



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

October 1, 2010

Mr. Jack M. Davis  
Senior Vice President and  
Chief Nuclear Officer  
Detroit Edison Company  
Fermi 2 - 210 NOC  
6400 North Dixie Highway  
Newport, MI 48166

SUBJECT: RELIEF REQUEST RR-A38 FOR FERMI 2 RE: EVALUATION OF  
APPENDIX VIII, SUPPLEMENTS 4 AND 6 – USE OF PDI QUALIFIED  
PROCEDURES, PERSONNEL AND EQUIPMENT FOR NON-APPENDIX VIII  
RPV SHELL-TO-FLANGE WELDS AND HEAD-TO-FLANGE WELD  
(TAC NO. ME3116)

Dear Mr. Davis:

By letter dated January 20, 2010, Detroit Edison (the licensee), submitted Relief Request RR-A38 which proposed Implementation of Appendix VIII, Supplements 4 and 6 – Use of Performance Demonstration Initiative (PDI) Qualified Procedures, Personnel and Equipment for Non-Appendix VIII Reactor Pressure Vessel (RPV) Shell-to-Flange Welds and Head-to-Flange Weld for Fermi 2.

The Nuclear Regulatory Commission (NRC) staff has reviewed the submittal and determined that the proposed alternative with PDI qualified procedures and personnel applied from the RPV shell and vessel surfaces along with the improved capabilities as discussed above will provide equivalent or better examination results than those realized from the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section V requirements and, therefore, will provide an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the remainder of the third 10-year inservice inspection interval which began on May 2, 2009 and ends on May 1, 2019, at Fermi 2. 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. The NRC staff review and evaluation is contained in the enclosed safety evaluation.

J. Davis

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If you have any questions, please contact Mahesh Chawla of my staff at (301) 415-8371.

Sincerely,

A handwritten signature in black ink, appearing to read "R. Pascarelli". The signature is fluid and cursive, with a large initial "R" and a long, sweeping underline.

Robert J. Pascarelli, Branch Chief  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-341

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

FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

RELIEF REQUEST RR-A38

FERMI 2

DETROIT EDISON

DOCKET NUMBER 50-341

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed and evaluated the information provided by Detroit Edison (the licensee) in its letter dated January 20, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100220171) which proposed Relief Request RR-A38, Implementation of Appendix VIII, Supplements 4 and 6 – Use of Performance Demonstration Initiative (PDI) Qualified Procedures, Personnel and Equipment for Non-Appendix VIII Reactor Pressure Vessel (RPV) Shell-to-Flange Welds and Head-to-Flange Weld for Fermi 2. This relief is requested for the third 10-year inservice inspection (ISI) interval which began on May 2, 2009 and ends on May 1, 2019.

2.0 REGULATORY REQUIREMENTS

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Title 10 CFR 50.55a(g)(6)(i) states that the Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, given the consideration of the burden upon the licensee. Title 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. Title 10 CFR 50.55a(g)(5)(iii) states that if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in §50.4, information to support the determinations.

Enclosure

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 preservice 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 ISI of components and system pressure tests conducted during the first 10-year interval and 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 applicable ASME Code, Section XI of record for the third 10-year ISI interval at Fermi 2 is the 2001 Edition through the 2003 Addenda.

The information provided by the licensee in support of the relief request has been evaluated by the NRC staff and the bases for disposition are documented below.

### 3.0 EVALUATION

#### 3.1 Applicable Code Edition and Addenda

The applicable ASME Code, Section XI of record for the third 10-year ISI interval at Fermi 2 is the 2001 Edition through the 2003 Addenda. In addition, as required by 10 CFR 50.55a, ASME Code, Section XI, 2001 Edition with no Addenda is used for Appendix VIII, Performance Demonstration for Ultrasonic Examination Systems.

#### 3.2 Components for Which Relief is Requested

ASME Code Class 1, Item Numbers B1.30 and B1.40, Reactor Pressure Vessel (RPV) Shell-to-Flange Weld No. 13-308 and RPV Head-to-Flange Weld No. 3-319.

#### 3.3 Code Requirements

ASME Code, Section XI, Subsection IWA-2232 requires ultrasonic test (UT) examinations be performed in accordance with Mandatory Appendix I. Paragraph I-2110(b) of Mandatory Appendix I requires that examination of the RPV shell-to-flange weld and head-to-flange weld to be in accordance with ASME Code, Section V, Article 4.

#### 3.4 Licensee's Proposed Alternative and Basis for Use

The licensee proposes to perform ultrasonic examinations of the RPV shell-to-flange weld and head-to-flange weld using procedures, personnel, and equipment that have been demonstrated and qualified in accordance with ASME Code, Section XI, 2001 Edition with no Addenda, Appendix VIII, Supplements 4 and 6 as amended by 10 CFR 50.55a and industry's PDI program. Since the examinations will be performed from a single side due to the weld configuration, all procedures, personnel, and equipment will be qualified for single sided access for examination of these welds.

