



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

August 28, 2009

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: FERMI 2 – EVALUATION OF SECOND 10-YEAR INTERVAL INSERVICE
INSPECTION REQUEST FOR RELIEF NO. RR-A36 ON END OF INTERVAL
SYSTEM PRESSURE TEST (TAC NO. ME0868)

Dear Mr. Davis:

By letter dated March 13, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090790207), Detroit Edison Company, (the licensee), submitted Relief Request No. RR-A36, related to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI requirements for the second 10-year interval inservice inspection (ISI) program for the Fermi Nuclear Power Plant, Unit 2. The licensee requested relief from performing an end of interval system pressure test of the reactor pressure vessel flange seal leak detection piping at the ASME Code-required test pressure corresponding to nominal operating pressure during system operation.

Based on information provided in the submittal, the staff concluded that the Code requirements are impractical and, if imposed, would cause significant burden on the licensee due to redesign of the reactor vessel head flange. The staff believes that the hydrostatic head developed due to the water above the vessel flange during flood-up, will allow for the detection of any gross leakage if present in the subject piping, and the proposed testing would provide a reasonable assurance of structural integrity.

Therefore, pursuant to Title 10 of the *Code of Federal Regulations* 50.55a "Codes and Standards" Section (g)(6)(i), the staff authorizes the ISI program alternatives proposed in RR-A36 for the second 10-year ISI interval for the Fermi Nuclear Power Plant, Unit 2. The relief granted 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 due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

J. Davis

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The U.S. Nuclear Regulatory Commission staff review and evaluation is contained in the enclosed safety evaluation.

Sincerely,

A handwritten signature in black ink that reads "Lois M. James". The signature is written in a cursive, flowing style.

Lois M. James, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure:
Safety Evaluation

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

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF NO. RR-A36 ON SYSTEM PRESSURE TEST

FERMI NUCLEAR POWER PLANT, UNIT 2

DETROIT EDISON COMPANY

DOCKET NO. 50-341

1.0 INTRODUCTION

By letter dated March 13, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090790207), Detroit Edison Company, (the licensee), submitted Relief Request No. RR-A36, related to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI requirements for the second 10-year interval inservice inspection (ISI) program for the Fermi Nuclear Power Plant, Unit 2. In RR-A36, the licensee requested relief from performing an end of interval system pressure test of the reactor pressure vessel (RPV) flange seal leak detection system at the ASME Code-required test pressure corresponding to nominal operating pressure during system operation.

The licensee has stated in the request for relief that the configuration of the leak detection piping precludes implementing the Code-required pressure test either with the vessel head installed or while removed. The Code requirement for system pressure test of the RPV flange seal leak detection system is impractical and if imposed, would necessitate redesign of the O-ring and its groove in the reactor vessel head flange. The staff has evaluated the licensee's proposed alternatives in the relief request pursuant to Title 10 to *Code of Federal Regulations* (10 CFR) 50.55a "Codes and Standards" Section (g)(6)(i).

2.0 REGULATORY REQUIREMENTS

The regulation at 10 CFR 50.55a(g) requires that ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific written relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). According to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph 50.55a(g) may be used, when authorized by the NRC, if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety or if the specified requirement 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 preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of Record for the 2nd 10-year ISI interval for the Fermi Nuclear Power Plant, Unit 2, is the 1989 Edition of the ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

System/Component(s) for Which Relief is Requested

RPV Flange Seal Leak Detection Piping

ASME Code Requirements

Table IWB-2500-1, Examination Category B-P, Item Number B15.11, requires all pressure retaining components be subject to a system hydrostatic test in accordance with IWB-5222. The NRC has approved ASME Section XI Code Case N-498-1 "Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems" that allows a system leakage test at or near the end of each inspection interval prior to reactor startup as an alternative to the 10-year system hydrostatic test required by Table IWB-2500-1, Category B-P. The pressure retaining boundary for the test conducted at or near the end of each inspection interval shall be extended to all Class 1 pressure retaining components per IWB-2500-1, Examination Category B-P (note 2). This extended boundary system leakage test is to be conducted once per inspection interval.

Licensee's Request for Relief

Relief is requested from performing the system leakage test at a pressure corresponding to nominal operating pressure during system operation. The licensee proposed an alternative pressure testing requirement in lieu of the system leakage test required under IWB-5221(a) for the RPV flange seal leak detection piping.

Licensee's Basis for Requesting Relief

The RPV flange seal leak detection piping is separated from the reactor pressure boundary by one passive membrane, which is an O-ring, located on the vessel flange. A second O-ring is located on the opposite side of the tap in the vessel flange. This piping is required during plant operation in order to indicate failure of the inner flange seal O-ring. Failure of the O-ring would result in the annunciation of an alarm in the control room. Failure of the inner O-ring is the only condition under which this line is pressurized. If the annunciator ceases to be in alarm, it would indicate that the outer O-ring or the leak detection line had failed and resulted in a reactor coolant pressure boundary leak. This would require immediate plant shutdown.

The configuration of this piping precludes system pressure testing while the vessel head is removed because the odd configuration of the vessel tap, coupled with the high test pressure

requirement, prevents the tap in the flange from being temporarily plugged or connected to other piping. The opening in the flange is smooth-walled, making the effectiveness of a temporary seal very limited. Failure of this seal could possibly cause ejection of the device used for plugging or connecting to the vessel.

