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DTE Energy

September 26, 2017 10 CFR 50.55a
NRC-17-0062

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) NRC Letter to DTE Electric Company, "Relief Request RR-A37 for Fermi 2 RE: Evaluation of Alternative to Reactor Pressure Vessel Nozzle-to-Vessel Welds and Inner Radius Examinations (TAC No. ME3117)," dated October 1, 2010 (ML102590141)

3) NRC Letter to Dennis Madison, BWRVIP Chairman, "Final Safety Evaluations of the Boiling Water Reactor Vessel Internals Project (BWRVIP)-241 Report, 'Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-To-Vessel Shell Welds and Nozzle Blend Radii' (TAC No. ME6328)," dated April 19, 2013 (ML13071A233).

Subject: Submittal of Revised Relief Request No. RR-A37, Revision 1, for the Inservice Inspection Program Third 10-Year Interval

Pursuant to 10 CFR 50.55a, "Codes and Standards," paragraph (z)(1), DTE Electric Company (DTE) hereby requests NRC approval of the enclosed revision to relief request RR-A37 for the Fermi 2 Power Plant. The third 10-year interval of the Fermi 2 Inservice Inspection (ISI) Program began on May 2, 2009 and complies with the 2001 Edition with 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code, Section XI.

The subject revised relief request is regarding the implementation of ASME Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1," and Boiling Water Reactor Vessel Inspection Program (BWRVIP)-241, "Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," as documented in the enclosure to this letter. DTE

originally received NRC approval of RR-A37 to utilize ASME Code Case N-702 using the technical basis and criteria in BWRVIP-108, "Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," for the third 10-year ISI interval by NRC letter dated October 1, 2010 (Reference 2). The N2 Recirculation Inlet nozzles were excluded from the alternative associated with RR-A37 because they did not meet the third criterion specified in Section 5.0 of the staff's safety evaluation for the BWRVIP-108 report for plant-specific application of ASME Code Case N-702. On April 19, 2013, the NRC issued a safety evaluation (Reference 3) approving the use of BWRVIP-241 for the application of ASME Code Case N-702, which contains criteria that the Fermi 2 N2 Recirculation Inlet nozzles meet.

DTE requests approval of the proposed revised relief request on or before August 1, 2018, to accommodate its application during an upcoming refueling outage. DTE plans to implement this alternative for the remainder of the Fermi 2 ISI Program third 10-year interval. Although this review is neither exigent nor emergency, DTE respectfully requests your prompt review to support application during the next Fermi 2 Refueling Outage, which is planned to begin in September 2018.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Scott A. Maglio, Manager – Nuclear Licensing, at (734) 586-5076.

Sincerely,

Keith J. Polson
Site Vice President

Enclosure: Revised Relief Request RR-A37, Revision 1, for the Inservice Inspection Third 10-Year Interval

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission
Regulated Energy Division (kindschl@michigan.gov)

Enclosure to
NRC-17-0062

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

Revised Relief Request RR-A37, Revision 1, for the Inservice Inspection Third 10-Year Interval

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Proposed Alternative In Accordance with 10 CFR 50.55a(z)(1)
Alternative Provides Acceptable Level of Quality and Safety

1. ASME Code Components Affected

ASME Code Class:	Code Class 1
References:	ASME Section XI, 2001 Edition with 2003 Addenda
	Table IWB-2500-1
	Code Case N-702
Examination Category:	B-D
Item Numbers:	B3.90, B3.100
Description:	Alternative Requirements for Examination of Boiling Water Reactor (BWR) Nozzle Inner Radius Sections and Nozzle-to-Shell Welds
Components:	N1, N2, N3, N5, N6, N7, N8, and N10 Nozzles (see Attachment 2 for specific nozzle identifications)

2. Applicable Code Edition and Addenda

ASME Section XI, 2001 Edition through 2003 Addenda

3. Applicable Code Requirement

Table IWB-2500-1, Examination Category B-D, Inspection Program B, Item Numbers B3.90, and B3.100 require a volumetric examination to be performed once per interval on each reactor vessel nozzle-to-vessel weld and nozzle inside radius section.

4. Reason for Request

Leverage the technical basis and criteria in BWR Vessel and Internals Project (BWRVIP)-108 (Reference 1) and BWRVIP-241 (Reference 2), as endorsed by the NRC (References 3 and 4), to realize substantial radiation dose and cost savings while maintaining an acceptable level of quality and safety.