Appendix VIII requirements were developed and adopted to ensure the effectiveness of ultrasonic examinations within the nuclear industry by means of a rigorous, item specific performance demonstration containing flaws of various sizes, locations and orientations. The

performance demonstration process has established with a high degree of confidence, the capability of personnel, procedures, and equipment to detect and characterize flaws that could be detrimental to the structural integrity of the RPV. The PDI approach has demonstrated that for detection and characterization of flaws in the RPV the ultrasonic examination techniques are equal to, or surpass the requirements of the ASME Section V, Article 4 ultrasonic examination requirements.

The licensee states that though Appendix VIII is not specified for the RPV flange weld UT examinations, the use of Appendix VIII, Supplements 4 and 6 criteria for detection and sizing of flaws in these welds will be equal to, or exceed the requirements of ASME Section V, Article 4. Therefore, the use of the proposed alternative will continue to provide an acceptable level of quality and safety, and approval is requested pursuant to 10 CFR 50.55a(a)(3)(i).

### 3.5 Duration of Proposed Alternative

The proposed alternative is requested for the duration of the third 10-year ISI interval for Fermi 2, which began on May 2, 2009 and ends on May 1, 2019.

### 4.0 STAFF EVALUATION

The ASME Code requires that ultrasonic examination of shell-to-flange welds and head-to-flange welds in vessels greater than 2 inches in thickness be conducted in accordance with Article 4 of the ASME Code, Section V, as supplemented by requirements in Table I-2000-1. ASME Code, Section V, Article 4 provides a prescriptive process for qualifying UT procedures and performing examinations. The licensee instead proposes to use procedures and personnel qualified in accordance with performance-based criteria listed in the 2001 Edition with no Addenda of the ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 as implemented by the industry's PDI program. These performance-based methods are currently required by 10 CFR 50.55a for examination of all other RPV shell welds (having replaced the Article 4 techniques).

Amplitude-based examination techniques such as the prescriptive UT procedures that comply with the requirements of Article 4 of ASME Code, Section V, are based on the amplitude of the returned signal and correlating that amplitude with an equivalent machined reflector such as a notch or a side-drilled hole. However, correlation between defect size and amplitude has been poor. This is not unexpected given the number of variables from the material, equipment and defect itself. The material has potential velocity and microstructure variations, and the equipment has potential amplitude variations due to the type of pulser, frequency band, cabling, and other inherent electrical parameters. Perhaps the biggest variable is the defect itself. Ultrasonic examination is highly sensitive to defect orientation. Also, roughness, curvature, and location play a role in the ability to detect and size defects. In addition, conventional amplitude-based ultrasonics is particularly unreliable for vertically oriented defects.

When prescriptive UT procedures that comply with the requirements of Article 4 of ASME Code, Section V, were used in round robin tests containing real flaws in RPV mockups, and the results statistically analyzed according to the screening criteria of ASME Code, Section XI, Appendix VIII, the procedures proved to be less effective than examinations that utilize Appendix VIII, Supplements 4 and 6, qualified procedures. Performance-based UT is generally

applied with higher sensitivity, which increases the probability of detecting a flaw when compared to prescriptive Section V, Article 4 requirements. Procedures, equipment, and personnel qualified through the PDI program have demonstrated their skill level to detect flaws common to nuclear power plants and have shown high probability of detection levels. This has resulted in an increased reliability of inspections for weld configurations subject to the requirements of Appendix VIII.

Due to the weld configuration the examination will be performed from a single side. Therefore, all procedures, personnel, and equipment will be qualified for single sided access for examination of the subject welds.

The NRC staff concludes that the use of UT procedures and personnel qualified to the 2001 Edition with no Addenda of Section XI of the ASME Code, Appendix VIII, Supplement 4 and 6, as modified by 10 CFR 50.55a(b)(2)(xv) by demonstration through the PDI program for the RPV shell-to-flange weld and head-to-flange weld, provides equivalent or better examination results than those obtained from ASME Code, Section V requirements. Therefore, based on the above analysis, the staff concludes that an acceptable level of quality and safety will be maintained when using the licensee's proposed alternative examination.

## 5.0 CONCLUSION

The NRC staff concludes that the proposed alternative with PDI qualified procedures and personnel applied from the RPV shell and vessel surfaces along with the improved capabilities as discussed above will provide equivalent or better examination results than those realized from the ASME Code, Section V requirements and, therefore, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the remainder of the third 10-year ISI interval at Fermi 2.

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.

Principal Contributor: Carol Nove, NRR

Date: October 1, 2010

J. Davis

- 2 -

If you have any questions, please contact Mahesh Chawla of my staff at (301) 415-8371.

Sincerely,

**/RA/**

Robert J. Pascarelli, Branch Chief  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-341

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