3)(i).

3.0 CONCLUSION

For Request for Relief No. 33, the licensee proposed to perform UT examinations of the RPV circumferential shell welds using PDI qualified flaw detection and flaw characterization techniques. The NRC staff has evaluated the licensee's proposed PDI program and concludes that the licensee's proposed PDI program demonstrates the effectiveness of ultrasonic examination systems in accordance with Appendix VIII. In addition, the staff concludes that the licensee's proposed alternative methodology meets or exceeds the Section XI requirements, provides for better qualified examiners and higher quality examinations. The staff concludes that the licensee's proposed alternative is equivalent or better and provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50a(a)(3)(i) the alternative is approved and the relief is granted for the R. E. Ginna Nuclear Power Plant for the third 10-year inservice inspection interval. The relief granted is authorized by law and will not endanger life or property or the common defense 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.

Attachment: Technical Letter Report

Principal Contributor: T. McLellan

Date: April 8, 1999

TECHNICAL LETTER REPORT
ON THIRD 10-YEAR INTERVAL INSERVICE INSPECTION
REQUEST FOR RELIEF NO. 33
FOR
ROCHESTER GAS AND ELECTRIC CORP.
R. E. GINNA NUCLEAR POWER PLANT
DOCKET NUMBER: 50-244

1. INTRODUCTION

By letter dated August 6, 1998, the licensee, Rochester Gas and Electric Corporation (RG&E), submitted Request for Relief No. 33, seeking relief from the requirements of the ASME Code, Section XI, for the R. E. Ginna Nuclear Power Plant third 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the following section.

2. EVALUATION

The information provided by RG&E in support of the request for relief from Code requirements has been evaluated and the basis for disposition is documented below. The Code of record for the Ginna Nuclear Power Plant, third 10-year ISI interval, which is scheduled to end in December 1999, is the 1986 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

Request for Relief No. 33, Authorization to Implement 1989 Edition, Appendix VIII, Supplements 4 and 6, for the Ultrasonic Volumetric Examination of Reactor Pressure Vessel Shell Welds

Code Requirement: The 1986 Edition, Examination Category B-A, Item B1.11 requires the volumetric examination of reactor pressure vessel (RPV) circumferential shell welds in accordance with IWA-2232. IWA-2232 requires that the inspections be conducted in accordance with Article 4 of Section V and as amended by Section XI.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to use Appendix VIII, Supplements 4 and 6, of the 1989 Edition for ultrasonic examination of RPV circumferential shell Welds RPV-B, RPV-C, RPV-D, RPV-E, and RPV-A. The licensee stated:

> "R. E. Ginna Nuclear Power Plant proposes to use Ultrasonic Volumetric inspection techniques to inspect the reactor vessel Circumferential shell welds and vessel to flange weld during the March 1999 outage. These inspection techniques have been demonstrated and qualified to the PDI program which meets the intent of the rules of Appendix VIII, Supplement 4 and 6, of the ASME Code, Section XI, 1989 Edition. These techniques will be used in place of the currently required Section XI, 1986 Edition, No Addenda, techniques. These examination techniques shall be performed by a vendor utilizing qualified PDI procedures."

Licensee's Basis for Proposed Alternative (as stated):

> "The Electric Utility industry has developed a program to qualify ultrasonic inspection techniques. This program, Performance Demonstration Initiative (PDI), is designed to meet the intent of Appendix VIII of the ASME Code, Section XI, 1989 and later Editions. The PDI program used a variety of test blocks to evaluate transducer designs, scanning requirements and flaw sizing techniques and the personnel performing the examinations.
>
> "It is our intent to use techniques qualified to the PDI program at the Electric Power Research Institute (EPRI) NDE Center that meets the intent of Appendix VIII, Supplement 4 and 6, of the 1989 or later Edition(s) of ASME Section XI Code. These qualified flaw detection and flaw characterization techniques shall utilize current industry calibration block standards and consists of scanning the examination volume, weld and base metal.
>
> "Performance-based Ultrasonic Testing (UT) techniques provide a higher degree of reliability for detection and characterization of flaws when compared to the conventional amplitude-based UT techniques that are currently required by ASME Section XI. The performance-based demonstration requires the inspection equipment, procedures, and examiners to be tested on flawed specimen representing materials and configurations similar to those found in actual plant configurations. The NRC staff has acknowledged the improvement achieved by performance-based UT techniques. Refer to the Federal Register Notice of December 31, 1996: 61 FR69120. Additionally, the NRC Staff has assessed the PDI program activities and found that PDI has established and executed a well-planned and effective program to test UT equipment, procedures, and examiners on selected portions of Appendix VIII, which include reactor vessel inspection technique. This assessment is documented in a letter from J. Strosnider (NRC) to B. Sheffel (PDI) dated March 6, 1996."

Evaluation: Paragraph IWA-2232 of the 1986 Edition of Section XI specifies that the ultrasonic examination of ferritic vessel welds greater than 2 inches in thickness shall be

conducted in accordance with Article 4 of Section V, as amended by IWA-2232. The licensee is proposing to use ultrasonic examination procedures and techniques that have been developed to meet the intent of Appendix VIII, Supplements 4 and 6, of the 1989 Edition for the examination of RPV shell and shell-to-flange welds. These inspection techniques have been demonstrated and qualified to meet the Performance Demonstration Initiative (PDI) program criteria.

The current regulations incorporate the 1989 Edition of Section XI for ISI activities. The 1989 Edition included mandatory Appendix VII, *Qualification of Nondestructive Examination Personnel for Ultrasonic Examination*, which specifies requirements for the training and qualification of ultrasonic nondestructive examination (NDE) personnel in preparation for employer certification to perform NDE. The 1989 Addenda to Section XI added mandatory Appendix VIII, *Performance Demonstration for Ultrasonic Examination Systems*, containing requirements for performance demonstration of ultrasonic testing (UT) procedures, equipment, and personnel used to detect and size flaws. The U. S. nuclear industry created the PDI group to manage implementation of the performance demonstration requirements of Appendix VIII.

The NRC staff has evaluated the PDI program and has generally found it to be acceptable for demonstrating the effectiveness of ultrasonic examination systems[1] in accordance with Appendix VIII. However, licensees are required to describe where the specific PDI procedures used differ from applicable ASME Code and Appendix VIII requirements. In addition, some PDI participants have announced conformance to PDI program requirements by performing examinations from one side of the weld. The NRC staff has not endorsed single-sided examinations at this time.

In order for this type of relief to be authorized, licensees are required to address specific areas where Code requirements are not being met. Ginna has not submitted the specific information comparing the PDI procedures used to Code and Appendix VIII

---

1 Ultrasonic examination systems include procedures, equipment, and personnel.

requirements. Therefore, it is recommended that the licensee's proposed alternative not be authorized.

3. CONCLUSION

The licensee's proposal to perform UT examination of the RPV circumferential shell welds using PDI qualified flaw detection and flaw characterization techniques has not been described in sufficient detail to assure the reviewers of an acceptable level of quality and safety. Therefore, it is recommended that the proposed alternative not be authorized.