5. Proposed Alternative and Basis for Relief

Pursuant to 10CFR50.55a(z)(1), DTE Electric Company (DTE) requests authorization to utilize the alternative requirements provided in ASME Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds, Section XI, Division 1," in lieu of the requirements of Table IWB-2500-1, Examination Category B-D, Item Numbers B3.90, and B3.100 for reactor vessel nozzle-to-

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shell welds and nozzle inside radius sections of the identified components in Attachment 2. These alternative requirements will not be utilized for the feedwater nozzles.

This alternative allows a 25% sampling of the reactor vessel nozzle inner radius section examinations and nozzle-to-shell weld examinations to be implemented, provided at least one nozzle from each system and nominal pipe size is examined. This alternative also allows a VT-1 examination of the nozzle inner radius base metal surfaces to be performed in lieu of the Code required volumetric examination. For the nozzle-to-shell welds requiring examination, a volumetric examination will be performed. ASME Section XI, Appendix VIII, 2001 Edition with no Addenda will be used for volumetric examinations as mandated in 10CFR50.55a(b)(2)(xv).

Current requirements for the inspection of the BWR nozzle-to-shell welds and nozzle blend radii are costly and result in significant radiation exposure to examiners. The performance of Nondestructive Examination (NDE) has improved substantially since the examinations of ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item Numbers B3.90, and B3.100 were first required such that there is now a high reliability of detecting flaws that can challenge the structural integrity of BWR nozzles and their associated welds. Knowledge of improved NDE capabilities, coupled with fracture mechanics, provides a technical basis to justify reduction of inspections while maintaining safety. This technical basis is provided in BWRVIP Report Nos. BWRVIP-108 and BWRVIP-241.

For any cracks in the nozzle blend radius region, the results of BWRVIP-108 show that the conditional failure probability of the nozzles due to a low temperature overpressure (LTOP) event are very low ($<1x10^{-6}$ for 40 years), even without any inservice inspection. At the nozzle-to-vessel shell weld, the conditional probability of failure due to the LTOP event is also very small ($<1x10^{-6}$ for 40 years), with or without any inservice inspection. As such, the BWRVIP-108 report provides the technical basis for the reduction of the nozzle-to-shell welds and nozzle blend radii from 100% to 25% of the nozzles every 10 years.

Supplemental analyses of BWR recirculation inlet and outlet nozzle-to-shell welds and nozzle inner radii are provided by Electric Power Research Institute (EPRI) report BWRVIP-241. This report was submitted to address the limitations and conditions specified in the December 19, 2007 Safety Evaluation Report (SER) for BWRVIP-108.

Regulatory Guide 1.147, Revision 17 conditionally accepts the use of Code Case N-702 with BWRVIP-108 and BWRVIP-241 used as the technical basis supporting the implementation with the following condition:

> "The applicability of Code Case N-702 must be shown by demonstrating that the criteria in Section 5.0 of NRC Safety Evaluation regarding BWRVIP-108 dated December 18, 2007 (ML073600374) or Section 5.0 of NRC Safety Evaluation regarding BWRVIP-241 dated April 19, 2013 (ML13071A240) are met."

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In Section 5.0, "Conditions and Limitations," of NRC SER regarding BWRVIP-241 (Reference 4), the following criteria are listed (reference Attachment 1):

(1) The maximum Reactor Pressure Vessel (RPV) heatup/cooldown rate is limited to less than 115ºF per hour.

- Per TS SR 3.4.10.1, the RPV heatup/cooldown is limited to less than or equal to 100ºF in any 1-hour period. This criterion is met.

For recirculation inlet nozzles

(2) $(pr/t)/C_{RPV} \leq 1.15$

- The calculation for the Fermi 2 N2 Nozzle results in 0.89, which is less than 1.15.

(3) $[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE} \leq 1.47$

- The calculation for the Fermi 2 N2 Nozzles results in 1.229, which is less than 1.47.

Therefore, these criteria are met for the Recirculation Inlet Nozzles.

For recirculation outlet nozzles

(4) $(pr/t)/C_{RPV} \leq 1.15$

- The calculation for the Fermi 2 N1 Nozzles results in 1.07, which is less than 1.15.

(5) $[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE} \leq 1.59$

- The calculation for the Fermi 2 N1 Nozzles results in 1.069, which is less than 1.59.