The configuration also precludes pressure testing with the vessel head installed because the seal prevents complete filling of the piping, which has no vent available. The top head of the vessel contains two grooves that hold the 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 was performed with the head on, the inner O-ring would be pressurized in a direction opposite to what it would see in normal operation. This test pressure would result in a net inward force on the inner O-ring that would tend to push it into the recessed cavities that house the retainer clips. The thin O-ring material would very likely be damaged by this inward force.

Operational testing of this line is precluded, because the line will only be pressurized in the event of a failure of the inner O-ring. It is impracticable to purposely fail the inner O-ring in order to perform a pressure test.

Licensee's Proposed Alternative

The end of interval system pressure test to be conducted for Fermi Unit 2 would not achieve the Code-required test pressure in the RPV flange seal leak detection piping since the leak-tight integrity of the inner O-ring would be maintained during the test. The licensee has implemented a periodic Preventive Maintenance Event (PM Event B564) to pressurize an isolable section of RPV flange seal leak detection piping which will verify that the pressure switch in the system is functional and in calibration. Further, the system leakage test and the VT-2 visual examination will be performed on the RPV flange seal leak detection piping during flood-up of the refueling pool during every refueling outage. The hydrostatic head developed due to the water above the vessel flange during flood-up will allow for the detection of any gross leakage in the piping.

4.0 STAFF EVALUATION

The ASME Code, Section XI of Record requires that all Class 1 components within the reactor coolant system boundary undergo a system hydrostatic test at or near the end of each inspection interval. The staff has accepted a system leakage test under Code Case N-498-1 in lieu of the system hydrostatic test. In RR-A36, the licensee requested relief from performing a system leakage test of the RPV flange seal leak detection piping at the Code required test pressure corresponding to the nominal operating pressure during system operation. The piping is located between the inner and the outer O-ring seals of the vessel flange and is required during plant operation in order to detect failure of the inner flange seal O-ring. The design of this line makes the Code-required system leakage test impractical either with the vessel head in place or removed. The piping cannot be filled completely with water since it cannot be vented to remove entrapped air from the line either with the vessel head in place, or removed due to its configuration. If a pressure test were to be performed with the head in place, the space between the inner and the outer O-ring seals would be pressurized. The test pressure would exert a net inward force on the inner O-ring that would tend to push it into the recessed cavities that house the retainer with the possibility of damaging the inner O-ring seal. The configuration of this

piping also precludes system pressure testing, while the vessel head is removed because the odd configuration of the vessel tap coupled with the high test pressure requirement prevents the tap in the flange from being temporarily plugged or connected to other piping. The opening in the flange is smooth-walled, making the effectiveness of a temporary seal very limited. Failure of this seal could possibly cause ejection of the device used for plugging or connecting to the vessel.

To perform the system leakage test in accordance with the Code requirements, the RPV flange seal leak detection piping would have to be redesigned, fabricated, and installed. This would impose severe burden on the licensee. The leak detection line is essentially a leakage collection and detection system. The line would only function as a pressure boundary if the inner O-ring fails and pressurizes the line, which would result in a control room annunciator alarm that would require operator action. Since the pressure switch in the line senses reactor coolant pressure and sets off the alarm, the licensee has implemented a periodic Preventive Maintenance Event (PM Event B564) to pressurize an isolable section of RPV flange seal leak detection piping to verify that the pressure switch in the system is functional and in calibration. The licensee has further proposed to perform a VT-2 visual examination of the RPV flange seal leak detection piping when the reactor cavity is flooded with water during a refueling outage. The staff believes that the hydrostatic head developed due to the water above the vessel flange during flood-up, will allow for the detection of any gross leakage if present in the subject piping, and the proposed testing would provide a reasonable assurance of structural integrity. Therefore, the licensee's proposed alternative is acceptable.

5.0 CONCLUSION

Based on staff's evaluation, a system leakage test of the RPV flange seal leak detection piping at the Code-required test pressure corresponding to the nominal operating pressure during system operation is impractical and would cause severe burden on the licensee if the requirement is imposed. The licensee's proposed alternative provides reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the proposed alternative in RR-A36 is authorized for the second 10-year ISI interval of Fermi Nuclear Power Plant, Unit 2. The relief granted 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 due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

6.0 REFERENCES

- 6.1 Letter from Mr. Joseph H. Plona, Site Vice President dated March 13, 2009, to the U.S. Nuclear Regulatory Commission, Subject: Submittal of Inservice Inspection Program Relief Requests, RR-A35 and RR-A36.
- 6.2 American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, 1989 Edition.

6.3 Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 1 to 50.

6.4 ASME Section XI Code Case N-498-1 "Alternative Rules for 10-Year System Hydrostatic Testing for Class 1, 2, and 3 Systems."

Principal Contributor: Pat Patnaik, NRR

Date: August 28, 2009

J. Davis

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The U.S. Nuclear Regulatory Commission staff review and evaluation is contained in the enclosed safety evaluation.

Sincerely,

/RA/

Lois M. James, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure:
Safety Evaluation

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