Therefore, the criteria are met for the Recirculation Outlet Nozzles.

Based upon the above information, all RPV nozzle-to-vessel shell welds and nozzle inner radius sections meet the criteria and therefore are applicable. Additionally, as stated earlier, this alternative will not be applied to the feedwater nozzles.

6. Duration of Proposed Alternative

This relief is requested for the duration of the Third Inservice Inspection Interval, which began on May 2, 2009 and is scheduled to end on May 1, 2019.

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7. Precedents

- Duane Arnold Energy Center – Safety Evaluation for Request for Alternative to Reactor Pressure Vessel Nozzle to Vessel Weld and Inner Radius Examinations was approved on August 29, 2008 (Accession number ML082040046, TAC No. MD8193)

- James A. Fitzpatrick Nuclear Power Plant – Safety Evaluation for Request for Relief Using the Requirements of the ASME Code Case N-702 and BWRVIP-241 for Plant Nozzle-to-Vessel Welds and Nozzle Inner Radii was approved on December 6, 2016 (Accession number ML16334A440, CAC. No. MF8301).

- Dresden Nuclear Power Station – Safety Evaluation for Proposed Alternative Request for Nozzle-to-Vessel Welds and Inner Radii Examinations was approved on June 28, 2017 (Accession number ML17073A121, CAC. Nos. MF8090 and MF8091).

- Hope Creek Generating Station – Safety Evaluation for Relief from the Requirements of the ASME Code for Alternative to Nozzle-to-Vessel Weld and Inner Radius Examinations was approved August 17, 2017 (Accession number ML17223A483, CAC No. MF9554).

- Quad Cities Nuclear Power Station – Safety Evaluation for Request for Alternative to the Requirements of the ASME Code Regarding Reactor Pressure Vessel Nozzle Assemblies was approved August 25, 2017 (Accession number ML17221A264, CAC Nos. MF8989 and MF8990).

8. References

1. EPRI, Palo Alto, CA, "BWRVIP-108NP: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," 1016123, November 2007.

2. EPRI, Palo Alto, CA, "BWRVIP-241: BWR Vessel and Internals Project, Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," 1021005, October 2010.

3. Matthew Mitchell, Office of Nuclear Reactor Regulation, to Rick Libra, BWRVIP Chairman, "Safety Evaluation of Proprietary EPRI Report, 'BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Inner Radius (BWRVIP-108)'," December 19, 2007.

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4. Sher Bahadur, Office of Nuclear Reactor Regulation, to Dennis Madison, BWRVIP Chairman, "Final Safety Evaluations of the Boiling Water Reactor Vessel Internals Project (BWRVIP)-241 Report, ‘Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-To-Vessel Shell Welds and Nozzle Blend Radii’ (TAC No. ME6328)," April 19, 2013.

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Attachment 1

Response to NRC Plant Specific Applicability to BWRVIP-241

1. The maximum Reactor Pressure Vessel (RPV) heatup/cooldown rate is limited to less than 115ºF/hour

Response: TS SR 3.4.10.1 limits the RPV heatup/cooldown to ≤ 100ºF/hour for Curve B and ≤20ºF/hour for Curve A.

	Recirculation Inlet Nozzles			**Recirculation Outlet Nozzles**	
2.	$(pr/t)/C_{RPV} \leq 1.15$		**4.**	$(pr/t)/C_{RPV} \leq 1.15$	
	p=RPV Normal Operating Pressure (psi)	1045		p=RPV Normal Operating Pressure (psi)	1045
	r=RPV inner radius (inch)	127.125		r=RPV inner radius (inch)	127.125
	t=RPV wall thickness (inch)	7.6875		t=RPV wall thickness (inch)	7.6875
	C_{RPV}=	19332		C_{RPV}=	16171
	$(pr/t)/C_{RPV}$=	0.89		$(pr/t)/C_{RPV}$=	1.07
3.	$[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE} \leq 1.47$		**5.**	$[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE} \leq 1.59$	
	p=RPV Normal Operating Pressure (psi)	1045		p=RPV Normal Operating Pressure (psi)	1045
	r_o=nozzle outer radius (inch)	11		r_o=nozzle outer radius (inch)	22.5625
	r_i=nozzle inner radius (inch)	6.1875		r_i=nozzle inner radius (inch)	13.125
	C_{NOZZLE}	1637		C_{NOZZLE}	1977
	$[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE}$=	1.229		$[p(r_o^2+r_i^2)/(r_o^2-r_i^2)]/C_{NOZZLE}$=	1.069

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Attachment 2
Applicable Components

Nozzle	Code Category	Item Number	Identification	Description	System	Isometric
N3	B-D	B3.100	8-316A IRS	Nozzle Inside Radius Section	Main Steam	5361-5
N3	B-D	B3.100	8-316B IRS	Nozzle Inside Radius Section	Main Steam	5361-5
N3	B-D	B3.100	8-316C IRS	Nozzle Inside Radius Section	Main Steam	5361-5
N3	B-D	B3.100	8-316D IRS	Nozzle Inside Radius Section	Main Steam	5361-5
N5	B-D	B3.100	14-316A IRS	Nozzle Inside Radius Section	Core Spray	5361-5
N5	B-D	B3.100	14-316B IRS	Nozzle Inside Radius Section	Core Spray	5361-5
N10	B-D	B3.100	15-315 IRS	Nozzle Inside Radius Section	Control Rod Drive	5361-5
N1	B-D	B3.100	5-314A IRS	Nozzle Inside Radius Section	Reactor Recirc Suction	5361-5
N1	B-D	B3.100	5-314B IRS	Nozzle Inside Radius Section	Reactor Recirc Suction	5361-5
N2	B-D	B3.100	13-314A IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314B IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314C IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314D IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314E IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314F IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314G IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314H IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314J IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N2	B-D	B3.100	13-314K IRS	Nozzle Inside Radius Section	Reactor Recirc Inlet	5361-5
N8	B-D	B3.100	19-314A IRS	Nozzle Inside Radius Section	Jet Pump Instrument	5361-5
N8	B-D	B3.100	19-314B IRS	Nozzle Inside Radius Section	Jet Pump Instrument	5361-5
N7	B-D	B3.100	2-318 IRS	Nozzle Inside Radius Section	RPV Head Vent	5361-5
N6	B-D	B3.100	4-318A IRS	Nozzle Inside Radius Section	RPV Head Spare	5361-5
N6	B-D	B3.100	4-318B IRS	Nozzle Inside Radius Section	RPV Head Spare	5361-5
N3	B-D	B3.90	8-316A	M.S. Nozzle-to-Vessel Weld	Main Steam	5361-5
N3	B-D	B3.90	8-316B	M.S. Nozzle-to-Vessel Weld	Main Steam	5361-5
N3	B-D	B3.90	8-316C	M.S. Nozzle-to-Vessel Weld	Main Steam	5361-5
N3	B-D	B3.90	8-316D	M.S. Nozzle-to-Vessel Weld	Main Steam	5361-5
N5	B-D	B3.90	14-316A	C.S. Nozzle-to-Vessel Weld	Core Spray	5361-5
N5	B-D	B3.90	14-316B	C.S. Nozzle-to-Vessel Weld	Core Spray	5361-5
N10	B-D	B3.90	15-315	CRD Ref. Nozzle-to-Vessel Weld	Control Rod Drive	5361-5

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Attachment 2
Applicable Components
(continued)

Nozzle	Code Category	Item Number	Identification	Description	System	Isometric
N1	B-D	B3.90	5-314A	RRI Nozzle-to-Vessel Weld	Reactor Recirc. Suction	5361-5
N1	B-D	B3.90	5-314B	RRI Nozzle-to-Vessel Weld	Reactor Recirc. Suction	5361-5
N2	B-D	B3.90	13-314A	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314B	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314C	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314D	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314E	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314F	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314G	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314H	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314J	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N2	B-D	B3.90	13-314K	RRI Nozzle-to-Vessel Weld	Reactor Recirc Inlet	5361-5
N8	B-D	B3.90	19-314A	JPI Nozzle-to-Vessel Weld	Jet Pump Instrument	5361-5
N8	B-D	B3.90	19-314B	JPI Nozzle-to-Vessel Weld	Jet Pump Instrument	5361-5
N7	B-D	B3.90	2-318	Head/Vent Nozzle-to-Vessel Weld	RPV Head Vent	5361-5
N6	B-D	B3.90	4-318A	Spare Nozzle-to-Vessel Weld	RPV Head Spare	5361-5
N6	B-D	B3.90	4-318B	Spare Nozzle-to-Vessel Weld	RPV Head Spare	5361-5